

# Flora, Vegetation and Fauna Assessment

**Dampier Desalination Plant**



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## Dampier Desalination Plant

Client: Rio Tinto Iron Ore

ABN: 96 0044 584 04

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## Acronyms

AECOM	AECOM Australia Pty Ltd
ALA	Atlas of Living Australia
BC Act	Biodiversity Conservation Act
BOM	Bureau of Meteorology
CAR	Comprehensive, Adequate and Reserve System
DAWE	Department of Agricultural, Water and Environment
DBCA	Department of Biodiversity Conservation and Attractions
DPaW	Department of Parks and Wildlife
EPA	Environmental Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act
ESA	Environmentally Sensitive Area
GPS	Global Positioning System
Ha	Hectares
IBRA	Interim Biogeographical Region of Australia
Km	Kilometres
M	Metres
PEC	Priority Ecological Community
PMST	Protected Matters Search Tool
Rio Tinto	Rio Tinto Iron Ore
SRE	Short Range Endemic
TEC	Threatened Ecological Community
WA	Western Australia
WAH	Western Australian Herbarium

## Executive Summary

Hamersley Iron, a member of the Rio Tinto Group (Rio Tinto) propose to construct a desalination plant and associated infrastructure adjacent to Parker Point at their Dampier operation utilising existing disturbed, reclaimed and cleared areas where feasible. AECOM Australia Pty Ltd (AECOM) was commissioned to undertake a flora, vegetation and fauna assessment of the proposed footprint to verify existing disturbance and define and map environmental values within a defined survey area.

The Project included a detailed desktop assessment, two field survey phases across two seasons, and reporting. The desktop assessment identified conservation significant flora and fauna species that have the potential to occur in the survey area. The likelihood assessment determined which of these species required targeted searches and informed the field survey sample plan.

The phase I field survey was completed by Floora de Wit and Anthony Bougher between 6 and 11 August 2020. At this time the native vegetation within the survey area was traversed on foot and data collected including 16 flora and vegetation relevés and 12 fauna habitat assessments and deployment of five motion sensor cameras (passive). The phase II field survey was completed by Floora de Wit and Jared Leigh between 12 and 15 April 2021. The survey area was modified to incorporate additional proposed linear infrastructure areas not previously surveyed comprising largely disturbed areas. At this time the previous survey area and new area were traversed on foot. Data collected included 10 flora and vegetation relevés and 9 fauna habitat assessments and deployment of five motion sensor cameras (passive).

Five native vegetation communities and three significantly altered communities were described and mapped. The survey area comprised of largely disturbed areas (76.01 ha) including hardstand cleared (existing rail, road and tracks), and historical extraction areas. Intact native vegetation was homogenous in the area, with vegetation communities observed in better condition outside the survey area. None of the communities represent a Threatened, Priority or geographically restricted ecological community.

Flora species diversity was high, a reflection of the survey effort including two field phases and ideal survey timing. One population of a Priority 3 flora species, *Eragrostis surreyana* was recorded in the Disturbed - Artificial Ephemeral Wetland community comprising 885 individuals. One species, *Hibiscus sturtii* var. *campylochlamys* may represent a range extension, with no records occurring in the region according to Florabase (WAH, 1998). The remaining 122 native flora species recorded are common in the area.

Five fauna habitats (including cleared) were identified and mapped within the survey area. Each fauna habitat provides some value for conservation significant fauna species however none are considered to represent core or critical habitat (as defined in the Department of Agriculture, Water and the Environment's conservation listing advice for these species). Species that may utilise habitat include the Northern Quoll *Dasyurus hallucatus*, Pilbara Olive Python *Liasis olivaceus barroni*, Ghost Bat *Macroderma gigas* and North-western Free-tailed Bat *Mormopterus cobourgiensis* and 16 coastal/shoreline bird species.

Two bird species listed as Migratory and Marine under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Migratory under the *Biodiversity Conservation Act 2016* (BC Act) were recorded during the surveys. This included the Caspian Tern *Hydroprogne caspia* and the Common Sandpiper *Actitis hypoleucos*. They were observed in the Artificial/ephemeral Wetlands and Rocky Foreshore habitats respectively, neither of which are restricted to the survey area.

Fauna habitats were considered 'suitable' and 'marginal' for 13 species listed as 'likely to occur' and eight species that 'may occur' from the desktop assessment. It is expected that none of the identified conservation significant fauna species are likely to be restricted to, or reliant on, the habitat in the survey area.

The majority of the survey area has been either cleared for placement of infrastructure or contains habitats categorised as degraded. It is within these predominantly modified habitats that the proposed desalination plant and associated pipelines would be located.

## 1.0 Introduction

### 1.1 Background

Hamersley Iron (Part of the Rio Tinto Group - herein referred to as Rio Tinto) propose to construct a small desalination plant and associated pipelines for transfer of water in the industrial port area of Parker Point (the Proposal) for the supply of water to the Parker Point Port Operations and the township of Dampier. The Proposal options have been designed to be located on existing disturbed or reclaimed areas where possible. The proposed intake pipeline is to be located at the existing intake area of a decommissioned power plant, and outfall will be tethered from the existing fuel wharf.

To support the environmental review of the Proposal, a flora, vegetation and fauna assessment, including field surveys, was required to verify the existing disturbance and define environmental values in the areas of the proposed desalination plant and its associated infrastructure.

### 1.2 Location

The Proposal is near the town of Dampier in the City of Karratha. The area surveyed is 104 ha and includes a linear corridor that splits into two alignments and several laydown areas. It also contains native vegetation, hardstand clearings (rail alignment, roads), cleared tracks and a small area of rocky intertidal shoreline. Refer to Figure 1 for further details.

### 1.3 Objectives

The objective of the assessment was to gather information to inform the proposed location options of a desalination plant and associated infrastructure at Parker Point near Dampier in the Pilbara region of Western Australia (WA). The outcomes of the assessment will support formal environmental impact assessments (under the WA *Environmental Protection Act 1986* [EP Act], and under the Commonwealth *Environment and Biodiversity Conservation Act 1999* [EPBC Act] if required).

The specific objectives of the assessment were to:

- undertake a comprehensive desktop assessment to define the existing significant flora and fauna values of the survey area noting that most of the survey area is already disturbed
- conduct a detailed flora and vegetation assessment in accordance with the Flora Survey Technical Guide (EPA, 2016) including targeted Threatened and Priority flora searches
- conduct a fauna assessment in accordance with the Fauna Survey Technical Guide (EPA, 2020)
- conduct an opportunistic Short Range Endemic (SRE) survey as per EPA Technical Guide (EPA, 2009)
- map environmental values including vegetation, condition, fauna habitats, and any conservation significant flora and fauna species.





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**LEGEND**  
 Survey Area

**Survey Area**

**RIO TINTO**

**FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT**

**Figure 1**

## 2.0 Existing Environment

### 2.1 Climate

The survey area is located in the City of Karratha which experiences a semi-arid climate. The region is influenced by both northern tropical and southern temperate systems. Semi-arid climates are characterised by areas that receive precipitation below the potential evapotranspiration rates. The climate is intermediate, between desert and humid, and is characterised by hot and dry (sometimes exceptionally hot) summers, with cold winters.

The nearest weather station is Karratha Aero, with the long-term data against the rainfall and mean temperatures received in the months preceding the survey shown in Figure 2 (Bureau of Meteorology [BOM], 2021). The area received significant rainfall from Cyclone Damien in February 2020. Rainfall was also higher than average in July 2020, the month preceding the first field survey, leading to a good flowering season in Karratha during the first survey. Rainfall was above average in December 2020, with close to average conditions for the months preceding the second field survey.

Average maximum temperatures peak between December and March. During the first field survey, temperatures were in the mid-twenties, between 24 °C to 26 °C, which is near average in August (mean maximum temperature is 27.7 °C). Weather conditions during this survey were sunny with mild temperatures. During the second field survey, temperatures peaked in their mid-thirties, between 30 °C to 32 °C, with conditions ranging from sunny to overcast.

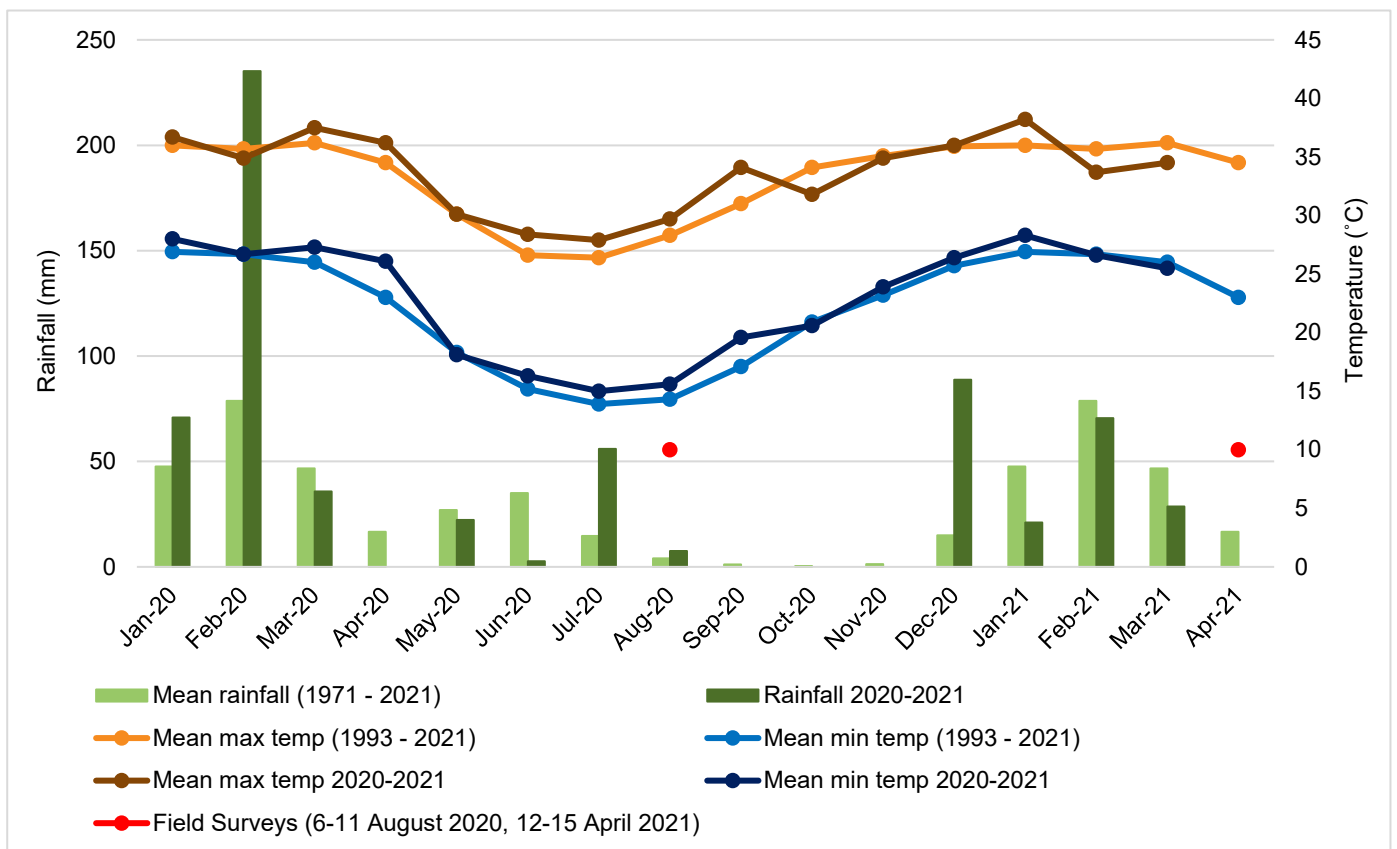


Figure 2 Rainfall Data from Karratha Aero 4083 (BOM, 2021)

