TECHNICAL MEMORANDUM

Flora and Fauna Survey

Port Hedland International Airport - Highway Precinct 2

PROJECT NUMBER	EP18-117 (05)	**DOC. NUMBER**	EP18-117 (05)—010
PROJECT NAME	Port Hedland Airport Highway Precinct Development Support	**CLIENT**	PHIA Asset Trust
AUTHOR	SKP	**REVIEWER**	TAA
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1. INTRODUCTION

1.1. Background

The PHIA Asset Trust is developing the Highway Precinct 2 (herein referred to as 'the site') as a part of their airport master plan, a leasehold industrial development located to the south-east of the PHIA Terminal. The Town of Port Hedland is the registered proprietor of the Port Hedland International Airport land and own the site in freehold.

The site is 37.99 hectares (ha) in size and is bound by the Great Northern Highway to the east, BHP Billiton Iron Ore (BHPBIO) railway line to the south and the main runway to the west.

Emerge Associates (Emerge) were engaged by PHIA Asset Trust to provide further information regarding the flora, vegetation and fauna values present within the site.

1.2. Scope of work

The scope of work was to undertake a flora and vegetation assessment to the standard required of a reconnaissance survey in accordance with the Environmental Protection Authority's (EPA's) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016b) and fauna assessment to the standard required of a part level 1 survey (desktop assessment) in accordance with the Environmental Protection Authority's (EPA's) *Technical Guidance – Terrestrial fauna Surveys* (EPA 2016a). As part of this scope of work, the following tasks were undertaken for the vegetation within the site:

- Desktop review of background information.
- Compilation of a representative list of flora species recorded as part of the field survey.
- Compilation of a list of conservation significant fauna species potentially using the site.
- Mapping of plant communities and vegetation condition.
- Documentation of the desktop assessment, survey methodology and results into a technical memo.

2. BACKGROUND

2.1. Climate

The site is in the Pilbara region of Western Australia. The Pilbara has an arid-tropical climate with two distinct seasons, a hot summer from October to April and a mild winter from May to September. Climate data from the Bureau of Meteorology (BoM) Port Hedland Airport weather station shows that the Port Hedland area experiences a wide temperature range, with an average annual maximum temperature of 33.3° C and an average annual minimum temperature of 19.5°C (BoM 2018).

Rainfall in the Pilbara is sporadic, and can occur in summer and winter. The Port Hedland area has an average annual rainfall of 319.2 mm with the majority of rainfall occurring from January to March (BoM 2018). Summer rainfall is typically associated with tropical storms in the north or tropical cyclones that cross the coast and move inland. Winter rainfall is commonly the result of cold fronts moving north-easterly across the State (Beard 1975).

2.2. Regional landforms and soils

The Interim Biogeographic Regionalisation for Australia (IBRA) divided Australia into 89 bioregions defined based on climate, geology, landform, and native vegetation and species characteristics. These bioregions are split into subregions, of which the site forms part of the 'PIL4' (Roebourne) subregion (Department of the Environment 2012). The Roebourne subregion is characterised by quaternary alluvial and older colluvial coastal and sub-coastal plains with alluvial flats and river deltas (Kendrick and Stanley 2001).

2.1. Regional vegetation

The Roebourne IBSA subregion is described as containing vegetation assemblages ranging from grass savannahs of mixed bunch and hummock grasses and dwarf shrub of *Acacia stellaticeps*, *A. pyrifolia* or *A. inaequilatera* on the coastal plains to *Triodia* hummock grasslands in the uplands. The ephemeral drainage lines are dominated by *Triodia* hummock grasslands while the alluvial flats and river deltas are dominated by samphire and mangroves (Kendrick and Stanley 2001).

Broad scale vegetation mapping of the Pilbara region was also undertaken by Beard (1975). The site forms part of the Roebourne plains which is located within the Fortescue botanical district of the Eremaean botanical province of Western Australia (Beard 1975). The Beard mapping has also subsequently been re-assessed and digitised by Shepherd *et al.* (2001). Based on this updated dataset, the site falls within vegetation type 647 'hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex'. The *Statewide Vegetation Statistics 2017* indicates that vegetation type 647 has 97.88% of its pre-European extent remaining (Government of Western Australia 2018).

2.2. Conservation significant flora species

A search was conducted for threatened and priority flora within a 50 km radius of the site using the *Protected Matters Search Tool* (DoEE 2018), the Department of Biodiversity, Conservation and Attractions (DBCA) *NatureMap* (DBCA 2018) and DBCA's threatened and priority flora database (reference no. 05-1216FL). No threatened flora species were identified, but 15 priority flora species occur within 50 km of the site as listed in **Table 1**.

Of the flora species potentially occurring in the local area, only those with habitat preferences of sandy soils and sandplains were deemed likely to occur in the site.

On this basis nine priority flora species were identified as having potential to occur within the site (shaded green in **Table 1**).

Table 1: Significant flora species known or likely to occur within 50 km of the site

Species	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	State	EPBC Act				
Abulilon sp. Pritzelianum (S. van Leeuwen 5095)	P1	-	P	Sand plains. Brown, orange, red sands.	Apr - Sep	Possible
Atriplex eremitis	P1	-	P	Coastal, sandplains. One occurrence on edge of claypan	Aug-Oct	Possible
Heliotropium parviantrum	P1	-	A	Sandy soils. Flats, plains, rocky slopes.	Feb-Jun	Possible
Tephrosia rosea var. Port Hedland (A.S. George 1114)	P1	-	P	Sand or loam soils. Coastal dunes, sand plains.	May or Sep	Possible
Uvedalia clementii	P1	-	Unknown	Unknown	Unknown	Unknown
Gomphrena pusilla	P2	-	A	Fine beach sand. Behind foredune, on limestone.	Mar-Apr or Jun	Unlikely
Eragrostis crateriformis	P3	-	A	Clayey loam or clay. Creek banks, depressions.	Jan-May or Jul	Unlikely
Euphorbia clementii	P3	-	P	Gravelly hillsides, stony grounds.	May-Jul	Unlikely
Gomphrena leptophylla	P3	-	A	Sand, sandy to clayey loam, granite, quartzite. Open flats, sandy creek beds, edges salt pans & marshes, stony hillsides.	Mar-Sep	Possible
Gymnanthera cunninghamii	P3	-	P	Sandy soils.	Jan-Dec	Possible
Heliotropium muticum	P3	-	P	Sandplain, sand, clay or loam soils.	Jul-Oct	Possible
Rothia indica subsp. *australis*	P3	-	A	Sandy soils. Sandhills and sandy flats.	Apr-Aug	Possible
Bulbostylis burbidgeae	P4	-	A	Granitic soils. Granite outcrops, cliff bases	Mar or Jun-Aug	Unlikely
Goodenia nuda	P4	-	P	Floodplains, drainage lines. Sand and clay soils. Sometimes sandy soils over limestone or ironstone.	Apr-Aug	Possible
Ptilotus mollis	P4	-	P	Stony hills and screes.	May or Sep	Unlikely

