**To:** [redacted], Preston Consulting, on behalf of Port Hedland Green Steel

**From:** [redacted], Phoenix Environmental Sciences

**Date:** 13 March 2024

**Subject:** Interim memo summarising flora desktop review findings – Lots 331 and 506

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## Background

Port Hedland Green Steel (PHGS) is progressing the development of large-scale downstream iron ore processing capability known as the Port Hedland Green Steel Project, located approximately 15 km southwest of Port Hedland, Western Australia (WA). As part of this project, PHGS is developing accommodation for staff and contractors to enable further progression of the project.

In January 2024, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by Preston Consulting to conduct a reconnaissance and targeted flora survey for a Temporary Accommodation area and Lots 331 and 506, located north of South Hedland (Figure 1). As part of this work, Phoenix was requested to compile a desktop flora assessment and prepare a memorandum summarising the findings of the desktop review.

## Study Area

The project is located in the Eremaean Climatic Province as defined by EPA (2016). The study area encompasses 28.2 ha of land split across Lots 331, 506 (Figure 1). Lot 331 is comprised of 2.8 ha and Lot 506 is 25.4 ha.

## Existing environment

The Department of Primary Industries and Regional Development undertook land system mapping for WA using a nesting soil-landscape mapping hierarchy (Schoknecht & Payne 2011). While the primary purpose of the mapping is to inform pastoral and agricultural land capability, it is also useful for informing biological assessments. Under this hierarchy, land systems are defined as areas with recurring patterns of landforms, soils, vegetation and drainage (Payne & Leighton 2004).

The entirety of the study area encompasses one land system, the Uaroo system, which is described as 'Broad sandy plains, pebbly plains and drainage tracts supporting hard and soft spinifex hummock grasslands with scattered *Acacia* shrubs.'

According to the Surface Geology of Australia 1:1,000,000 scale, Western Australian database Stewart *et al.* (2008), the study area is found exclusively on one geological formation representing alluvium 38485 (Figure 2). This is described as 'Channel and flood plain alluvium; gravel, sand, silt, clay, locally calcreted.'

The study area occurs in the Pilbara bioregion and the Roebourne (PIL4) subregion. The dominant land use of the PIL4 subregion comprises grazing (native pastures), Aboriginal lands and reserves, conservation, mining leases and urban development (Kendrick & Stanley 2001). As per land use summaries extracted from the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES 2018), 'production from relatively natural environments' and 'conservation and natural environments' are the dominant land use components comprising the PIL4 subregion. Land use across the study area is subject to similar usages to the PIL4 subregion, with 'conservation and natural environments' (28.1 ha, 99.7%) comprising the majority of the study area. The remainder of the study area is allocated for 'production from natural environments' (<0.1 ha, 0.3%).

No conservation reserves intersect the study area or occur within the 40 km desktop search extent. No Department of Biodiversity, Conservation and Attractions (DBCA) lands of interest proposed for conservation occur near the study area.

Eight environmentally sensitive areas were identified in the desktop review. Five of the of the 8 correspond with the Eighty Mile System P3 Protected Ecological Community (PEC). Two correspond to Spoil Bank Recreation Reserve and the final one is on Weerdee Island (Figure 1).



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| Project No | 1642 |
| Date | 29/01/2024 |
| Drawn by | JL |
| Map author | EB |