## 2.2 Interim Biogeographical Region of Australia Regions

The largest regional vegetation classification scheme recognised by Environmental Protection Authority (EPA) is the Interim Biogeographical Region of Australia (IBRA). The IBRA regions provide the planning framework for the systematic development of a comprehensive, adequate and representative (CAR) national reserve system. There are 89 recognised IBRA regions across Australia that have been defined based on climate, geology, landforms and characteristic vegetation and fauna (DoEE, 2012).

The Roebourne synopsis, described by Kendrick and Stanley (2001), is the coastal edge of the Pilbara and includes Karratha, Onslow and Port Hedland. The area consists of coastal and sub-coastal plains with grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of *Acacia stellaticeps* or *A. pyrifolia* and *A. inaequilatera*. The uplands of the region are dominated by *Triodia* grasslands, and the ephemeral drainage lines are fringed with *Eucalyptus victrix* or *Corymbia hamersleyana* woodlands. Marine alluvial flats and river deltas consist of Samphire and mangal communities. Rare features include the numerous offshore islands, the Burrup Peninsula, and the Cane River swamp community.

## 2.3 Vegetation

Beard (1975) mapping is used to determine the current extent of remnant vegetation remaining when compared to pre-European vegetation extent (Figure 3). The survey area is situated in vegetation association 117 (Abydos Plain - Roebourne). This association consists of hummock grassland *Triodia* spp. Currently, there is 94.43% of this vegetation association in Western Australia and 99.3% remaining in the Pilbara IBRA region (Govt. of WA 2018).

## 2.4 Conservation Reserves and Environmentally Sensitive Areas

The survey area is located approximately 1.6 km west of an Environmentally Sensitive Area (ESA) declared under s51B of the EP Act (Figure 3). This ESA is aligned with Murujuga National Park.

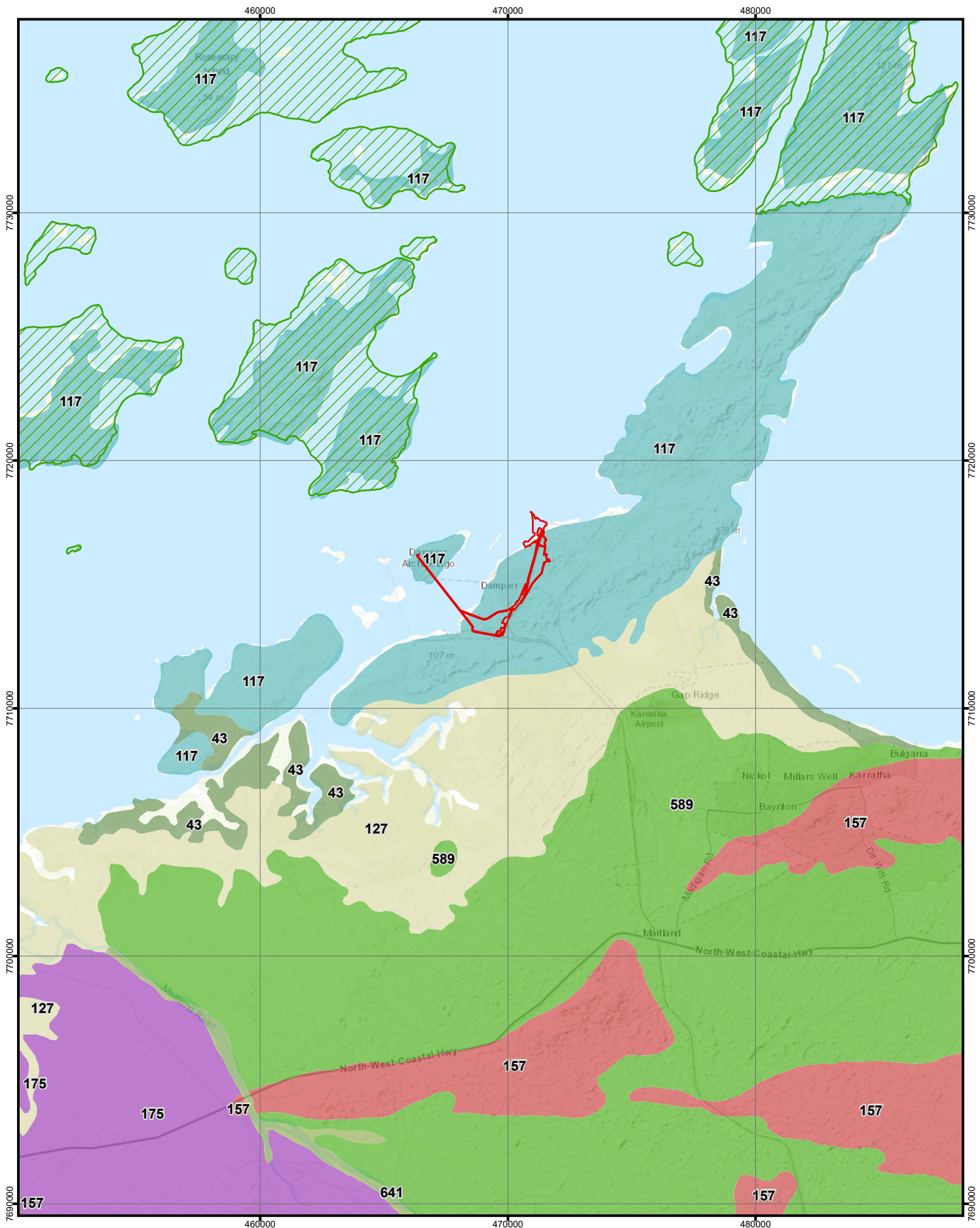
The survey area intersects with the Dampier Archipelago (including Burrup Peninsula) National Heritage Place (Dampier Archipelago NHP). The Dampier Archipelago NHP is listed as a sacred place, home to Indigenous Australians for tens of thousands of years. The rocks are amongst the oldest on earth, formed in the Archaean period more than 2,400 million years ago. Other reasons for listings include:

- petroglyphs such as quarries, middens, fish traps, rock shelters, ceremonial sites, artefact scatters, grinding patches, stone arrangements and engravings
- stone sites including standing stones, complex stone arrangements, fish traps, stone pits, hunting hides and stone cairns
- artistic styles demonstrating connections over vast distances.

## 2.5 Geology and Landforms

The survey area lies in the Fortescue Province which is described at a regional level by Tille (2006) as hills and ranges (with stony plains and some alluvial plains and sandplains) on the volcanic granitic and sedimentary rocks of the Pilbara Craton. Soils are stony with red loamy earths and red shallow loams (and some red/brown non-cracking clays, red deep sandy duplexes and red deep sands [Tille, 2006]).

One land system has been mapped within the survey area, the Granitic System (286Gr), which is characterised by rugged granitic hills and hill tracts of granitic rocks with pockets of shallow gritty surfaced acidic soils (van Vreeswyk et al., 2004) (Figure 4). Topography in the survey area is typical of the Granitic system with elevations up to 100 m (van Vreeswyk et al., 2004).



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▬ Survey Area  
▬ Environmentally Sensitive Areas

**Pre-European Vegetation**

- 43: Mangroves: Low forest (Kimberley) or thicket (Pilbara) mangroves *Avicennia marina*, *Rhizophora stylosa*, *Bruguiera exaristata*.
- 117: Grass-steppe: Hummock grassland *Triodia* spp.
- 127: Tidal mud flat.
- 157: Grass-steppe: Hummock grassland *Triodia* spp.
- 175: Grasslands, short bunch-grass savanna: Annual grasses *Enneapogon* spp., *Aristida* spp. etc on dry plains and salt water grasses *Sporobolus virginicus* on the coast
- 589: Short bunch-grass savanna / Grass-steppe:
- 641: Woodland other: Wheatbelt; York gum, salmon gum etc. *Eucalyptus loxophleba*, *E. salmonophloia*. Goldfields; gimlet, redwood etc. *E. salubris*, *E. oleosa*. Riverine; rivergum *E. camaldulensis*. Tropical; messmate, woollyb

**Pre-European Vegetation and Environmentally Sensitive Areas**

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**FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT**

**Figure 3**



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**LEGEND**

Survey Area

Soil Landscape Mapping

- Cheerawarra System: Sandy coastal plains and saline clay plains supporting soft and hard spinifex grasslands and minor tussock grasslands.
- Granitic System: Rugged granitic hills supporting shrubby hard and soft spinifex grasslands.
- Littoral System: Bare coastal mudflats (unvegetated), samphire flats, sandy islands, coastal dunes and beaches, supporting samphire low shrublands, sparse acacia shrublands and mangrove forests.
- Rocklea System: Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex and occasionally soft spinifex grasslands with scattered shrubs.