2.3. Conservation significant vegetation

Known locations of TECs and PECs within 50 km of the site were searched for using the publicly available *Protected Matters Search Tool* (DoEE 2018) and DBCA's threatened and priority ecological communities' database. These search results indicate that no TECs or PECs are known to occur within the site, but that one PEC (Eighty Mile Land System) occurs within 50 km of the site as listed in **Table 2**. This PEC is specifically named and focused on the Eighty Mile Beach area due to extensive threatening processes at the landscape scale and it is not considered to potentially occur within the site.

Table 2: TECs and PECs known to occur within 50 km of the site.

Community name	Description	TEC/PEC	Level of significance	
			State	EPBC Act
Eighty Mile Land System	Beach foredunes, longitudinal coastal dunes and sandy plains with tussock grasslands and spinifex grasslands	PEC	P3	-

2.4. Conservation significant fauna species

A search was conducted for threatened and priority fauna within a 50 km radius of the site using the *Protected Matters Search Tool* (DoEE 2018), *NatureMap* (combined data from DBCA, Western Australian Museum, Birds Australia and consultants' reports, DBCA 2018) and DBCA's threatened and priority fauna database. As advised by the EPA in the T*echnical Guidance Terrestrial Fauna Suveys* (EPA 2016a), taxonomy and nomenclature for fauna species was taken from the current "Checklist of the Terrestrial Vertebrate Fauna of Western Australia" (Western Australian Museum 2018).

A total of 21 conservation significant fauna species were identified as potentially occurring in the wider local area as listed in **Table 3**.

Of the fauna species potentially occurring in the local area, only those with habitat preferences of low open shrublands and grasslands were deemed likely to occur in the site.

Three conservation significant fauna species (night parrot, crest-tailed mulgara and bilby) were identified having potential to utilise the habitat within the site (shaded green in **Table 3**).

Table 3: Summary of conservation significant fauna species known or likely to occur within 50 km of the site.

Species	Common name	Level of significance		Habitat	Likelihood of occurrence
		State	EPBC Act		
Birds					
Calidris ferruginea	Curlew sandpiper	VU (IA)	CR (MI)	Mainly shallows of estuaries and near-coastal saltlakes (including saltwork ponds) and drying near-coastal freshwater lakes and swamps. Also beaches and near-coastal sewage ponds (Johnstone and Storr 1998).	Unlikely

Table 3 (cont): Summary of conservation significant fauna species known or likely to occur within 50 km of the site

Species	Common name	Level of significance		Habitat	Likelihood of occurrence
		State	EPBC Act		
Calidris tenuirostris	Great knot	VU (IA)	CR (MI)	Mud or sand flats in estuaries and on sheltered coasts. Also near-coastal saltlakes, including saltwork ponds (Johnstone and Storr 1998).	Unlikely
Charadrius mongolus	Lesser sand plover	EN (IA)	EN (MI)	Sandy beaches and tidal estuarine flats. Also near-coastal saltlakes, including saltwork ponds (Johnstone and Storr 1998).	Unlikely
Falco hypoleucos	Grey falcon	VU	-	Lightly wooded coastal and riverine plains (Johnstone and Storr 1998).	Unlikely
Falco peregrinus	Peregrine falcon	S	-	Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes (Johnstone and Storr 1998).	Unlikely
Limosa lapponica baueri	Bar-tailed godwit	VU (IA)	VU or CR (MI)	Estuarine sand and mudflats and sandy beaches with loads of seaweed; also reef flats and near-coastal saltlakes (including saltwork ponds) (Johnstone and Storr 1998).	Unlikely
Limosa lapponica menzbieri	Bar-tailed godwit	VU (IA)	CR (MI)	Mainly coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats (Higgins and Davies 1996).	Unlikely
Numenius madagascariensis	Eastern curlew	VU (IA)	CR (MI)	Mainly tidal mudflats; also reef flats, sandy beaches and rarely near-coastal lakes (including saltwork ponds) (Marchant and Higgins 1990).	Unlikely
Pezoporus occidentalis	Night parrot	CE	EN	Treeless or sparsely wooded spinifex (*Triodia* spp.) near water (including artesian bores) (Johnstone and Storr 1998).	Possible
Rostratula australis	Australian painted snipe	EN	EN	Mainly shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (Higgins and Davies 1996).	Unlikely
Tringa brevipes	Grey-tailed tattler	P4	-	Tidal mud and reef flats, sheltered rocky coasts, stony and seaweedy beaches and sandpits, dry coral ridges (Abrolhos) and pebbly shores of near-coastal saltlakes (including saltwork ponds) (Johnstone and Storr 1998).	Unlikely

Table 3 (cont): Summary of conservation significant fauna species known or likely to occur within 50 km of the site.