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Kilometers

1:203,200(at A4) GDA 1994 MGA Zone 50



- Study area
- Lakes
- Environmentally Sensitive Areas
- Roads

**Figure 1**

**Project location and study area**

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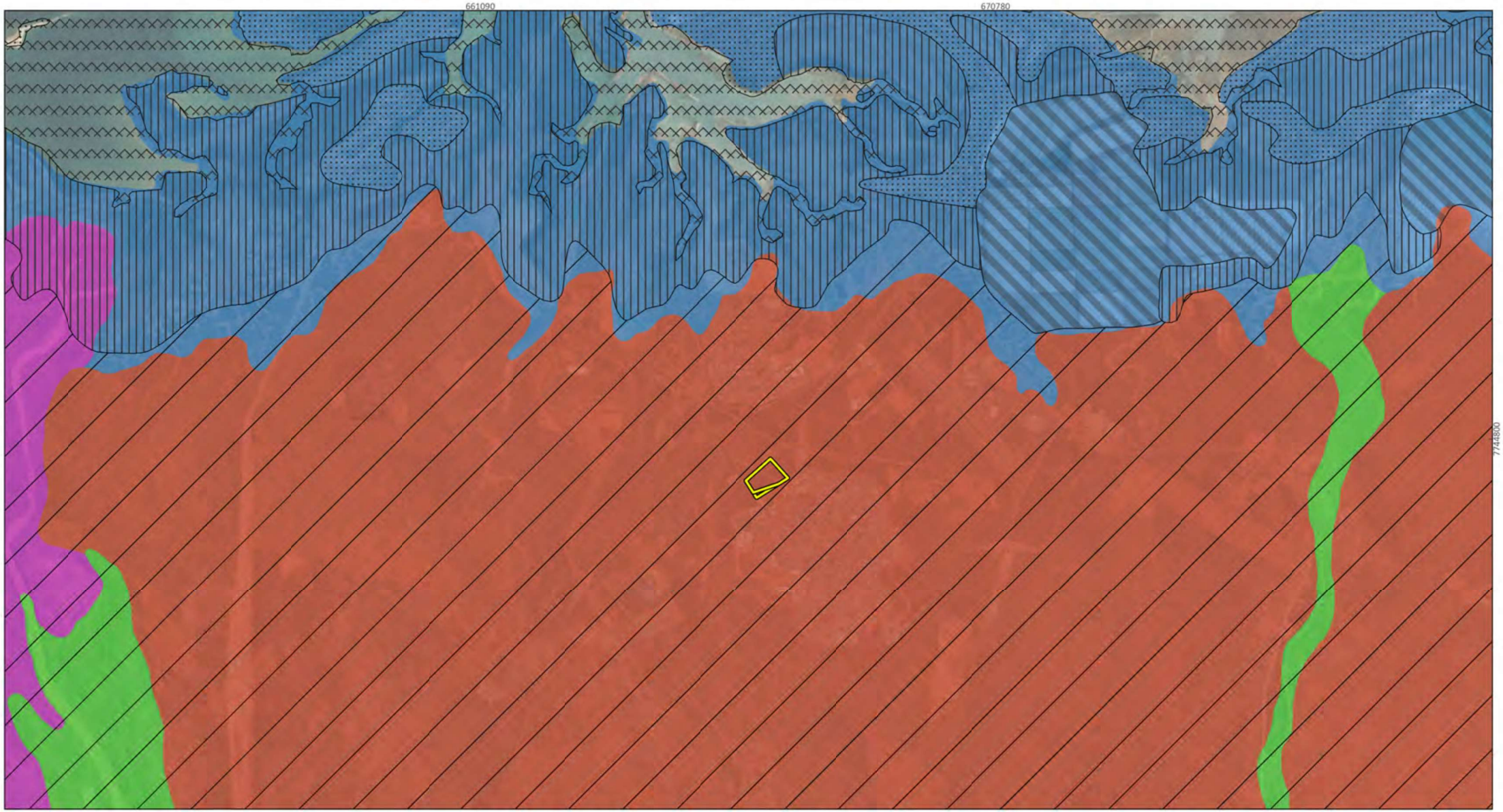



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| Project No | 1642 |
| Date | 29/01/2024 |
| Drawn by | JL |
| Map author | EB |

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Kilometers

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Study area

**Land system**

- Littoral System
- River System
- Uaroo System
- Yamerina System

**Surface geology**

- Alluvium 38485
- Artificial salt pans 74791
- Coastal dunes 38488
- Estuarine and delta deposits 38489
- Water

**Figure 2**

**Land systems and surface geology in the study area**

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## Methods

Searches of several biological databases were undertaken to identify and prepare lists of significant flora and vegetation that may occur within the study area (Table 1). A literature search was conducted for accessible reports for biological surveys conducted within 40 km of the study area to build on the lists developed from the database searches (Table 2).