**Land Systems and Soils**

**RIO TINTO**

*FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT*

**Figure 4**

## 3.0 Methodology

### 3.1 Desktop Assessment

A desktop assessment was undertaken prior to the phase I field survey to identify significant environmental values likely to be present in the survey area including flora, fauna and vegetation communities. Desktop database searches were requested from the following government databases (including a 50 km search radius from the survey area):

- Department of Biodiversity Conservation and Attractions (DBCA) Threatened Species and Communities database including Threatened and Priority flora, fauna and communities (DBCA, 2020a; 2020b; 2020c)
- Western Australian Herbarium (WAH, 1998) records
- NatureMap
- Atlas of Living Australia (ALA, 2021)
- EPBC Act Protected Matters Search Tool (PMST)
- Previous surveys including
  - Dampier Salt Native Vegetation Clearing Permit Report (Biota, 2011)
  - Dampier Resilience Native Vegetation Clearing Permit Supporting Report (Biota, 2018)
  - Botanical Survey of the Dampier Power Station and Sub-station and 33kV Network Connection at 7 Mile (Rio Tinto, 2011).

All conservation significant matters including flora, fauna and communities were reviewed and a likelihood of occurrence was completed based on the categories in Table 1. The results of the desktop assessment were revised following the phase I field surveys (see Section 3.2).

**Table 1 Categories of Likelihood of Occurrence for Species and Communities**

Likelihood category	Flora	Fauna	Communities
Likely to occur	Habitat is present in the Survey area and the species has been recorded in close proximity to the survey area.	Survey area is within the known distribution of the species, habitat is present in the survey area and the species has been recorded in close proximity to the survey area.	Known occurrences of the community in close proximity to the Survey area. Vegetation looks the same within the known occurrence and survey area based on aerial imagery. Geographic location is similar to the survey area.
May occur	Habitat may be present and/or the species has been recorded in close proximity to the survey area.	Survey area is within the known distribution of the species, marginal habitat may be present and/or the species has been recorded in close proximity to the survey area.	Known occurrence of the community in the local area, and/or vegetation looks the same within known occurrence and survey area based on aerial imagery. Geographic location is similar to the survey area.
Unlikely to occur	No suitable habitat is present and the species has not been recorded in close proximity to the survey area.	Survey area is outside the known distribution for the species, or no suitable habitat is present and the species has not been recorded in close proximity to the survey area.	Known occurrence of the community in close proximity to the Survey area however geographic location does not occur in survey area.

## 3.2 Flora and Vegetation Assessment

A detailed flora and vegetation assessment was undertaken utilising methods outlined in the *Flora Survey Technical Guide* (EPA, 2016a). The field surveys were undertaken by Floora De Wit (collection permit FB62000137). Floora has 14 years' experience undertaking flora and vegetation assessments. Floora completed a Bachelor of Science in Environmental Biology (Environmental Restoration) and completed a Postgraduate Diploma in Environmental Management and Impact Assessment.

The field survey included two phases:

- Phase I undertaken by Floora de Wit between 6 and 11 August 2020
- Phase II undertaken by Floora de Wit between 12 and 15 April 2021 accompanied by a Murujuga Aboriginal Corporation ranger.

The survey focussed on areas in Good or better condition, with observations made in areas significantly disturbed. Unbounded relevés were used to assess the flora and vegetation, supported by opportunistic collections and observation points.

Data collected from 31 relevés included the presence of plant species, their cover abundance, structural composition of vegetation, physical environment, and presence/absence of disturbance.

Each site was given a unique site number, and the following parameters recorded:

- date
- location using hand-held GPS (WGS 1984 - accuracy of 5 m)
- sample site type and size
- photograph (north-west corner)
- soil details (type, colour, moisture)
- landform
- vegetation condition using the Trudgen (1988) scale and description of disturbance
- fire history
- species list including:
  - estimated height
  - estimated percentage cover (for trees both percentage within relevé and within community was recorded to enable better description of vegetation community).

Survey effort is presented in Figure 5.

### 3.2.1 Vegetation Mapping

Vegetation communities were described and mapped based on changes in dominant species composition and landform. Vegetation community descriptions were based on the Association Level V in accordance with the National Vegetation Information System (NVIS) Framework (DotEE, 2018). Delineation of vegetation communities was supported by analysing floristic data collected within relevés.

Following phase I, classification of plant communities was carried out based on a species by site matrix of crown cover values. From the options available in the multivariate analysis package PC-ORD (MJM Software Design, 2011), Ward's method of hierarchical grouping was chosen using the relative Euclidian distance measure (Ward, 1963). This is one of two methods recommended by McCune and Grace (2002) as a way of avoiding space distortion and chaining among samples. Analysis considered all floristic data with the Braun-Blanquet scale applied to foliage cover. Following phase II, Primer-e was used to analyse the similarity of relevés from both field phases by applying the Bray-Curtis similarity index. Primer-e was used because it allows for easier manipulation of data and graphs.

Vegetation condition was determined using the scale adapted from Trudgen (1988) as recommended in the *Flora Survey Technical Guide* (EPA, 2016) (Table 2).

**Table 2 Bushland Condition Ratings (Trudgen, 1988)**

Descriptor	Description
Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Very Good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good	Most obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely Degraded	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

### 3.2.2 Targeted Flora Searches

Targeted searches were undertaken for conservation significant flora species considered likely to occur. The detailed desktop assessment identified four species that were targeted during phase I. Following this survey, the desktop results were refined based on habitat presence and the updated survey area. Habitat predominantly comprised rocky/scree slopes, artificial wetlands and minor ephemeral drainage lines. The targeted species were reduced to three species and included:

- *Vigna triodiophila*
- *Rhynchosia bungarensis*
- *Terminalia supranitifolia*.

Prior to commencing the field surveys, all species were reviewed and field guide booklets made. This included photographs, habitat and identification details of plant, flower and/or fruit. The majority of the survey area, excluding cleared and significantly disturbed areas, were traversed on foot to search for the target species.

In the event that a potential Priority species was encountered, the following was recorded:

- location (using a hand-held GPS accuracy 5m)
- the number of individuals in the immediate population, or an estimate of the size (number) of the population with an estimated radius of its spatial extent plant height
- vegetation condition
- associated dominant species
- soil type and colour
- topography
- additional information relevant to the area including key characteristics and landforms.



### 3.3 Fauna Assessment

A basic fauna assessment was undertaken including two field surveys:

- Phase I undertaken by Anthony Bougher between 6 and 11 August 2020
- Phase II undertaken by Jared Leigh between 12 and 15 April 2021 accompanied by a Murujuga Aboriginal Corporation ranger.

Both phases included a basic terrestrial fauna assessment in accordance with *Terrestrial Vertebrate Fauna Survey Technical Guide* (EPA, 2020). The survey was conducted concurrently with the detailed flora and vegetation assessment, which enabled consistent mapping of the fauna habitats and vegetation communities.

The surveys primarily focused on mapping of fauna habitat and assessing this habitat for potential utilisation by conservation significant fauna species. Fauna habitats were assessed for specific habitat components, including consideration of structural diversity and refuge opportunities for fauna. The fauna habitat assessments included:

- location
- general habitat description
- habitat condition and disturbance types
- dominant / characteristic flora species and vegetation layers
- presence and abundance of
  - large mature trees
  - small and large hollows
  - varying sizes of fallen logs
  - coarse and fine litter
  - decorticated bark
  - bare ground
  - grass
  - varying sizes of stones and boulders
  - rock crevices
  - soil cracks
  - cryptogamic crust
  - vines
  - dense shrubs
  - water bodies etc.
- presence of fauna and secondary signs (e.g. scats, digging, tracks, burrows, eggshell, bones, feathers etc.)
- connectivity of habitat.

In addition to the habitat mapping, records of all fauna observed through direct sightings and indirect evidence (e.g. scats, burrows, tracks, feathers, diggings etc) were documented. Particular attention was given to searching for conservation significant species identified in the desktop assessment as having the potential to occur in the area. All observations were made between daylight hours of 0700 and 1600.

The taxonomy and nomenclature of vertebrate species for mammals, reptiles and amphibians is consistent with the Western Australian Museum's Checklist of Vertebrates of Western Australia (2020) and the Department of the Environment and Energy (2021) Australian Faunal Directory for avian species.

Habitat suitability for conservation significant species was categorised according to species habitat preference, desktop assessment results, and species behaviour. The three categories include:

- suitable – species likely to occur, description aligns with species preference
- marginal – species likely to occur and habitat partly represents suitable habitat; or, species may occur, and habitat aligns with species preference
- vagrant visitors for aerial species that may fly over the area.

### **3.3.1 Short Range Endemic**

An opportunistic short range endemic (SRE) survey was undertaken during phase I and phase II of the fauna surveys. The survey area was traversed on foot to assess potential SRE habitat through fauna habitat assessments and opportunistic notes made during the survey. A representative range of micro-habitats or niches were searched for evidence of trapdoor spiders. Reference images showing a range of trapdoor spider burrows and lids were used as a guide when searching.

### **3.3.2 Motion Sensor Cameras**

Motion sensor cameras (BuckEye Cam X7D) were deployed at five locations for phase I and five different locations in phase II to determine whether Northern Quolls utilise the survey area. The total survey effort included 37 trap nights. Cameras were attached to surveyor tripods standing approximately one metre above the ground.

Sites chosen to locate cameras (shown in Figure 5) took consideration of:

- Sun trajectory being relatively low in the north sky during early August – cameras were orientated to face south to minimise sun glare.
- Windy conditions and movement of nearby vegetation that triggers motion cameras to take unnecessary or “blank” images.
- Habitat suitable for the Northern Quoll, including rockpiles and the man-made rockwall based on anecdotal evidence of a sighting.
- Habitat suitable for migratory birds i.e. the artificial wetlands.