Mammals					
Dasycercus blythi	Brush-tailed mulgara	P4	-	Mostly dunes with canegrass (Menkhorst and Knight 2011)	Unlikely
Dasycercus cristicauda	Crest-tailed mulgara	P4	VU	Hummock grass plains, sand ridges, mulga shrubland on loamy sand (Menkhorst and Knight 2011).	Possible
Dasyurus hallucatus	Northern quoll	EN	EN	Most abundant in rocky eucalypt woodland but occurs in range of vegetation types, mostly within 200 km of the coast (Menkhorst and Knight 2011).	Unlikely
Lagostrophus fasciatus fasciatus	Banded hare-wallaby	VU	VU	Restricted to Bernier and Dorre Island in Shark Bay, WA. Assumed extinct on the mainland (Menkhorst and Knight 2011).	Unlikely (locally extinct)
Macroderma gigas	Ghost bat	VU	VU	Requires undisturbed roost caves or mineshafts, usually complex systems with several openings (Menkhorst and Knight 2011).	Unlikely
Macrotis lagotis	Bilby	VU	VU	Open tussock grassland on uplands and hills, mulga woodland/shrubland growing on ridges and rises and hummock grassland (spinifex) growing on sandplains and dunes, drainage systems, salt lake systems and other alluvial areas (DBCA 2017a).	Possible
Ozimops cobourgianus	Northern coastal free-tailed bat	P1	-	Mangroves and adjacent coastal vegetation. Restricted to two stretches of north-western coastline, between Exmouth Gulf and Derby, WA, and about Wadeye to Wollogorang (Menkhorst and Knight 2011).	Unlikely
Rhinonicteris aurantia	Pilbara leaf-nosed bat	VU	VU	During the dry season the species roosts in deep, warm, humid caves or mines and forages nearby; in the wet season it is more widespread and may not require caves for roosting (Menkhorst and Knight 2011).	Unlikely
Reptiles					
Ctenotus angusticeps	Airlie island ctenotus	P3	VU	On the mainland, the species inhabits landward fringe of salt marsh communities in samphire shrubland or marine couch grassland. In the intertidal zone along mangroves of *Avicennia marina and* with occasional *Rhizophora stylosa* margins (Maryan *et al.* 2013).	Unlikely
Liasis olivaceus barroni	Pilbara olive python	VU	VU	Escarpments, gorges and water holes in ranges of the pilbara region. Seeks shelter under rock piles and spinifex (Wilson and Swan 2017).	Unlikely

2.5. Previous disturbance

The earliest available historical aerial from 1995 shows that the site was largely undisturbed at this time, excepting some discernible fences and a building close to the north western corner of the site. The ponding facility currently present in the western portion of the site was constructed between 1995 and 2001.

Between October 2001 and August 2002, most of the site appears to have been cleared. By 2009 the vegetation shows evidence of having recolonised most of the site and has been largely undisturbed since this time. Construction of the accommodation to the north east of the site is also visible by 2009 and included the re-clearing of a small portion of the vegetation within the site. By 2012 the vegetation in this cleared area had begun to re-establish.

2.6. Previous surveys

No flora, vegetation or fauna surveys are known to have been undertaken within the site.

The *Port Hedland Regional Flora and Vegetation Assessment* was undertaken by ENV Australia in 2011 and incorporated the results of various previous surveys undertaken over the wider Port Hedland area. The *Port Hedland Regional Flora and Vegetation Assessment* included areas adjacent to the site, but the site itself was not surveyed (ENV Australia 2011).

The *Port Hedland Regional Flora and Vegetation Assessment* did not identify any TECs or PECs within the wider Port Hedland area (ENV Australia 2011). A total of 12 priority flora species were identified as occurring within the wider area (ENV Australia 2011). A number of occurrences of *Tephrosia rosea* var. *venulosa* (now named *Tephrosia rosea* var. Port Hedland (A.S. George 1114), P1) were recorded within approximately 2 km to the north east and south of the site.

3. METHODS

3.1. Field surveys

One ecologist from Emerge visited the site on 16 November 2018 to conduct the flora and fauna surveys.

The site was traversed on foot and the vegetation composition and condition was recorded. The vegetation was also searched for potentially suitable habitat for threatened and priority flora and fauna species.

Detailed sampling of the vegetation was undertaken using non-permanent 10 x 10 m quadrats. A total of five locations were sampled. The position of each sample location was recorded with a hand-held GPS unit, as shown in **Figure 2.**

The data recorded within the sample included:

- site details (site name, site number, observers, date, location)
- environmental information (slope, aspect, bare-ground, rock outcropping soil type and colour class, litter layer, topographical position, time since last fire event)

- biological information (vegetation structure and condition, degree of disturbance and species present).

The species percentage 'foliage projective cover' (FPC) was also recorded within each quadrat. Additional plant taxa not observed within the quadrats were recorded opportunistically as the ecologist traversed the site. Photographs were taken throughout the field visit to show particular site conditions.

All plant specimens collected during the field survey were dried, pressed and then named in accordance with requirements of the Western Australian Herbarium. Identification of specimens occurred through comparison with named material and through the use of taxonomic keys by an experienced botanist. Specimens that could not be easily identified (or were not typical of the species) were submitted the Western Australian Herbarium for formal identification. Flora species not native to Western Australia are denoted by an asterisk (*) in text and raw data.

Vegetation condition was assigned at each quadrat and changes in vegetation condition were also noted and mapped across the site. The condition of the vegetation was assessed using the Keighery condition scale (1994) (**Table 4**).

Table 4: Vegetation condition scale applied during the field assessment

Condition	Definition (Keighery 1994)
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

3.2. Mapping and data analysis

3.2.1. Plant communities

The local plant communities within the site were identified from the sample data collected during the field survey. The vegetation was described according to the dominant species present using the structural formation descriptions of the *National Vegetation Inventory System* (NVIS) (ESCAVI 2003). The identified plant communities were then mapped on aerial photography (1:15,000) from the sample locations and boundaries were interpreted from aerial photography and notes taken in the

field. Vegetation condition was mapped on aerial photography (1:13,000) based on the locations and notes recorded during the field survey to define areas with differing condition.

3.2.2. Regional Vegetation Associations

The identified plant communities were then compared to the descriptions of regional vegetation associations identified in the *Port Hedland Regional Flora and Vegetation Assessment* (ENV Australia 2011) and the current lists of TECs and PECs (DBCA 2017b, 2018).

3.3. Survey limitations

It is important to note the specific constraints imposed on surveys and the degree to which these may have limited survey outcomes. An evaluation of the survey methodology against standard constraints outlined in the EPA document *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016b) is provided in **Table 5**.