**Table 1 Database searches conducted for the desktop review**

| Database | Target group/s | Search coordinates and extent |
|---|---|---|
| Protected Matters Search Tool (DCCEEW 2024) | EPBC Act Threatened flora, and ecological communities | Study area plus a 40km buffer |
| DBCA Threatened and Priority flora Database (DBCA 2024c) | Threatened and Priority flora | Study area plus a 40km buffer |
| DBCA Threatened and Priority Ecological Communities Database (DBCA 2024b) | TECs and PECs | Study area plus a 40km buffer |
| NatureMap database (DBCA 2024a) | Flora records | Study area plus a 40km buffer |

**Table 2 Survey reports included in the desktop review**

| Report author | Survey description | Project |
|---|---|---|
| Biota (2004) | Detailed flora and vegetation assessment | FMG Stage A Rail Corridor |
| Biota (2008) | Targeted survey and vegetation mapping | Utah Point |
| ENV (2011) | Detailed flora and vegetation assessment | Port Hedland Area |
| Emerge Associates (2019) | Reconnaissance flora and vegetation assessment | Port Hedland Airport Highway |
| GHD (2010) | Detailed flora and vegetation assessment and fauna survey | Boodarie Industrial Estate |
| GHD (2016) | Targeted survey and vegetation mapping | Roy Hill Port Facility |
| Phoenix (2022) | Detailed flora and vegetation assessment | Port Hedland Solar Farm |
| Phoenix (2023) | Targeted and basic vertebrate fauna survey and one season detailed flora and vegetation assessment | Roy Hill Port Facility |
| Phoenix (2024 in prep) | Detailed flora and vegetation assessment | Boodarie Industrial Estate |

## Results

The desktop review identified records of 494 floral taxa, representing 449 native species and 45 introduced species. Comprising of 218 genera and 78 families, the most prominent families being Fabaceae (93 spp.), Poaceae (77 spp.), Malvaceae (39 spp.) and Amaranthaceae (29 spp.). No Threatened species and 14 Priority species were identified in the desktop review. No significant flora has previously been recorded within the study area boundaries (Figure 3) and most records outside of the study area were near roads. The likelihood of occurrence assessment was completed, which takes into consideration the proximity of known records to the study area and the presence of suitable habitat (Table 3).

**Desktop reports primary results**

Biota (2004) identified 762 flora taxa, representing 218 genera and 96 families. The most prominent families were Fabaceae, Poaceae and Malvaceae. Nine Priority species recorded maintain a Priority listing, however only 2 are relevant to this survey due to proximity, *Gymnanthera cunninghamii* (P3) and *Themeda* sp. Hamersley Station (P3). The Biota (2004) study area was a 354 km long corridor from Port Hedland to Mindy Mindy Iron Ore mine and consisted of 97 quadrats. Due to the nature of the study area only the western most portion near Port Hedland and South Hedland is applicable.

Biota (2008) identified 115 flora taxa, representing 77 genera and 35 families. The most prominent families were Fabaceae and Poaceae. One Priority flora, *Bulbostylis burbidgeae* (P4) was recorded. The Biota (2008) study area is located on Finucane Island and is characterised as coastal, therefore much of the flora and vegetation data is not applicable to this survey.

ENV (2011) identified 338 flora taxa, representing 152 genera and 58 families. The most prominent families were Fabaceae, Poaceae and Malvaceae. Four species recorded currently maintain a Priority, *Abutilon* sp. Pritzelianum (P3), *Euploca mutica* (P3), *Tephrosia rosea* var. Port Hedland (P1) and *Gomphrena pusilla* (P2). The report also included vegetation and condition mapping, whereby the entire 331 and 506 study area was characterised as being in Very good condition in the Sandplain B vegetation type. Sandplain B is described as open *Acacia colei* var. *colei* shrublands over low *Acacia stellaticeps* shrublands over *Triodia epactia* and *Triodia secunda* hummock grasslands/low *Acacia stellaticeps* shrublands over *Triodia epactia* and *Triodia secunda* hummock grasslands mosaic. The ENV (2011) study area was located within the Port Hedland general area and encompassed 80,874 ha with 159 quadrats and 3 relevés.

Emerge Associates (2019) identified 43 flora taxa, representing 31 genera and 16 families. The most prominent families were Poaceae and Fabaceae. No Threatened or Priority species were identified during this survey. The Emerge Associates (2019) study area was located within the Port Hedland Airport and encompassed 37.99 ha with 5 10 m x 10 m quadrats.

GHD (2010) identified 144 flora taxa, representing and 48 families. The most prominent families were Poaceae, Fabaceae and Amaranthaceae. No Threatened or Priority species were identified during this survey. The GHD (2010) study area was located in the Boodarie Industrial area, nearby South Hedland and encompassed 3,770 ha with 14 quadrats.