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 CREATED BY WYATK2  
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**AECOM**  
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Datum: GDA 1994 MGA Zone 50

1:30,000  
 (when printed at A4)

0 100 200 300 400 metres

Data sources:  
 Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010), Geoscience Australia, Streetpro

**LEGEND**

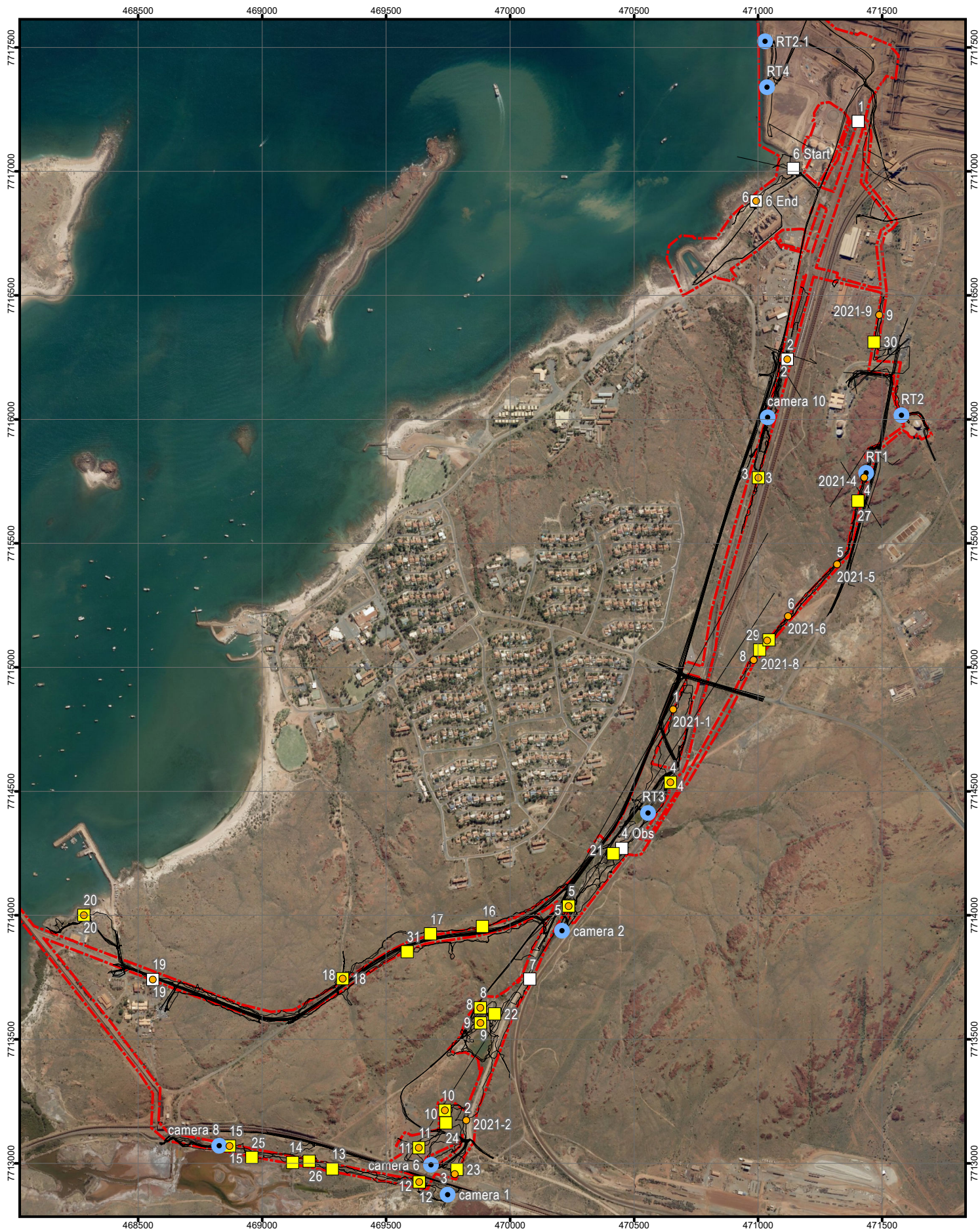
- 2020 Survey Area
- 2021 Survey Area

**Survey Effort**

**RIO TINTO**

*FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT*

**Figure 5.1**



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Datum: GDA 1994 MGA Zone 50  
 0 100 200 300 400  
 metres

1:20,000  
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Data sources:  
 Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010), Geoscience Australia, Streetpro

**LEGEND**

- ▬ Survey Area
- ▬ Tracklog
- Habitat Assessment
- Relevé
- Vegetation Mapping Note
- Motion Camera (passive)

**Survey Effort**

**RIO TINTO**

*FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT*

**Figure 5.2**

### 3.4 Limitations

Limitations of the survey are discussed in Table 3.

**Table 3 Limitations of the Ecological Surveys**

Limitation	Flora and Vegetation Survey	Fauna Survey
Availability of contextual information on the region	<b>Nil</b> Sufficient resources for the Pilbara were available to provide contextual information. These included NatureMap and DBCA search results, WA Herbarium specimens, taxonomic guides, the FloraBase database and previous surveys conducted in the region.	<b>Nil</b> Sufficient resources were available to provide contextual information. These included NatureMap and DBCA database, ALA, EPBC Act PMST, and Rio Tinto advice.
Competency/experience of consultant conducting survey	<b>Nil</b> Phase I and II flora and vegetation surveys were undertaken by Floora de Wit who has more than 14 years' experience conducting surveys of similar scope.	<b>Nil</b> Fauna phase I was undertaken by Ecologist Anthony Bougher who has more than 25 years' experience in the environmental industry in WA.  Fauna phase II was undertaken by Jared Leigh, an ecologist with over 16 years/ experience in the environment industry including numerous zoology projects associated with Chevron / Wheatstone and similar scopes.
Proportion of flora/fauna identified, recorded and/or collected (based on sampling, timing and intensity)	<b>Nil</b> Two field surveys were undertaken including phase I at which time 16 relevés were completed and the survey area traversed on foot to search for significant flora across four days. Phase II included additional targeted searches throughout the entire survey area, and another 12 relevés were completed across three days.	<b>Nil</b> The survey effort incorporated one Ecologist traversing the entire survey area on foot, recording fauna habitat descriptions at 14 sample point locations and deploying five motion sensor cameras (22 trap nights total).
Completion (is further work needed)	<b>Nil</b> The survey was complete with a search effort that was distributed effectively to provide a representative assessment of the vegetation, target flora species present.	<b>Minor</b> The survey effort was considered suitable for assessing the fauna habitats and determine likelihood of fauna utilising the habitats present.  Surveys were completed during daylight hours only. Additional survey effort would lead to more sightings of fauna species.
Remoteness and/or access issues	There were no issues with site access and adequate survey coverage was achieved.	

Limitation	Flora and Vegetation Survey	Fauna Survey
Timing, weather, season, cycle	<p><b>Nil</b></p> <p>The phase I survey coincided with the flowering period of numerous annual and perennial species. The phase II survey coincided with the typical 'ideal survey season' in accordance with EPA (2016) <i>Flora Survey Technical Guide</i>.</p>	<p><b>Nil</b></p> <p>The fauna surveys were undertaken during a suitably cooler time of the year to facilitate opportunistic fauna sightings.</p>
Disturbances (e.g. fire, flood, accidental human intervention) which affected results of the survey	<p><b>Nil</b></p> <p>No disturbance was observed, not including the anticipated disturbance from historical clearing.</p>	

## 4.0 Desktop Assessment Results

### 4.1 Threatened and Priority Ecological Communities

The desktop assessment identified five Priority Ecological Communities (PECs), described in Table 4 and mapped in Figure 6. An analysis of the community descriptions and their distance from the survey determined one PEC may occur and four PECs were unlikely to occur within the survey area.

The Burrup Peninsula rock pile community had potential to occur in the survey area. It is known from several locations 3.5 km from the survey area and aerial imagery determined that similar habitat may be present.

**Table 4 Priority Ecological Communities Identified in the Desktop Assessment**

Community Name and Description <sup>1</sup>	Cons. Status		Distance from Survey Area	Likelihood
	EPBC	WA		
<b>Roebourne Plains coastal grasslands with gilgai micro-relief on deep cracking clays</b>	-	P1	7.3 km	Unlikely
The Roebourne Plains coastal grasslands with gilgai micro-relief occur on deep cracking clays that are self-mulching and emerge on depositional surfaces. The Roebourne Plains gilgai grasslands occur on microrelief of deep cracking clays, surrounded by clay plains/flats and sandy coastal and alluvial plains. The gilgai depressions supports ephemeral and perennial tussock grasslands dominated by <i>Sorghum</i> sp. and <i>Eragrostis xerophila</i> (Roebourne Plains grass) along with other native species including <i>Astrelba pectinata</i> (Barley Mitchell grass), <i>Eriachne benthamii</i> (swamp wanderie grass), <i>Chrysopogon fallax</i> (golden beard grass) and <i>Panicum decompositum</i> (native millet). Restricted to the Karratha area, this community differs from the surrounding clay flats of the Horseflat land system which are dominated by <i>Eragrostis xerophila</i> and other perennial tussock grass species ( <i>Eragrostis</i> mostly). Threats: grazing, clearing for mining and infrastructure and urban development, weed invasion, basic raw material extraction.				
<b>Horseflat Land System</b>	-	P3	8.8 km	Unlikely
The Horseflat Land System of the Roebourne Plains are extensive, weakly gilgaied clay plains dominated by tussock grasslands on mostly alluvial non-gilgaied, red clay loams or heavy clay loams. Perennial tussock grasses include <i>Eragrostis xerophila</i> (Roebourne Plains grass) and other <i>Eragrostis</i> spp., <i>Eriachne</i> spp. and <i>Dichanthium</i> spp. The community also supports a suite of annual grasses including <i>Sorghum</i> spp. and rare <i>Astrelba</i> spp. The community extends from Cape Preston to Balla surrounding the towns of Karratha and Roebourne. This community incorporates Unit 3 (Gilgai plains), Unit 5 (Alluvial Plains) with some Unit 7 (Drainage Depressions) described in van Vreeswyk et al. 2004. Threats: grazing, weed invasion, fragmentation.				
<b>Burrup Peninsula rock pile communities</b>	-	P1	3.5 km	May
Pockets of vegetation in rock piles, rock pockets and outcrops. Comprise a mixture of Pilbara and Kimberley species, communities are different from those of the Hamersley and Chichester Ranges. Short range endemic land snails. Threats: industrial development dust emissions. Weed invasion including Buffel Grass, <i>Passiflora foetida</i> .				
<b>Coastal dune native tussock grassland dominated by <i>Whiteochloa airoides</i></b>	-	P3	17.5 km	Unlikely
Tussock grassland of <i>Whiteochloa airoides</i> occurs on the landward side of fore dunes, hind dunes or remnant dunes with white or pinkish white medium sands with marine fragments. There may be occasional <i>Spinifex longifolius</i> tussock or <i>Triodia epactia</i> hummock grasses and scattered low shrubs of <i>Olearia</i> sp. Kennedy Range ( <i>Scaevola spinescens</i> , <i>S. cunninghamii</i> , <i>Trianthera turgidifolia</i> and <i>Corchorus</i> species ( <i>C. walcottii</i> , <i>C. laniflorus</i> ). Occurs on Barrow Island and possibly some unaffected littoral areas in west Pilbara. Threats: weed invasion especially Buffel Grass and kapok, basic raw material extraction.				
<b>Burrup Peninsula rock pool communities</b>	-	P1	6.8 km	Unlikely
Calcareous tufa deposits. Interesting aquatic snails. Threats: recreational impacts, and potential development; possibly NOX and SOX emissions, weed invasion including <i>Passiflora foetida</i> (stinking passion flower).				