Table 5: Evaluation of survey methodology against standard constraints outlined in EPA Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment

Constraint	Degree of limitation	Details
Availability of contextual information	No limitation	The broad scale contextual information and previous surveys described in **Section 2** is adequate to place the site and vegetation in context.
Experience level of personnel	No limitation	This flora and vegetation assessment was undertaken by a qualified botanist with over seven years of botanical experience in Western Australia. Technical review was undertaken by a senior environmental consultant with 15 years' experience in environmental science in Western Australia.
Suitability of timing	Limitation	The survey was conducted in November and thus outside of the main flowering season for the region. A variety of perennial, annual and geophytic flora species are likely to have been undetectable during the survey. A detailed assessment would require further survey conducted after adequate rainfall (likely March-May).
Temporal coverage	Limitation	Comprehensive flora and vegetation assessments can require multiple visits, at different times of year, and over a period of a number of years, to enable observation of all species present. The site was visited once in 2018 and therefore, according to the EPA guidelines, this survey is not considered to meet the requirements of a 'detailed' survey. However, should additional survey be undertaken in the main flowering period, the combined survey would then meet the requirements of a 'detailed' assessment.
Spatial coverage and access	No limitation	Site coverage was comprehensive (track logged).
	No limitation	All parts of the site could be accessed as required.
Sampling intensity	Limitation	A total of 43 flora species were recorded, of which 25 were recorded from five sample locations and 17 were recorded opportunistically. Due to the timing of the survey, the current survey is likely to have missed a proportion of the flora species present (particularly annual and perennial geophytic species) that are only easily detectible after rainfall.
Influence of disturbance	Minor limitation	Time since fire is greater than 20 years as interpreted from aerial imagery and therefore short lived species more common after fire may not have been visible.
	No limitation	Historical ground disturbance and clearing was evident in the vegetation. The disturbance history of the site was considered when undertaking field sampling.

Constraint	Degree of limitation	Details
Adequacy of resources	No limitation	All resources required to perform the survey were available.

With regard to the level 1 fauna survey, there were no limitations for the desktop or habitat assessment. However, no observations of fauna species utilising the site were recorded during the field survey.

4. RESULTS AND DISCUSSION

4.4. Flora

A total of 38 native and 5 non-native (weed) species were recorded within the site during the field survey, representing 16 families and 31 genera. The dominant family recorded was Poaceae (seven native taxa and two non-native taxa) and Fabaceae (six native taxa). Other dominant families were Amaranthaceae (four native taxa and one non-native taxon) and Asteraceae (four native taxa).

A complete species list is provided in **Appendix A** and sample data in **Appendix B**.

4.5. Threatened and priority flora

No threatened or priority flora species were found to occur within the site.

One priority 3 flora species (*Gomphrena leptophylla*) was provisionally identified based on one of the specimens collected, however formal identification of this specimen was undertaken by a taxonomist at the Western Australian Herbarium and was not considered to represent *G. leptophylla*. The specimen could not be assigned to the species level with confidence, and was named *Gomphrena* sp. but in terms of general morphology could be *G. sordida* (which was found elsewhere within the site). The specimen was found near the cleared portion of the site and was considered to be mutated or diseased (Michael Hislop 2018, email, 31 December).

As the survey was undertaken outside of the main flowering period for the region, a number of annual species may have been undetectable at the time of the survey. These include *Heliotropium parviantrum (*P1) and *Rothia indica* subsp. *australis* (P3).

4.6. Declared pests

A particularly invasive or detrimental weed species may be listed as a 'declared pest' pursuant to the Western Australia's *Biosecurity and Agriculture Management Act 2007* (BAM Act), indicating that it warrants special management to limit its spread.

One species listed as a declared pest pursuant to the BAM Act was recorded in the site, **Calotropis procera*. This species were found in and around the ponding facility in the western portion of the site. Declared pests 'must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia'. The keeping category for **C. procera* is 'exempt' thus no permit or conditions are required for keeping.

4.7. Plant communities

The vegetation within the site was determined to represent two native plant communities as described in **Table 6**.

Table 6: Plant communities present within the site

Plant community	Description	Area (ha)
AtTtE	Shrubland of *Acacia trachycarpa* over low open shrubland *Acacia stellaticeps*, *Tecticornia* sp. and *Trianthema turgidifolia* over grassland of *Eragrostis* spp., *Triodia* spp. and **Cenchrus setiger* (**Plate 1**).	0.25
AsTtCc	Low open shrubland to low shrubland *Acacia stellaticeps*, *Tecticornia* sp. and *Trianthema turgidifolia* with open vineland of *Cassytha capillaris* over open forbland of *Pluchea longiseta* and grassland to closed grassland of *Eragrostis* spp., *Triodia* spp. and **Cenchrus setiger* (**Plate 2**).	31.27
Cleared	Cleared areas with scattered native species (**Plate 3**).	6.47

*Plate 1: Plant community **AtTtE** in 'good' condition*

*Plate 2: Plant community **AsTtCc** in 'very good' condition.*

Plate 3: Cleared areas in 'completely degraded' condition.

4.8. Vegetation condition

The condition of the vegetation within the site was determined to range from 'completely degraded' to 'very good'. Vegetation was mapped as being in 'degraded' and 'good' condition due to signs of vegetation structure alteration and the level of weed cover. Vegetation in good and degraded condition comprised native low shrub, forb and grass species with higher densities of non-native species (particularly the grass species, **Cenchrus setigera* (ranging from 10 to 70% cover throughout the site). Scattered woody weed species were also present, largely situated in or around the ponding facility to the west of the site.

The south eastern portion of the vegetation in the site was mapped as largely being in 'very good' condition, due to higher cover by native species and reduced weed cover.

The extent of vegetation by condition category is detailed in **Table 7** and shown in **Figure 3**.

Table 7: Vegetation condition categories within the site

Condition category (Keighery (1994))	Size (ha)
Pristine	0
Excellent	0
Very good	15.8
Good	10.42
Good – degraded	3.56
Degraded	1.75
Completely degraded	6.47

4.1. Regional vegetation associations

The plant communities largely described over the site align with the 'sandplain A' vegetation type as described by ENV Australia (2011). This is described as comprising 'low *Acacia stellaticeps* shrublands over *Triodia epactia* and *Triodia secunda* grasslands/ *Triodia epactia* and *Triodia secunda* hummock grasslands mosaic'. The 'sandplain A' vegetation type is mapped as occurring to the north of the site within ENV (2011). This area of 'sandplain A' is also intersected with the 'samphire B' vegetation type, which comprises 'scattered *Avicennia marina* shrubs over a low open *Tecticornia halocnemoides* subsp. *tenuis*, *Tecticornia halocnemoides* and *Trianthema turgidifolia* shrubland'. The 'samphire B' is present on mud flats and tidal areas (ENV Australia 2011). *T. turgidifolia* and *Tecticornia* spp. are common within the site, particularly in the western portion adjacent to the ponding facility. This reflects the higher moisture and saline conditions present within this area.