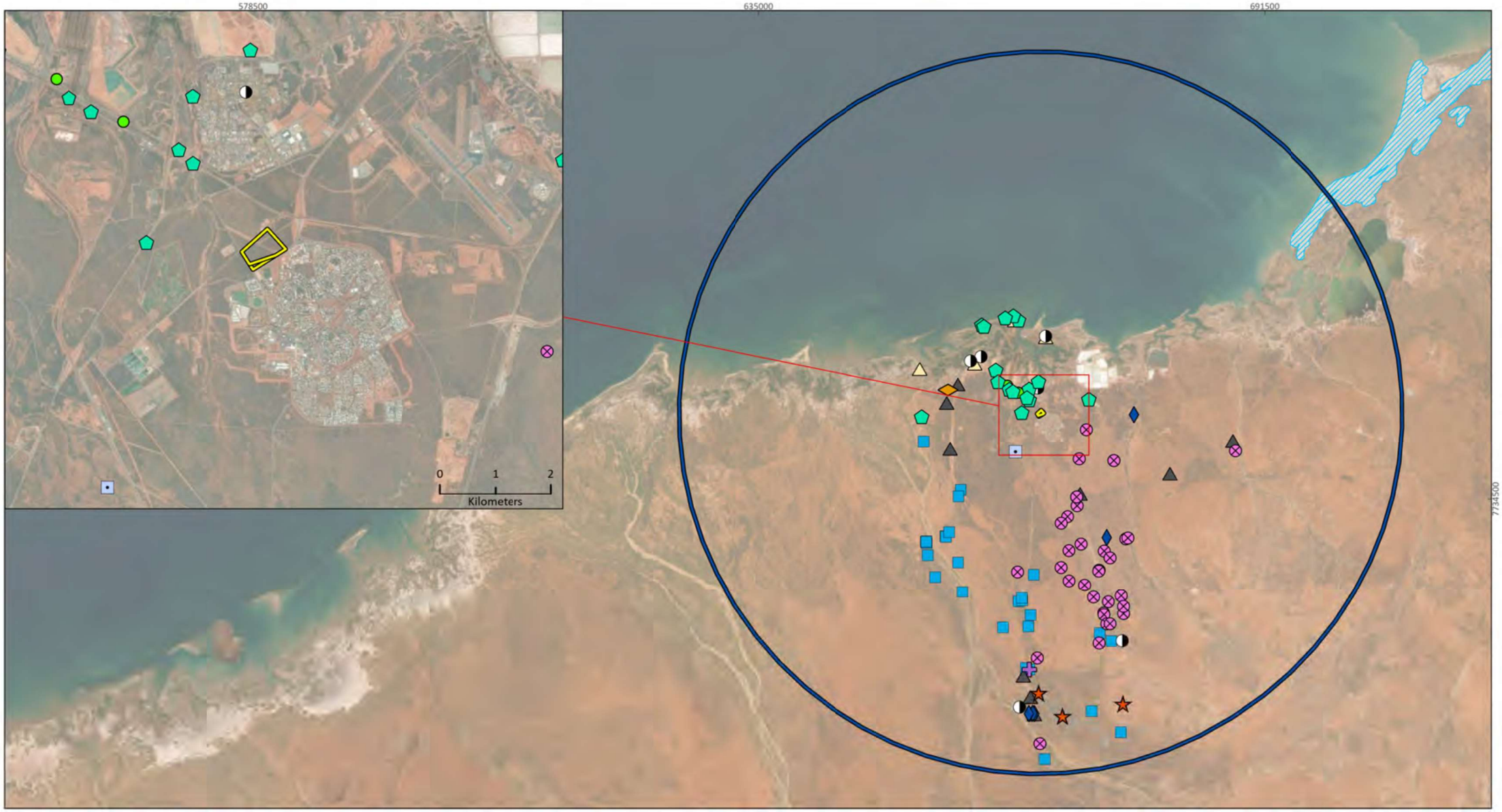
GHD (2016) identified 28 flora taxa, representing 15 families. The most prominent families were Poaceae and Fabaceae. No Threatened or Priority species were identified during this survey. The GHD (2016) study area was a 3.6 km long corridor from Finucane Island to Roy Hill Port facility which encompassed 27.13 ha.

Phoenix (2022) identified 146 flora taxa, representing 88 genera and 38 families. The most prominent families were Poaceae, Fabaceae and Malvaceae. No Threatened or Priority species were identified during this survey, however a specimen referred to as *Phyllanthus* sp. 'Port Hedland Solar Farm', that closely resembles the Priority 1 species *Lysiandra indigoferoides* and 3 unnamed *Phyllanthus* taxa was recorded. *Lysiandra indigoferoides* are all within the Kimberley bioregion growing in sandstone habitat and thus it is unlikely to be this species. It may represent an undescribed species or a very large range extension of another *Phyllanthus*. The Phoenix (2022) study area was the Boodarie Industrial area, nearby South Hedland and encompassed 670.37 ha with 19 quadrats and 11 relevés.