## 4.2 Conservation Significant Flora

The desktop study identified 618 native flora species and 35 weed species. The most common families are Fabaceae (104 species), Poaceae (76 species) and Malvaceae (42 species). The most common genera include *Acacia* (29 species), *Euphorbia* (17 species) and *Ptilotus* (17 species).

No Threatened flora were identified in the desktop assessment. Twenty two Priority flora species were identified as potentially occurring including:

- three species that are likely to occur
- one species may occur
- 18 species are unlikely to occur.

Following phase I surveys, *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) which was originally considered likely to occur, was reduced to unlikely to occur. Species considered likely or may occur are defined in Table 5 and all records are shown in Figure 7. The comprehensive species list of the desktop flora results, including habitat, flowering period, latest count date and likelihood of occurrence is presented in Appendix A and includes the Protected Matters Search and NatureMap results.

**Table 5 Conservation Significant Flora Species that May or are Likely to Occur**

Species	WA	Habitat <sup>1</sup>	Count Date	Likelihood of Occurrence
<i>Rhynchosia bungarensis</i>	P4	Associated with rocky slopes, rockpiles, rock pools and gullies.	2010	Likely, numerous records nearby, suitable habitat.
<i>Rostellularia adscendens</i> var. <i>latifolia</i>	P3	Ironstone soils. Near creeks, rocky hills.	2007 <sup>2</sup>	May, suitable habitat, one record nearby from previous survey.
<i>Terminalia supranitifolia</i>	P3	Rocky outcrops, slopes, piles. Among basalt rocks and on sand.	2003	Likely, numerous records nearby associated with rocky outcrops.
<i>Vigna triodiophila</i>	P3	Scree and rockpiles.	2009	Likely, records nearby. Suitable habitat.

1. Habitat derived from Pilbara Flora (Rio Tinto & DPAW, 2015) and WAH (1998) Florabase

2. Location provided by Rio Tinto

## 4.3 Conservation Significant Fauna

The desktop assessment identified 751 native fauna species including 4 amphibian, 204 bird, 230 fish, 173 invertebrate, 43 mammal and 109 reptile species.

A total of 55 conservation significant fauna species that could potentially occur within the survey area. This included two reptile, 47 bird, and six mammal species. The likelihood of occurrence of fauna species was determined by assessing the likely presence of suitable habitat in the survey area and reviewing the recent records and distribution of the species. This assessment determined that:

- 13 species are 'likely to occur' including one mammal, two reptiles and 10 birds
- 31 species 'may occur' including three mammals and 28 birds
- 11 species are 'unlikely to occur' including two mammals and nine birds.

The 13 species considered likely to occur are described in Table 6 and all records are shown in Figure 7. The comprehensive desktop results are presented in Appendix A.



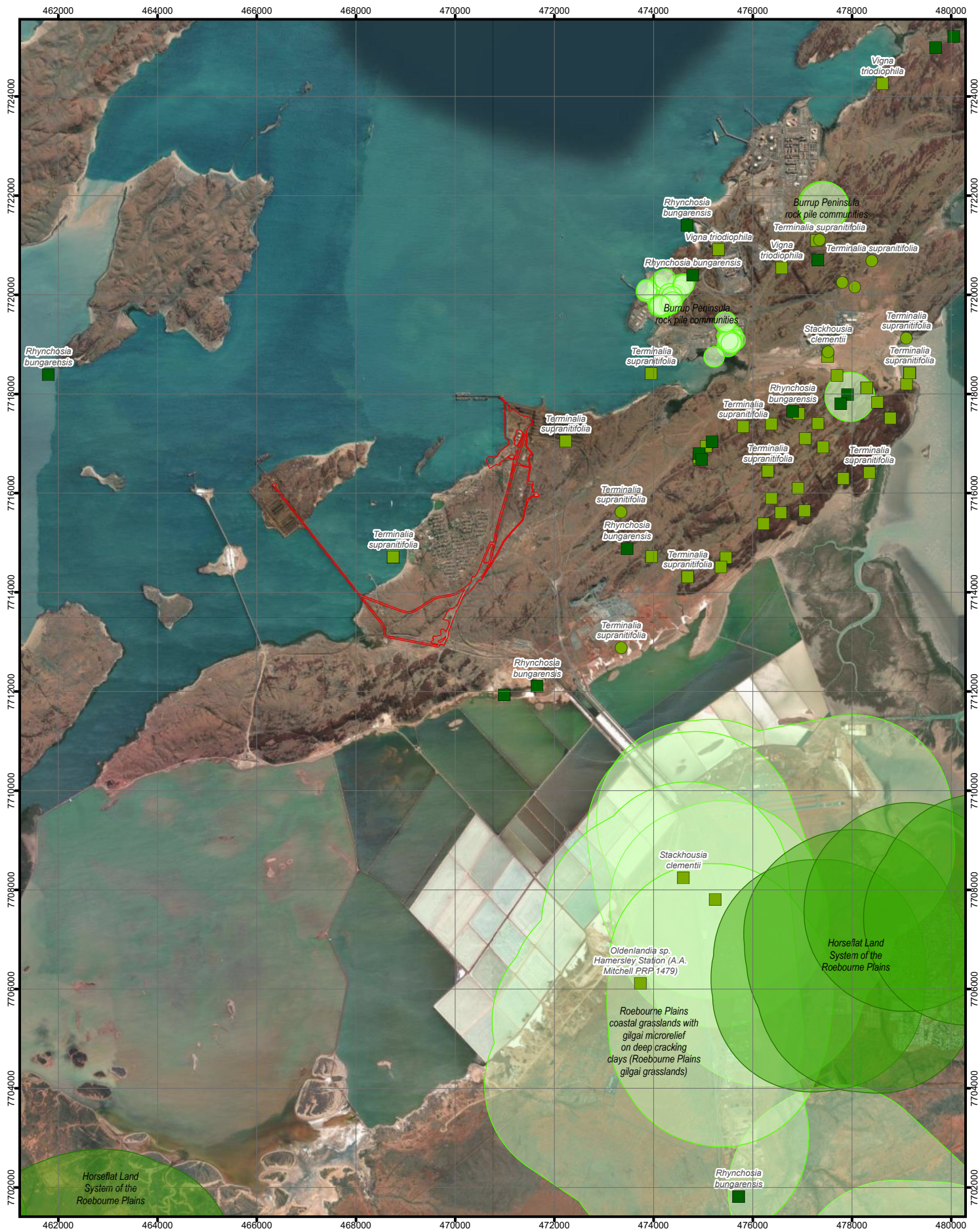
Table 6 Conservation Significant Fauna Species that are Likely to Occur

Taxon	Common Name	Cons. Status <sup>1</sup>		Habitat <sup>2</sup>	Number of Records	Distance from Survey Area
		EPBC Act	DBCA / BC Act			
<b>Birds</b>						
<i>Actitis hypoleucos</i>	Common Sandpiper	Mi, Ma	MI	The Common Sandpiper is widespread in small numbers utilising a wide range of coastal wetlands and some inland wetlands where it forages in muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. Areas of national importance within Western Australia include Nuytsland Nature Reserve and Roebuck Bay (Watkins, 1993).	25	1 km
<i>Arenaria interpres</i>	Ruddy Turnstone	Mi, Ma	MI	The Ruddy Turnstone are mainly found on exposed rocks or reefs, often with shallow pools, and on beaches. In the north, they are found in a wider range of habitats, including mudflats.	28	1 km
<i>Charadrius leschenaultii</i>	Large Sand Plover	VU, Mi, Ma	VU	This species inhabits littoral and estuarine habitats, sheltered sandy shelly or muddy beaches with large intertidal mudflats or sandbanks, and sandy estuarine lagoons, inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs. Important areas of habitat in Western Australia include Eighty Mile Beach, Roebuck Bay and Ashmore Reef (DAWE, 2020).	22	1 km
<i>Charadrius mongolus</i>	Lesser Sand Plover	EN, Mi, Ma	EN	This species occurs in littoral and estuarine environments, large intertidal sandflats or mudflats, sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. Important Western Australian sites include Eighty Mile Beach, Roebuck Bay, Broome and Port Hedland Saltworks.	8	7 km
<i>Falco peregrinus</i>	Peregrine Falcon	-	OS	A well-known falcon, the Peregrine inhabits a vast array of environs in Australia. Usually uncommon and migratory (Pizzey & Knight, 2007). This species lays its eggs in recesses of cliff faces, tree hollows or large abandoned nests (Bamford, 2009).	7	8 km
<i>Hydroprogne caspia</i>	Caspian Tern	Mi, Ma	MI	The largest tern in Australia, the Caspian Tern is widespread in coastal regions, breeding on variable types of sites including low islands, cays, spits, banks, ridges, beaches of sand or shell, terrestrial wetlands and stony or rocky islets or banks.	30	0 km
<i>Limosa lapponica</i>	Bar-tailed Godwit	Mi, Ma	MI	The Bar-tailed Godwit is found in coastal habitats, particularly large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	26	1 km