None of the plant communities are considered to represent TECs and PECs.

4.2. Fauna

The habitats present for fauna species within the site are mixed tussock and hummock grasslands and low shrublands. Based on the habitat descriptions for conservation significant fauna detailed in **Table 3**, the site contains some habitat for night parrot, crest-tailed mulgara and bilby. However, due to the disturbed condition of most of the vegetation present, and the location of the site between the airport run way to the south, BHPBIO train line to the east and Great Northern Highway to the north, the site is not considered likely to provide significant habitat for any of these species. Moreover, there are extensive areas of similar or superior habitat to the north and east of the site.

5. CONCLUSIONS

The flora and fauna surveys undertaken over the site identified the following:

- No flora listed as threatened were recorded.
- Vegetation within the site comprises two native plant communities and cleared areas.
- No TECs or PECs occur within the site.
- The site contains potential habitat for night parrot, crest-tailed mulgara and bilby. However, the site is not considered to represent significant habitat for any of these species.

FIGURES

Figure 1: Site Location
Figure 2: Plant Communities
Figure 3: Vegetation Condition

APPENDICES

Appendix 1: Species List
Appendix 2: Sample Data

REFERENCES

General references

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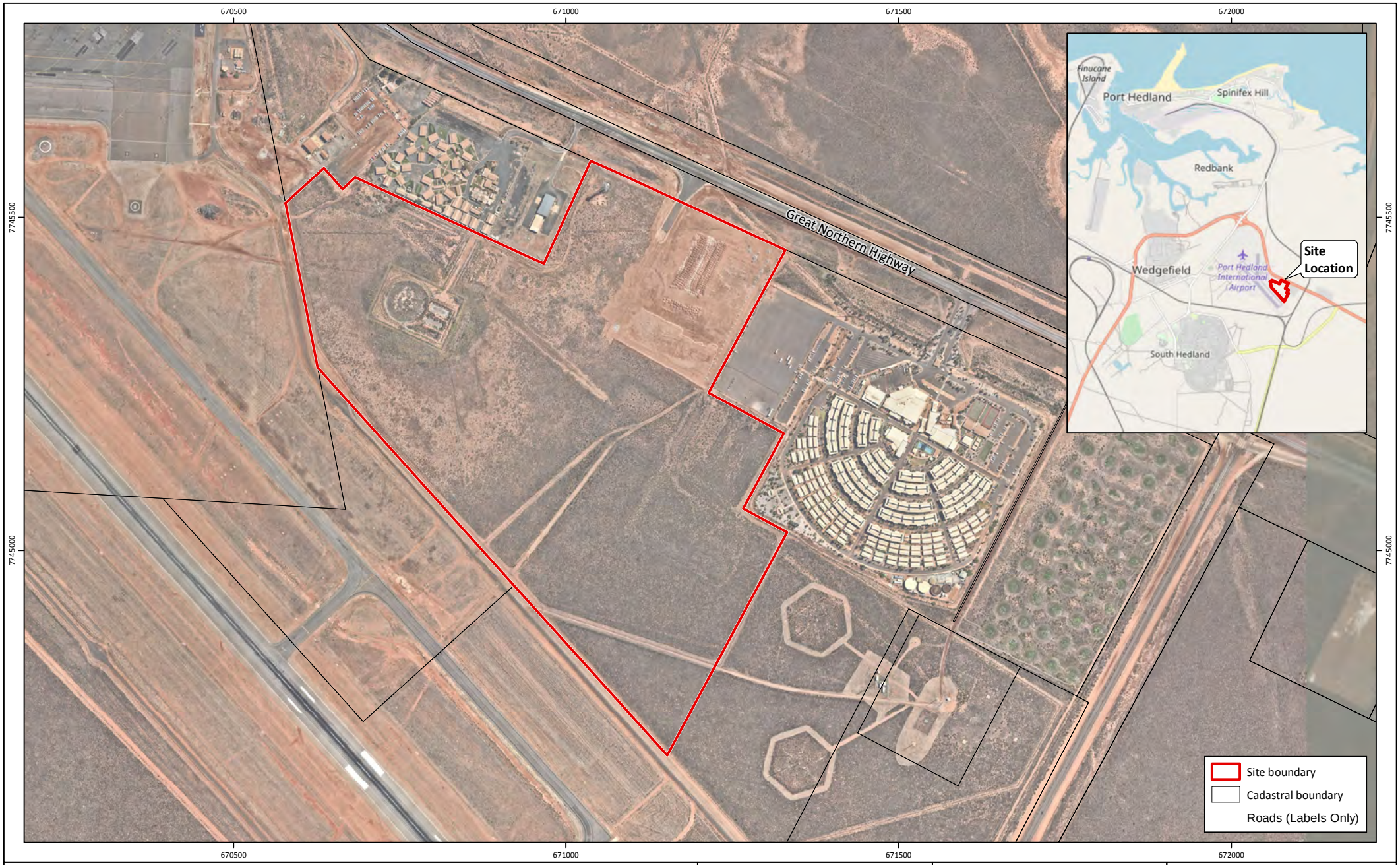

Figure 1: Site Locality

Project: Flora and Fauna Survey
Port Hedland International Airport - Highway Precinct 2