Phoenix (2023) identified 77 flora taxa, representing 50 genera and 24 families. The most prominent families were Poaceae and Fabaceae. One Priority species was recorded within the study area, *Tephrosia rosea* var. Port Hedland (P1) with 3 populations. The Phoenix (2023) study area was a corridor that encompassed 99 ha with 11 quadrats and 4 relevés.

(Phoenix 2024 in prep) identified 139 flora taxa, representing 84 genera and 35 families. The most prominent families were Poaceae and Fabaceae. One Priority species was recorded during the survey, *Tephrosia rosea* var. Port Hedland (P1), where one population was recorded within the study area and an additional 3 populations recorded outside the study area. The Phoenix (2024 in prep) study area

was located within the Boodarie Industrial area, nearby South Hedland and encompassed 1,476.3 ha and 42 quadrats.





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| Project No | 1643 |
| Date | 6/02/2024 |
| Drawn by | JL |
| Map author | NR |

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Kilometers

1:574,900 (at A4) GDA 1994 MGA Zone 50



- Study area
- 40 km buffer
- Eighty Mile Land System, Priority 3

**Species, status**

- *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095), P3 (DBCA list)
- *Bulbostylis burbidgeae*, P4 (DBCA list)
- *Eragrostis crateriformis*, P3 (DBCA list)
- *Euploca mutica*, P3 (DBCA list)
- *Gomphrena leptophylla*, P3 (DBCA list)
- *Gomphrena pusilla*, P2 (DBCA list)
- *Gymnanthera cunninghamii*, P3 (DBCA list)
- *Ptilotus mollis*, P4 (DBCA list)
- *Rothia indica* subsp. *australis*, P3 (DBCA list)
- *Tephrosia rosea* var. Port Hedland (A.S. George 1114), P1 (DBCA list)
- *Triodia chichesterensis*, P3 (DBCA list)
- *Phyllanthus* sp. 'Port Hedland Solar Farm'

**Figure 3**

**Desktop records of significant flora and vegetation**

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**Table 3 Significant flora identified in the desktop review**

| Species | Status | Proximity to study area (number of records within 40 km) | Habitat | Flowering times | Likelihood of occurrence in study area |
|---|---|---|---|---|---|
| *Tephrosia rosea* var. Port Hedland (A.S. George 1114) | P1 (DBCA) | 1.9 km W of study area | Predominantly recorded on coastal dunes but also in red sand plain in *Acacia* shrublands over *Triodia* hummock grasslands. Often found is disturbed area such as road verges. | March, July, August, September, October | Possible, suitable habitat is present. |
| *Gomphrena pusilla* | P2 (DBCA) | 8.3 km N of study area | Grows in open shrublands of *Acacia bivenosa* over open *Triodia epactia* hummock grassland of over an open tussock of *Cenchrus ciliaris* along limestone ridge tops on brown loam, exposed calcrete rock and calcareous coastal dunes. | March – April, June | Unlikely, as generally closer to the coast and unsuitable habitat. |
| *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) | P3 (DBCA) | 12.7 km SW of study area | Grows in shrublands of *Acacia* sp. over *Triodia* hummock grasslands on sandy plains and floodplains in red-brown sandy clay-loam soil. | April, July, | Possible, suitable habitat is present. |
| *Bonamia oblongifolia* | P3 (DBCA) | >40 km of study area (no geometry) | Grows in *Acacia* shrublands over hummock and tussock grasslands Prefers light reddish-brown sandy clay-loam as found on Pindan plains. | February – June, November | Possible, suitable habitat is present. |
| *Eragrostis crateriformis* | P3 (DBCA) | 9.8 km SSE of study area | Grows in low open woodlands over sparse *Acacia* shrublands over *Triodia* grasslands on red sandy clay-loam soil associated with drainage lines, floodplains and clay pans. | January – May or July | Unlikely, habitat may not be present. |
| *Euploca mutica* | P3 (DBCA) | 5.4 km SEE of study area | Grows in *Acacia* shrubland over hummock grassland in sandy loam plains and floodplains. | May - November | Possible, suitable habitat is present. |
| *Gomphrena leptophylla* | P3 (DBCA) | 11.0 km NWW of study area | Grows in hummock grassland, *with Triodia epactia* and *T. secunda* along drainage lines and floodplains in red sandy loam soils. | March - September | Unlikely, habitat may not be present. |
| *Gymnanthera cunninghamii* | P3 (DBCA) | 2.5 km N of study area | Grows in *Eucalyptus*, *Melaleuca* and *Acacia* woodlands over mixed grasslands associated with riverbanks, creeks, drainage lines and floodplains. | January - December | Unlikely, habitat may not be present. |
| *Rothia indica* subsp. *australis* | P3 (DBCA) | 10.7 km E of study area | Grows in shrublands over *Triodia* hummock grasslands in red sandy to loamy soils. | April - August | Possible, suitable habitat is present. |