Taxon	Common Name	Cons. Status <sup>1</sup>		Habitat <sup>2</sup>	Number of Records	Distance from Survey Area
		EPBC Act	DBCA / BC Act			
<i>Pluvialis fulva</i>	Pacific Golden Plover	Mi, Ma	MI	The Pacific Golden Plover usually forages on sandy or muddy shores (including mudflats and sandflats) or margins of sheltered areas such as estuaries and lagoons, though it also feeds on rocky shores, islands or reefs. In addition, Pacific Golden Plovers occasionally forage among vegetation, such as saltmarsh, mangroves or in pasture or crops.	5	1 km
<i>Thalasseus bergii</i>	Crested Tern	Mi, Ma	MI	This large tern is predominantly found offshore and coastal, on beaches, bays, inlets, tidal rivers, salt swamps, lakes and larger rivers (Pizzey & Knight, 2010). The Crested Tern is usually a strictly coastal species, though there are occasional records in the arid interior of Australia, where birds were possibly blown by passing tropical cyclones (Birdlife Australia, 2020).	24	1 km
<i>Tringa brevipes</i>	Grey-tailed Tattler	Mi, Ma	P4	The Grey-tailed Tattler is found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. Also found on intertidal rocky, coral or stony reefs, platforms and islets that are exposed at low tide.	33	1 km
<b>Mammals</b>						
<i>Dasyurus hallucatus</i>	Northern Quoll	EN	EN	This species occupies a wide range of habitats including, rocky areas, deserts, eucalypt forests and woodlands, hummock grass ( <i>Plechtrachne</i> sp.), basalt hills, mesas, high and low plateaux, lower slopes, occasional tor fields and stony plains supporting either hard or soft spinifex grasslands (Braithwaite & Griffiths, 1994; van Vreeswyk et al., 2004). Northern Quolls on the Burrup Peninsula are likely to inhabit complex landforms of rocky outcrops, which can afford greater cover from predators than more open areas (Cardno, 2019). They will usually den in hollow trees or small caves and crevices in rocky outcrops.	39	4 km
<b>Reptiles</b>						
<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	VU	VU	The Olive Python (Pilbara subspecies) is known to occur at 17 locations in the Pilbara, mostly in the Hammersley Range and Dampier Archipelago and is terrestrial and rock-inhabiting (Wilson & Swan, 2010). It is often associated with rockpiles around permanent water pools and seasonal creek. On the Burrup Peninsula they prefer granophyre rock piles and occasionally are found in neighbouring spinifex grasslands (Cardno, 2019).	20	1 km
<i>Notoscincus butleri</i>	Lined Soil-crevice Skink (Dampier)		P4	Usually found in hummock grasslands on stony or sandy ground. A relatively poorly known species that has been collected in the Hearson Cove - King Bay area of the Burrup Peninsula.	12	6 km

1. Conservation status: VU Vulnerable, Mi/MI Migratory, Ma Marine, P Priority, EN Endangered, CR/CE Critically Endangered, OS Other specially protected fauna

2. Habitat information derived from the DAWE (2020) Species Profiles and Threats Database unless otherwise referenced.



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**LEGEND**

Survey Area  
 PECs

- Priority 1
- Priority 3

WA Herb

- Priority 3
- Priority 4

Threatened and Priority Flora Database

- Priority 3

**Desktop Results – Flora and Communities**

**RIO TINTO**

**FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT**

**Figure 6**



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**LEGEND**

Survey Area

**Desktop Results – Fauna**

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**FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT**

**Figure 7**

#### 4.3.1 Short Range Endemic Species

Taxonomic groups with known or likely SRE taxa in Western Australia are defined in EPA (2009) *Short Range Endemic Invertebrate Fauna* and include:

- Mollusca – freshwater mussels and snails, land snails
- Annelida – earthworms
- Onychophora – velvet worms
- Arthropoda –spiders, pseudoscorpions, schizomids, mites, slaters, freshwater crayfish, millipedes.

The ALA (2021) online database shows a record of *Idiosoma* sp. and *Kwonkan* sp. (trapdoor spider species) occurring in the vicinity of the survey area. Both genera are known to support SRE fauna species.

*Idiosoma* sp. was recorded in 1998, described as being near the Hamersley Iron Technical Services Building. Other records in the region are from Dixon Island and the wider Wickham area, more than 35 km east of the survey area.

*Kwonkan* sp. was recorded in 2009 approximately 3 km northeast of the survey area, near Murujuga National Park and another record located 13 km south of the survey area.

Neither of these species are listed as conservation significant fauna under the BC Act or listed as a Priority species by DBCA.

## 5.0 Field Survey Results

### 5.1 Vegetation

#### 5.1.1 Conservation Significant Vegetation

No vegetation communities listed as Threatened Ecological Communities (TECs) under the EPBC Act or BC Act were recorded during the field survey. The survey area skirts the edge of several rockpiles which have similar characteristics to the Burrup Peninsula Rock Pile Priority Ecological Community (PEC). The PEC is described as pockets of vegetation in rock piles, rock pockets and outcrops (DBCA, 2017) and represents fire and evolutionary refugia with high habitat diversity for plants (Kendrick & Stanley 2001).

#### 5.1.2 Vegetation Communities



Nine vegetation communities were described and mapped across the 104 ha (excluding cleared areas and ocean) within the survey area. These included:

- Hummock Grasslands – three communities on scree slopes and flats, and rockpiles
- Disturbed Areas – including artificial wetlands, disturbed roadside, and cleared
- Wetlands / tidal areas – two ephemeral creeks and two intertidal / shoreline communities.

Analysis of floristic data from relevés was analysed using dendrograms (Appendix C). The dendrograms determined that many sites were statistically very similar to one another, leading to the grouping of many sites in one vegetation community (notably, ToAITe).



The vegetation communities recorded in the survey area are described in Table 7 and mapped in Figure 8.



Table 7 Vegetation Community Descriptions and Photographs


Description	Additional Detail	Photograph
<b>Wetlands / Tidal</b>		
<p><b>EcScCc</b> <b>Minor Flowline</b></p> <p><i>Eucalyptus camaldulensis</i> and <i>Melaleuca lasiandra</i> low woodland over <i>Sesbania cannabina</i>, <i>Acacia coriacea</i> and <i>Solanum horridum</i> mid open shrubland over *<i>Cenchrus ciliaris</i> low open tussock grassland.</p> <p>This community includes a layer of herbs including <i>Rhynchosia minima</i>, <i>Pluchea rubelliflora</i>, <i>Cucumis variabilis</i> and 13 more species.</p>	<p>Survey effort: 12, 19, 23, 28</p> <p>Extent: 1.54 ha</p> <p>Species richness: 44 native and one weed species</p> <p>Condition: Good</p>	
<p><b>GpTzTa</b> <b>Minor Flowline</b></p> <p><i>Grevillea pyramidalis</i> and <i>Terminalia canescens</i> low isolated trees over <i>Trichodesma zeylanicum</i> var. <i>zeylanicum</i>, <i>Pluchea rubelliflora</i> and <i>Streptoglossa decurrens</i> tall herbland over <i>Triodia angusta</i> and *<i>Cenchrus ciliaris</i> tall mixed Hummock and Tussock grassland.</p> <p>Restricted to one location where flowline intersects with the road. Floristics are very similar to adjacent rocky slopes, and was largely barren in April 2021.</p>	<p>Survey effort: 18</p> <p>Extent: 0.22 ha</p> <p>Species richness: 22 native and one weed species</p> <p>Condition: Good</p>	

Description	Additional Detail	Photograph
<p><b>FvTdlc</b>  <b>Tidal/Shoreline</b></p> <p><i>Flueggea virosa</i> subsp. <i>melanthesoides</i>, <i>Rhizophora stylosa</i> and <i>Avicennia marina</i> scattered mangrove patches with <i>Typha domingensis</i>, <i>Cyperus vaginatus</i> and <i>Spinifex longifolius</i> low scattered sedges with <i>Ipomoea costata</i> and *<i>Passiflora foetida</i> scattered climbers.</p> <p>Recorded along the mid to upper levels of shoreline where plants occurred sporadically. Low levels of the shoreline were devoid of vegetation.</p>	<p>Survey effort: 6, 20</p> <p>Extent: 3.25 ha</p> <p>Species richness: 23 native and three weed species</p> <p>Condition: Good</p>	
<p><b>PaTiEo</b>  <b>Tidal Flats</b></p> <p><i>Pittosporum phillyreoides</i> and <i>Acacia coriacea</i> scattered tall trees over <i>Tecticornia indica</i>, <i>Enchylaena tomentosa</i> and <i>Acacia ampliceps</i> low open shrubland over <i>Eriachne obtusa</i> and *<i>Cenchrus ciliaris</i> low open tussock grassland.</p> <p>Associated with tidal flats on clay soils that responds rapidly to rainfall, varying between large barren areas to open herbland.</p>	<p>Survey effort: 14, 25</p> <p>Extent: 0.30 ha</p> <p>Species richness: Nine native and one weed species</p> <p>Condition: Good</p>	



Description	Additional Detail	Photograph
<b>Hummock Grasslands</b>		
<p><b>AbEtTa Hummock Grassland</b></p> <p><i>Acacia bivenosa</i>, <i>Salsola australis</i> and <i>Corchorus walcottii</i> mid to low open shrubland over <i>Euphorbia tannensis</i> subsp. <i>eremophila</i>, <i>Euphorbia australis</i> and <i>Tribulus hirsutus</i> low open herbland over <i>Triodia angusta</i> and <i>Triodia epactia</i> tall Hummock Grassland</p> <p>Recorded on flat clay soils with some rocks on lower slopes.</p>	<p>Survey effort: 13, 17, 26</p> <p>Extent: 1.94 ha</p> <p>Species richness: 50 native and one weed species</p> <p>Condition: Good</p>	
<p><b>SdSfTe Hummock Grassland</b></p> <p><i>Solanum diversifolium</i>, <i>Indigofera monophylla</i> and <i>Acacia synchronicia</i> mid to low open shrubland with <i>Swainsona formosa</i>, <i>Boerhavia coccinea</i> and <i>Euphorbia australis</i> mid to low open herbland over <i>Triodia epactia</i> Hummock Grassland.</p> <p>Recorded on skeletal soils on lower slopes. This community is very similar to ToAIte as shown in Appendix C similarity dendrograms. This is particularly evident following the April 2021 survey.</p>	<p>Survey effort: 7, 8, 11</p> <p>Extent: 7.10 ha</p> <p>Species richness: 32 native and two weed species</p> <p>Condition: Good to Very Good</p>	