Client: PHIA Trust

Plan Number:
EP18-117(05)--F06

Drawn:	KNM
Date:	11/12/2018
Checked:	SKP
Approved:	TAA
Date:	19/12/2018

N

0 100 200 300
Metres

Scale: 1:210,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

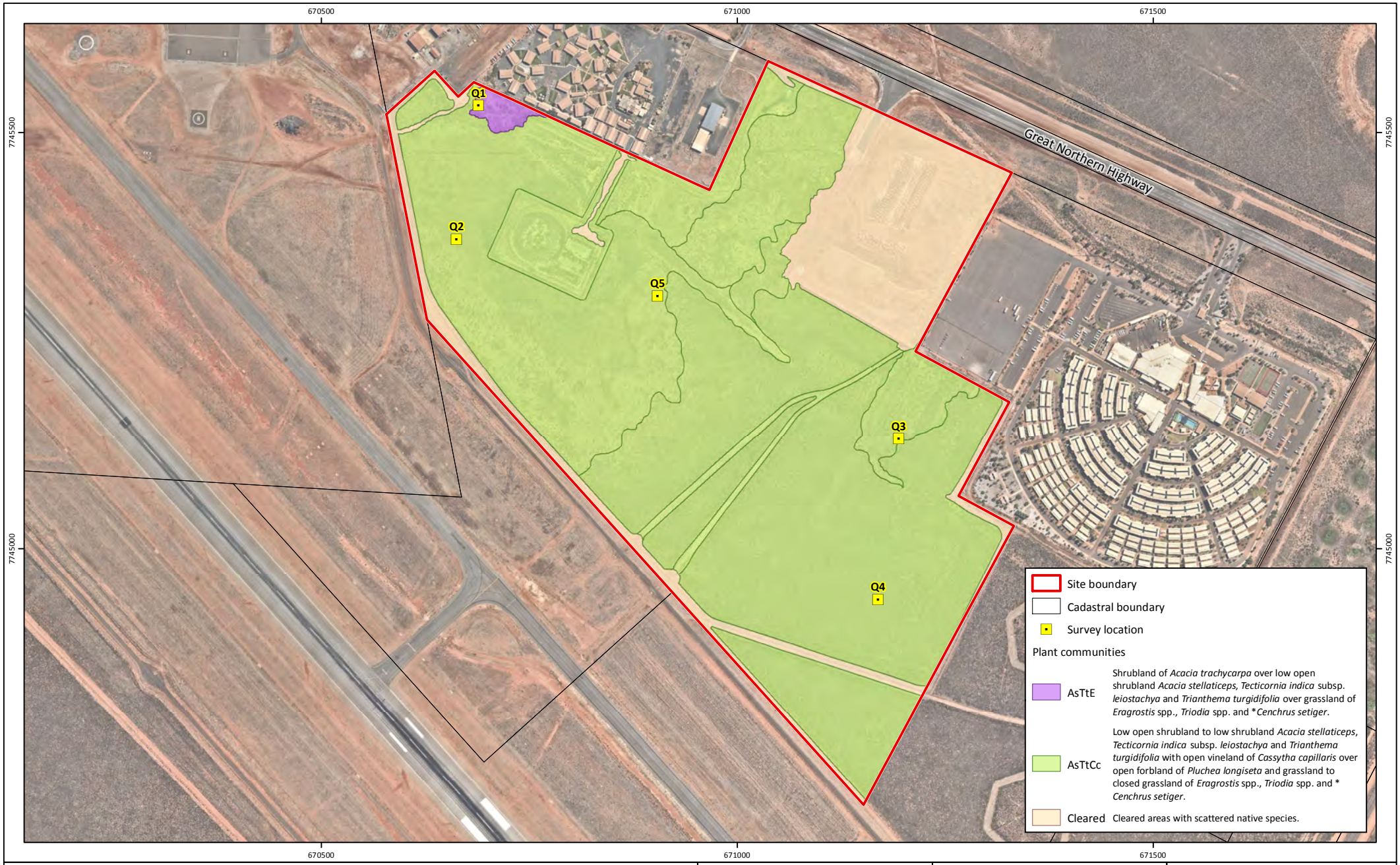

Figure 2: Plant Communities

Project: Flora and Fauna Survey
Port Hedland International Airport - Highway Precinct 2
Client: PHIA Trust

Plan Number:
EP18-117(05)--F07a
Drawn: RAO
Date: 04/01/2019
Checked: SKP
Approved: TAA
Date: 04/01/2019

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Metres
Scale: 1:6,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