| Species | Status | Proximity to study area (number of records within 40 km) | Habitat | Flowering times | Likelihood of occurrence in study area |
|---|---|---|---|---|---|
| *Triodia chichesterensis* | P3 (DBCA) | 31.2 km S of study area | Seasonally inundated floodplains and cracking claypans with gilgai depressions. Often found growing in highly disturbed areas like road verges and areas cattle graze. Red-brown clay loan with Ironstone pebbles scattered. | April - June | Unlikely, habitat may not be present. |
| *Bulbostylis burbidgeae* | P4 (DBCA) | 3.3 km NW of study area | Grows in clay-loam soils frequently associated with quartzite on undulating plains and low rises in woodlands and shrublands over *Triodia* hummock grasslands. | March or June - August | Unlikely, habitat may not be present. |
| *Ptilotus mollis* | P4 (DBCA) | 28.5 km S of study area | Grows in *Triodia* hummock grasslands typically associated with granite boulders, hill tops and outcrops. | May or September | Unlikely, habitat may not be present. |
| *Phyllanthus* sp. 'Port Hedland Solar Farm' | Indeterminate | 4.9 km SSW of study area | Grows on ironstone outcroppings, hill slopes in skeletal red/brown clay-loam soils. | March | Unlikely, habitat may not be present. |

**Introduced flora**

The desktop review identified records of 45 introduced species within the desktop search extent (Appendix 1). Of these 5 are a declared pest and 3 are also a Weed of National Significance (WoNS) (Table 4).

**Table 4 Desktop records of significant weeds**

| Species | Declared pest | WoNS |
|---|---|---|
| **Coccinia grandis* | ✓ | |
| **Jatropha gossypifolia* | ✓ | ✓ |
| **Indigofera hochstetteri* | ✓ | |
| **Parkinsonia aculeata* | ✓ | ✓ |
| **Andropogon gayanus* | ✓ | ✓ |

**Vegetation associations**

Regional scale vegetation mapping by Shepherd *et al.* (2002) mapped one vegetation association in the study area (Table 5; Figure 4). The remaining extent of the vegetation association at the Statewide scale exceeds 97% (DBCA 2018) and is therefore considered of Least Concern (Table 5).

**Table 5 Statewide extent of Pre-European vegetation associations present in the study area (Government of Western Australia 2019)**

| Vegetation association | Pre-European extent (ha) | Current extent (ha) | Remaining (%) | Current extent in DBCA lands (%) | % of study area |
|---|---|---|---|---|---|
| 647 - Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex | 195,860.89 | 191,711.41 | 97.88 | NULL | 100% |



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| Project No | 1643 |
| Date | 6/02/2024 |
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| Map author | NR |

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Kilometers

1:45,500(at A4) GDA 1994 MGA Zone 50



Study area

**Vegetation association**

127, Bare areas; mud flats

589, Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex

647, Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex

**Figure 4**

**Vegetation associations of the study area**

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**Significant vegetation**

The DBCA Threatened and Priority Ecological Communities database search identified the presence of one PEC within the desktop search extent (Figure 3; Table 6). The community does not intersect with the study area.

None of the reports outlined in the desktop review identified any Threatened Ecological Communities (TEC) or Protected Ecological Communities (PEC). It is very unlikely that the Eighty Mile System (P3) PEC will occur within the study area as it is restricted to coastal dunes and plains which do not occur within the study area. Also, when comparing the landforms, soil colour and vegetation texture the study area is not compatible with the P3 PEC.