Description	Additional Detail	Photograph
<p><b>ToAITe Hummock Grassland</b></p> <p><i>Trachymene oleracea</i> subsp. <i>oleracea</i>, <i>Trichodesma zeylanicum</i> var. <i>zeylanicum</i> and <i>Swainsona formosa</i> mid to tall herbland with <i>Abutilon lepidum</i>, <i>Crotalaria novae-hollandiae</i> and <i>Senna notabilis</i> low shrubland over <i>Triodia epactia</i> tall hummock grassland.</p> <p>Recorded on skeletal soils on flats, slopes and around rockpiles. Trees including <i>Terminalia canescens</i> growing from rockpiles.</p>	<p>Survey effort: 3, 10, 15, 16, 24, 27, 29, 30</p> <p>Extent: 14.26 ha</p> <p>Species richness: 73 native and three weed species</p> <p>Condition: Very Good</p>	
<b>Disturbed – significantly altered</b>		
<p><b>Rocky Shore</b></p> <p>Shoreline comprised of partially man-made, partially natural rocks, boulders and sand.</p>	<p>Extent: 2.19 ha</p>	

Description	Additional Detail	Photograph
<p><b>AaEgPr</b> <b>Disturbed - Artificial Ephemeral Wetland</b></p> <p><i>Acacia ampliceps</i> and <i>Sesbania cannabina</i> medium open shrubland over <i>Eleocharis geniculata</i>, <i>Schoenus falcatus</i> and <i>Cyperus vaginatus</i> low open sedgeland over <i>Pluchea rubelliflora</i>, <i>Samolus repens</i> and <i>Stemodia grossa</i> low open herbland.</p> <p>Represents artificial ephemeral wetlands. Wetter areas include <i>Typha domingensis</i>. Supports Priority 3 <i>Eragrostis surreyana</i> population. Presence of water likely to vary throughout the year.</p>	<p>Survey effort: 4, 5, 9, 21, 22</p> <p>Extent: 9.66 ha</p> <p>Species richness: 37 native and six weed species</p> <p>Condition: Degraded</p>	
<p><b>CL</b> Cleared – devoid of native vegetation, includes hardstand roads and rail as well as roadside with weeds.</p>	<p>Extent: 63.50 ha</p>	<p>N/A</p>
<p><b>Water</b> Open water</p>	<p>Extent: 0.18 ha</p>	<p>N/A</p>



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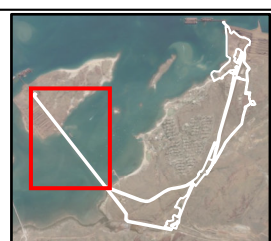
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**LEGEND**

- Survey Area
- Vegetation Communities
- FvTdLc
- Cleared



**Vegetation Communities**

**RIO TINTO**

**FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT**

**Figure 8.1**



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**LEGEND**

Survey Area

Vegetation Communities

AbETa

EcScCc

FvTdLc

PaTiEo

ToAiTe

Cleared

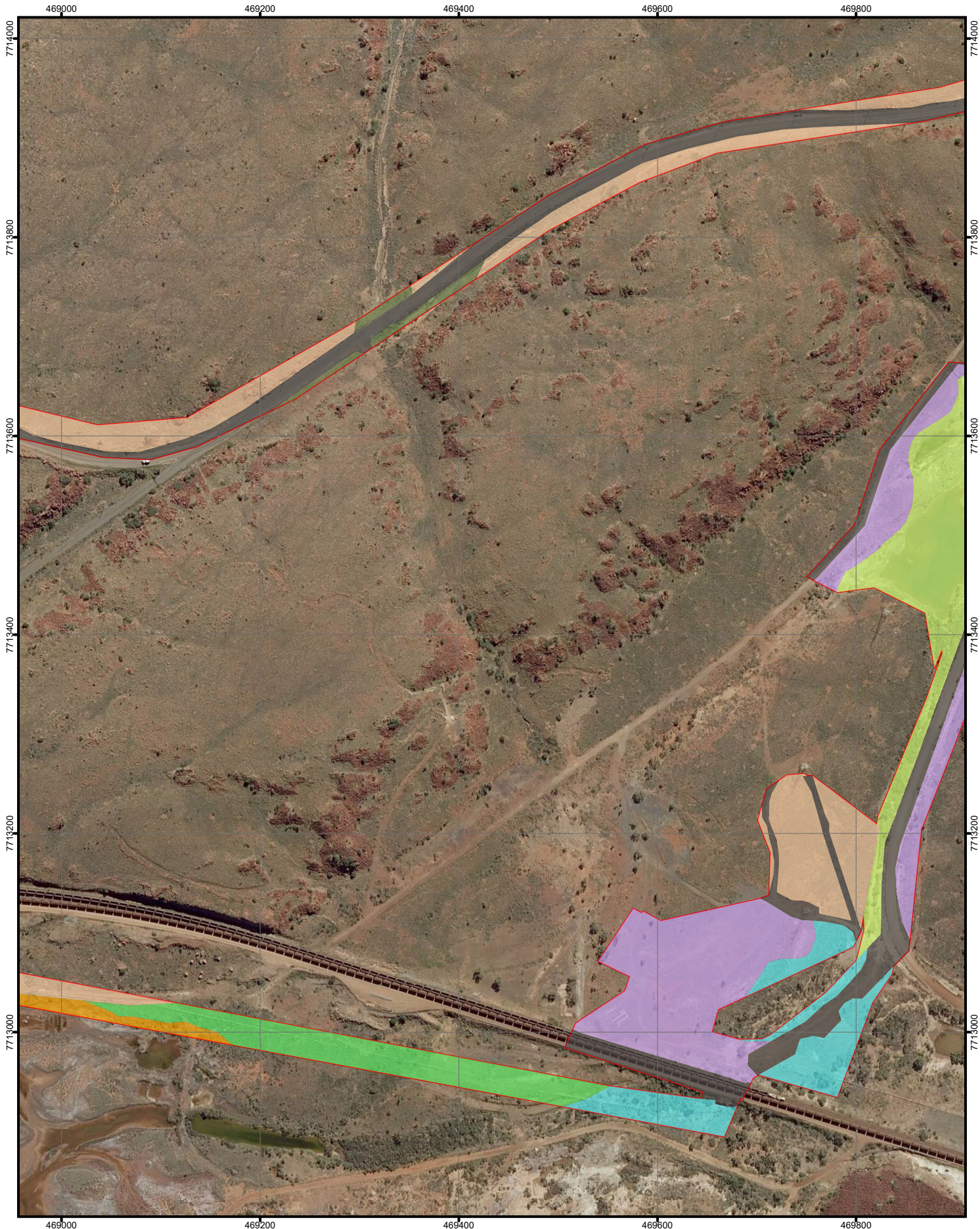


**Vegetation Communities**

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**FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT**

**Figure 8.2**



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0 25 50 75 100  
 metres

1:5,000  
 (when printed at A4)

Data sources:  
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**LEGEND**

Survey Area

Vegetation Communities

- GpTzTa
- PaTIEo
- SdSfTe
- ToAlTe
- Cleared
- AaEgPr
- AbEtTa
- EcScCc

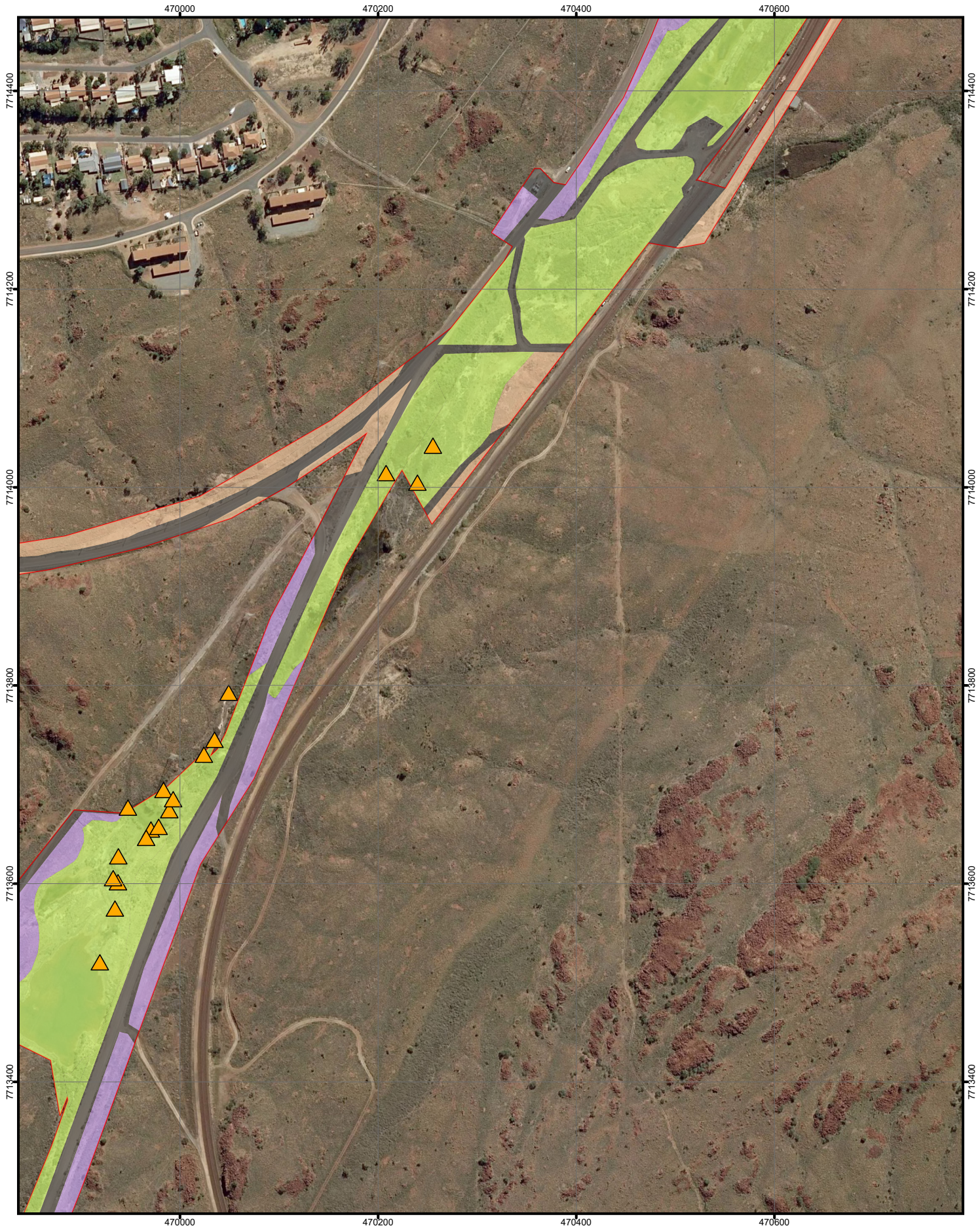


**Vegetation Communities**

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**FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT**