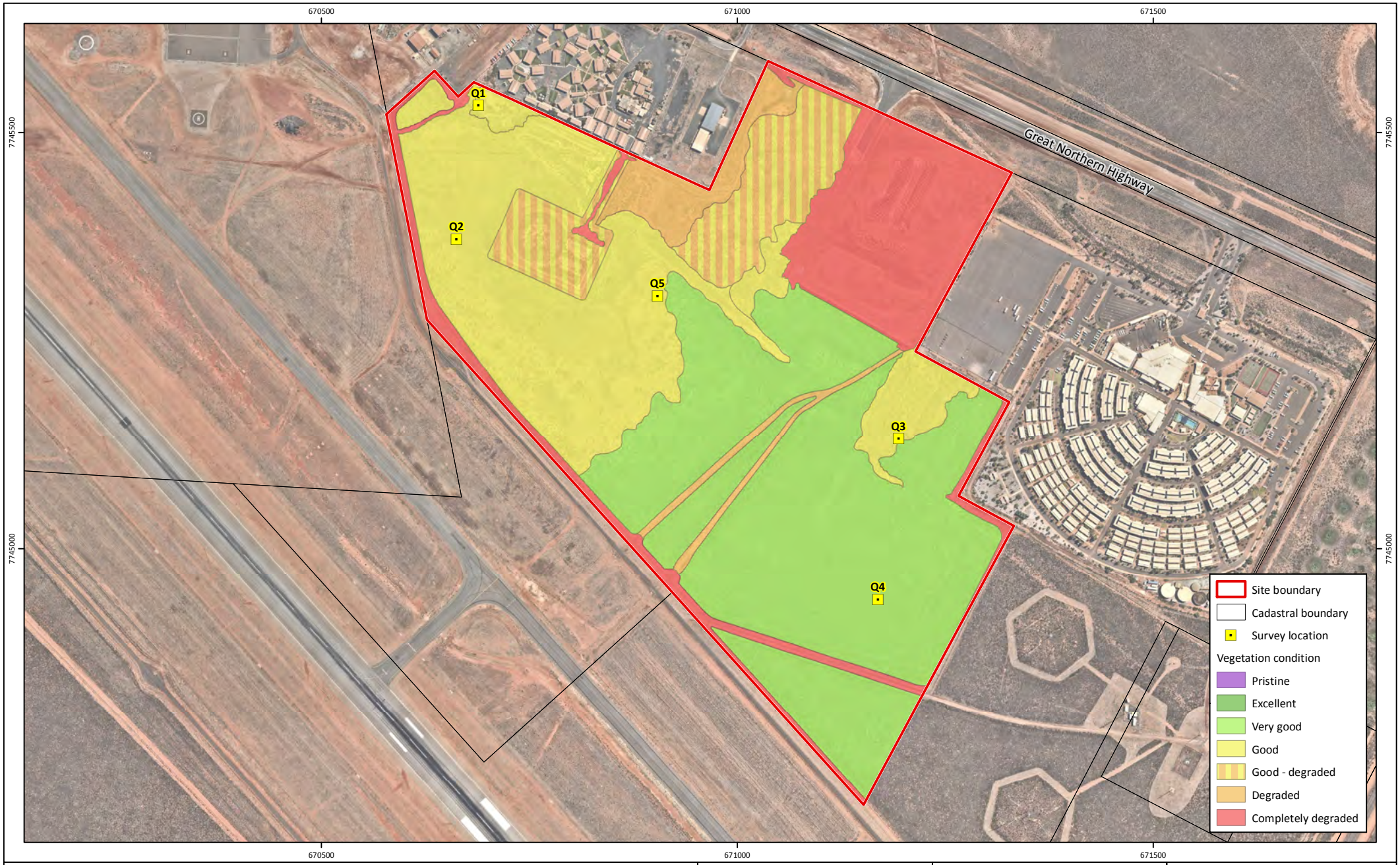

Figure 3: Vegetation Condition

Project: Flora and Fauna Survey
Port Hedland International Airport - Highway Precinct 2
Client: PHIA Trust

Plan Number:
EP18-117(05)--F08

Drawn:	KNM
Date:	11/12/2018
Checked:	SKP
Approved:	TAA
Date:	19/12/2018

0 100 200
Metres
Scale: 1:6,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

Flora Taxa List - Port Hedland Airport Highway Precinct 2

Note: * denotes introduced (weed) species

Family	Species
Aizoaceae	
	Trianthema turgidifolia
Amaranthaceae	
	* *Aerva javanica*
	Gomphrena sordida
	Gomphrena sp.
	Ptilotus exaltatus
	Ptilotus polystachyus
Apocynaceae	
	* *Calotropis procera*
Arecaceae	
	* *Washingtonia filifera*
Asteraceae	
	Pluchea longiseta
	Pluchea rubelliflora
	Pterocaulon intermedium
	Pterocaulon sphacelatum
Chenopodiaceae	
	Salsola australis
	Tecticornia halocnemoides subsp. *tenuis*
	Tecticornia indica subsp. *leiostachya*
Cleomaceae	
	Cleome viscosa
Convolvulaceae	
	Ipomoea muelleri
	Bonamia alatisemina
Cyperaceae	
	Cyperus sp.
Fabaceae	
	Acacia colei var. *colei*
	Acacia stellaticeps
	Acacia trachycarpa
	Cajanus marmoratus
	Senna notabilis
	Sesbania cannabina
Goodeniaceae	
	Goodenia lamprosperma

Flora Taxa List - Port Hedland Airport Highway Precinct 2

Note: * denotes introduced (weed) species

Family	Species
Lauraceae	
	Cassytha capillaris
Malvaceae	
	Corchorus laniflorus
	Sida rohlenae subsp. *rohlenae*
	Waltheria indica
Nyctaginaceae	
	Boerhavia ?repleta
Poaceae	
	Aristida contorta
	* *Cenchrus ciliaris*
	* *Cenchrus setiger*
	Eriachne ?obtusa
	Eragrostis eriopoda
	Eragrostis falcata
	Eragrostis speciosa
	Triodia epactia
	Triodia secunda
Portulacaceae	
	Calandrinia pentavalvis
	Calandrinia tepperiana
Violaceae	
	Hybanthus aurantiacus

Vegetation Sample Data

Sample Name: Q1

Project no.: EP18-117
Date: 16.11.2018
Author: SKP
Status Non-permanent

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	670689	NW corner northing:	7745532
Altitude (m):	10.95	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	no evidence	Disturbance:	moderate - weeds (grass), previous clearing
Soil type/texture	Sand/	Bare ground (%):	20
Rocks (%) and type:	2%,	Soil colour:	red/orange
Litter:	1%	Vegetation condition:	good-

Strata	Cover (%)	Height (m)
Upper:	0%	Treeless
Mid:	10 to 30	1 to 2
Ground layer 1:	30 to 70	<0.5
Ground layer 2:	<10	<2

Vegetation description

Shrubland of *Acacia trachycarpa, A. stellaticeps, Trianthema turgidifolia* and *Tecticornia indica* subsp. *leiostachya* over low tussock grassland of **Cenchrus setiger, Aristida contorta* and *Eragrostis* spp. over low sparse hummock grassland of *Triodia epactia and T. secunda*

Vegetation Sample Data

Sample Name: Q1

Project no.: EP18-117
Date: 16.11.2018 **Status** Non-permanent
Author: SKP Q1: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acacia stellaticeps	3
	Acacia trachycarpa	10
	Aristida contorta	5
	Boerhavia ?repleta	1
	Bonamia alatisemina	1
	Cajanus marmoratus	1
*	*Cenchrus setiger*	20
	Corchorus laniflorus	1
	Cyperus sp.	opp
	Eragrostis eriopoda	20
	Eragrostis falcata	15
	Eriachne ?obtusa	opp
	Gomphrena sordida	opp
	Ptilotus exaltatus	3
	Sida rohlenae subsp. *rohlenae*	1
	Tecticornia indica subsp. l*eiostachya*	4
	Tecticornia halocnemoides subsp. *tenuis*	opp
	Trianthema turgidifolia	10
	Triodia ?epactia	3
	Triodia secunda	5
	Waltheria indica	1
*	*Cenchrus ciliaris*	opp

Vegetation Sample Data

Sample Name: Q2

Project no.: EP18-117
Date: 16.11.2018
Author: SKP
Status Non-permanent
Q1: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	670662	NW corner northing:	7745372
Altitude (m):	10.73	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	no evidence	Disturbance:	moderate - weeds (grass), previous clearing
Soil type/texture	Sand/	Bare ground (%):	30
Rocks (%) and type:	No rocks	Soil colour:	red/orange
Litter:	1%	Vegetation condition:	good-