**Table 6 TECs and PECs identified in the desktop review**

| Community name | Status | Proximity to study area | Description |
|---|---|---|---|
| Eighty Mile System | P3 (DBCA) | 34.9 km NE of study area | Beach foredunes, longitudinal coastal dunes and sandy plains with tussock grasslands and spinifex grasslands.<br>Threats: extensive threatening processes acting at landscape scales, namely altered fire regimes, over grazing, erosion, and weed invasion (buffel grass). |

## Conclusion

The floral assemblage tends to remain consistent when comparing reports referred to in the desktop review and the NatureMap database search. It can therefore be hypothesised that the 2 most prominent families to be recorded in the upcoming survey will be Fabaceae and Poaceae, which will often be the defining attribute of the vegetation types.

The desktop assessment has determined that it is unlikely any TEC or PEC occurs within the study area mostly due to the study area's landforms and vegetation texture is inconsistent with the Eighty Mile System (P3) PEC. Although, the final report may uncover locally significant vegetation in the form habitat for Priority species, restricted vegetation or provides an important function required to maintain ecological integrity of a significant ecosystem.

No Threatened flora was recorded within 40 km of the study area and 14 Priority species were identified. Of these, 5 were considered possible to occur within the study area based on their habitat preferences. The most likely to occur is the *Tephrosia rosea* var. Port Hedland (A.S. George 1114) (P1) as it favours disturbed areas like road verges and of all the Priority species identified in the desktop it is the closest to the study area.

A high proportion of weeds were identified in the desktop review, with 5 declared pests of which 3 are WoNs. This is expected due both Port Hedland and South Hedland falling within the boundaries of the 40 km flora database search.

Yours Sincerely,

[redacted]

Principal Botanist/Director

[redacted]

[redacted]/3 King Edward Road Osborne Park WA 6017

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**Appendix 1 Introduced flora identified in the desktop review**

| Family | Species |
|---|---|
| Aizoaceae | **Trianthema portulacastrum* |
| Amaranthaceae | **Aerva javanica* |
| Amaranthaceae | **Gomphrena celosioides* |
| Amaranthaceae | **Pupalia lappacea* |
| Asteraceae | **Cyanthillium cinereum* var. *cinereum* |
| Asteraceae | **Erigeron bonariensis* |
| Asteraceae | **Flaveria trinervia* |
| Asteraceae | **Symphyotrichum squamatum* |
| Asteraceae | **Tridax procumbens* |
| Convolvulaceae | **Distimake dissectus* var. *dissectus* |
| Cucurbitaceae | **Citrullus amarus* |
| Cucurbitaceae | **Coccinia grandis* |
| Euphorbiaceae | **Euphorbia tirucalli* |
| Euphorbiaceae | **Jatropha gossypifolia* |
| Fabaceae | **Albizia lebbeck* |
| Fabaceae | **Clitoria ternatea* |
| Fabaceae | **Desmodium scorpiurus* |
| Fabaceae | **Indigofera hochstetteri* |
| Fabaceae | **Indigofera oblongifolia* |
| Fabaceae | **Indigofera sessiliflora* |
| Fabaceae | **Leucaena leucocephala* |
| Fabaceae | **Parkinsonia aculeata* |
| Fabaceae | **Senna bicapsularis* |
| Fabaceae | **Senna occidentalis* |
| Fabaceae | **Stylosanthes guianensis* var. *guianensis* |
| Fabaceae | **Stylosanthes hamata* |
| Malvaceae | **Gossypium hirsutum* |
| Papaveraceae | **Argemone ochroleuca* subsp. *ochroleuca* |
| Passifloraceae | **Passiflora foetida* var. *hispida* |
| Poaceae | **Andropogon gayanus* |
| Poaceae | **Cenchrus ciliaris* |
| Poaceae | **Cenchrus setaceus* |
| Poaceae | **Cenchrus setiger* |
| Poaceae | **Chloris barbata* |
| Poaceae | **Chloris virgata* |
| Poaceae | **Cynodon radiatus* |
| Poaceae | **Diplachne fusca* |

| | |
|---|---|
| Poaceae | **Echinochloa colona* |
| Poaceae | **Eragrostis pilosa* |
| Poaceae | **Lamarckia aurea* |
| Poaceae | **Paspalum fasciculatum* |
| Poaceae | **Setaria sphacelata* |
| Portulacaceae | **Portulaca pilosa* |
| Rhodomelaceae | **Acanthophora spicifera* |
| Solanaceae | **Physalis angulata* |