**Figure 8.3**



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**LEGEND**

- Survey Area
- SdSfTe
- ToAlTe
- Cleared
- ▲ *Eragrostis surreyana* (P3)
- AaEgPr

**Vegetation Communities**

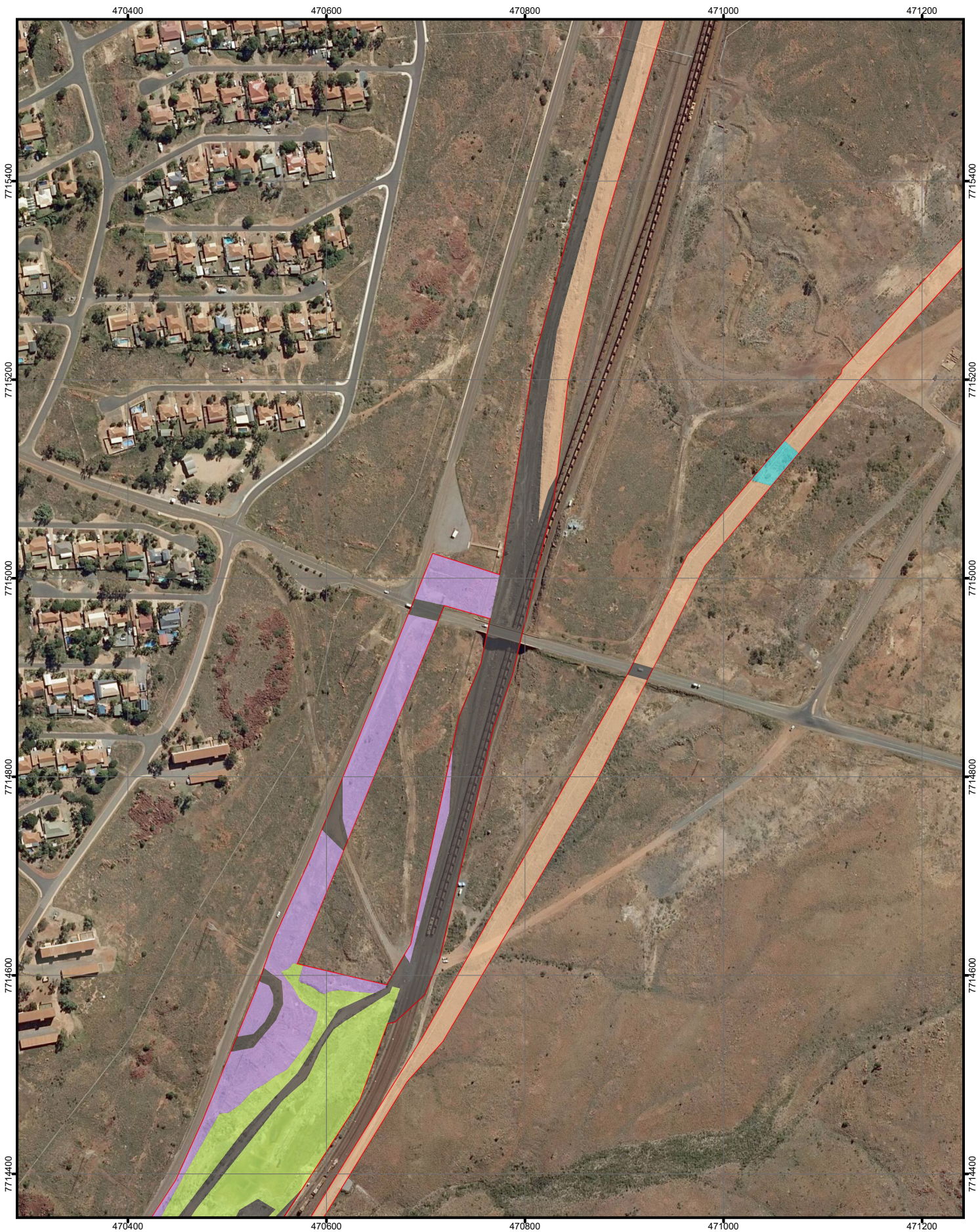


**Vegetation Communities**

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**FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT**

**Figure 8.4**



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Data sources:  
 Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010), Geoscience Australia, Streetpro

**LEGEND**

Survey Area

**Vegetation Communities**

- AaEgPr
- EcScCc
- SdSfTe
- ToAlTe
- Cleared



**Vegetation Communities**

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**FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT**

**Figure 8.5**





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0 25 50 75 100 metres

Data sources:  
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- LEGEND**
- Survey Area
  - Vegetation Communities**
  - SdSfTe
  - ToAlTe
  - Cleared



**Vegetation Communities**

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*FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT*

**Figure 8.6**



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1:5,000  
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0 25 50 75 100 metres

Data sources:  
 Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010), Geoscience Australia, Streetpro

**LEGEND**

- Survey Area
- SdSfTe
- ToAIte
- Vegetation Communities
- Cleared
- FvTdLc
- Water
- Rocky shore

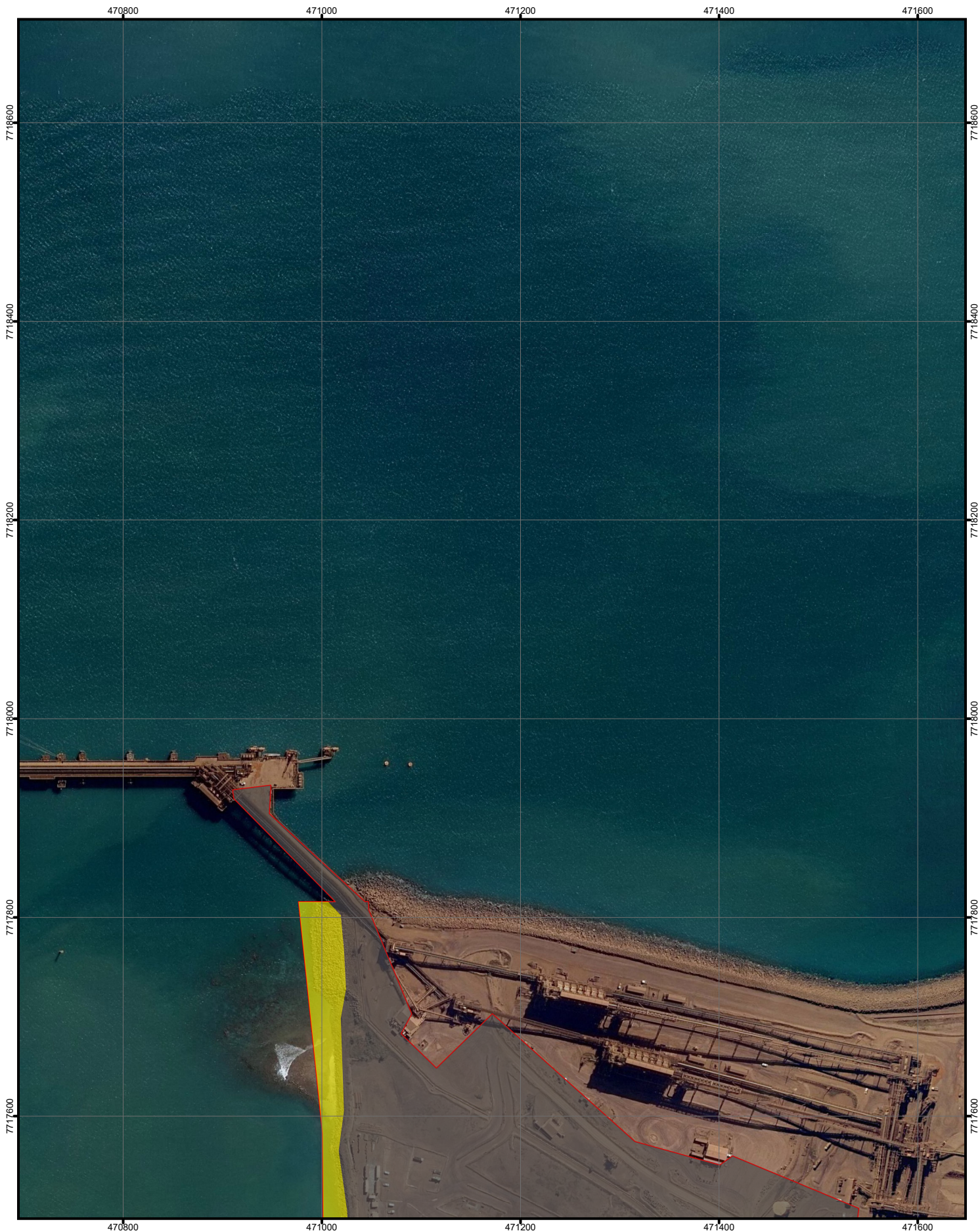


**Vegetation Communities**

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**FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT**

**Figure 8.7**



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0 25 50 75 100 metres

Data sources:  
 Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010), Geoscience Australia, Streetpro

**LEGEND**

- Survey Area
- Vegetation Communities
- Rocky shore
- Cleared



**Vegetation Communities**

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*FLORA, VEGETATION AND FAUNA ASSESSMENT – DAMPIER DESALINATION PROJECT*

**Figure 8.8**

**5.1.3 Condition**

Vegetation condition was mapped as Completely Degraded to Very Good throughout the survey area (Figure 9). The majority of the survey area has been disturbed to some degree from existing infrastructure. The Completely Degraded area comprises 63% of the survey area, followed by ‘Poor’ condition vegetation at 13%, and Degraded at 12%. Of the 104 ha of vegetation, 1.83 ha (2%) represents vegetation in Very Good condition.

There are numerous areas of disturbance including cleared hardstand for permanent infrastructure (rail, road, buildings), roadside clearing and drainage, pipelines and powerlines with regrowth vegetation underneath, and historical borrow pits which have developed into artificial wetlands. Some examples of this is shown in Plate 1.

**Table 8 Vegetation Condition Extent**

Condition rating	Extent (ha)	Percent of Total Area (%)
Very Good	1.83	2
Good	10.71	10
Poor	13.14	13
Degraded	12.39	12
Completely Degraded/Cleared	65.90	63
Total	104.00	100

Note: Water represents 0.18 ha and is not included in calculations



**Plate 1 Evidence of disturbance from top right clockwise: pipeline, man-made rock wall, roadside drainage, earthworks**