Strata	Cover (%)	Height (m)
Upper:	0%	Treeless
Mid:	10 to 30	<1
Ground layer 1:	30 to 70	<0.5
Ground layer 2:	<10	0

Vegetation description

Low open shrubland of *Trianthema turgidifolia* and *Tecticornia indica* subsp. *leiostachya* over low tussock grassland *Eragrostis falcata*

Vegetation Sample Data

Sample Name: Q2

Project no.: EP18-117
Date: 16.11.2018 **Status** Non-permanent
Author: SKP Q2: Page 2 of 2

Species Data

* denotes non-native species

Status		Confirmed name	Cover (%)
	*	*Cenchrus setiger*	5
		Eragrostis falcata	30
		Gomphrena sordida	3
		Ptilotus exaltatus	opp
		Tecticornia indica subsp. l*eiostachya*	5
		Trianthema turgidifolia	10
	*	*Cenchrus ciliaris*	2

Vegetation Sample Data

Sample Name: Q3

Project no.: EP18-117
Date: 16.11.2018
Author: SKP
Status Non-permanent
Q1: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	671194	NW corner northing:	7745132
Altitude (m):	11.65	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	no evidence	Disturbance:	moderate - weeds (grass), previous clearing
Soil type/texture	Sand/	Bare ground (%):	50
Rocks (%) and type:	No rocks	Soil colour:	red/orange
Litter:	1%	Vegetation condition:	good-

Strata	Cover (%)	Height (m)
Upper:	0%	Treeless
Mid:	10 to 30	<1
Ground layer 1:	30 to 70	<0.5
Ground layer 2:	<10	<2

Vegetation description

Low open shrubland *Acacia stellaticeps* and *Trianthema turgidifolia* over low tussock grassland of **Cenchrus setiger,* open vineland of *Cassytha capillaris* and low open hummock grassland of *Triodia epactia* and *T. secunda*

Vegetation Sample Data

Sample Name: Q3

Project no.: EP18-117
Date: 16.11.2018 **Status** Non-permanent
Author: SKP Q3: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acacia stellaticeps	1
	Cassytha capillaris	10
*	*Cenchrus setiger*	70
	Corchorus laniflorus	1
	Eragrostis falcata	2
	Eriachne ?obtusa	2
	Pluchea longiseta	1
	Trianthema turgidifolia	3
	Triodia epactia	10

Vegetation Sample Data

Sample Name: Q4

Project no.: EP18-117
Date: 16.11.2018
Author: SKP
Status Non-permanent
Q1: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	671169	NW corner northing:	7744939
Altitude (m):	10.54	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	no evidence	Disturbance:	moderate - weeds (grass), previous clearing
Soil type/texture	Sand/	Bare ground (%):	5
Rocks (%) and type:	No rocks	Soil colour:	red/orange
Litter:	1%	Vegetation condition:	very good-

Strata	Cover (%)	Height (m)
Upper:	0%	Treeless
Mid:	10 to 30	<1
Ground layer 1:	30 to 70	<0.5
Ground layer 2:	<10	<2

Vegetation description

Low open shrubland *Acacia stellaticeps* over low tussock grassland of *Eriachne ?obtusa* and **Cenchrus setiger* , open vineland of *Cassytha capillaris* and low open hummock grassland of *Triodia epactia* and *T. secunda*

Vegetation Sample Data

Sample Name: Q4

Project no.: EP18-117
Date: 16.11.2018 **Status** Non-permanent
Author: SKP Q4: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acacia stellaticeps	20
	Cassytha capillaris	3
*	*Cenchrus setiger*	15
	Eragrostis falcata	1
	Eriachne ?obtusa	20
	Pluchea longiseta	1
	Triodia epactia	10
	Triodia secunda	30
*	*Cenchrus ciliaris*	3

Vegetation Sample Data

Sample Name: Q5

Project no.: EP18-117
Date: 16.11.2018
Author: SKP
Status Non-permanent

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	670904	NW corner northing:	7745303
Altitude (m):	10.5	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	flat
Time since fire:	no evidence	Disturbance:	moderate - weeds (grass and woody), previc
Soil type/texture	Sand/	Bare ground (%):	30
Rocks (%) and type:	No rocks	Soil colour:	red/orange
Litter:	1%	Vegetation condition:	good-

Strata	Cover (%)	Height (m)
Upper:	0%	Treeless
Mid:	10 to 30	<1
Ground layer 1:	30 to 70	<0.5
Ground layer 2:	<10	<2

Vegetation description

Low open shrubland *Trianthema turgidifolia, Acacia stellaticeps* and *Tecticornia indica* subsp. *leiostachya* over low tussock grassland *Eragrostis falcata, Cenchrus setigera* and *Eriacnhe ?obtusa* , open vineland of *Cassytha capillaris* and low sparse hummock grassland *Triodia epactia* and *T. secunda*

Vegetation Sample Data

Sample Name: Q5

Project no.: EP18-117
Date: 16.11.2018 **Status** Non-permanent
Author: SKP Q5: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Trianthema turgidifolia	15
	Eragrostis falcata	10
*	*Cenchrus setiger*	20
	Eriachne ?obtusa	5
	Gomphrena ?sordida	1
	Pluchea longiseta	2
	Pluchea rubelliflora	2
	Triodia secunda	5
	Acacia stellaticeps	5
	Cassytha capillaris	15
	Pterocaulon intermedium	1
	Pterocaulon sphacelatum	1
	Ptilotus polystachyus	2
*	*Calotropis procera*	opp
	Goodenia lamprosperma	opp
	Eragrostis speciosa	opp
	Calandrinia tepperiana	opp
	Pluchea longiseta	opp
	Hybanthus aurantiacus	opp
	Senna notabilis	opp
	Calandrinia pentavalvis	opp
	Salsola australis	opp
	Gomphrena sp.	opp
	Cleome ?viscosa	opp
	Acacia colei var. colei	opp
	Ipomoea muelleri	opp
	Sesbania cannabina	opp
*	*Washingtonia filifera*	opp
*	*Aerva javanica*	opp