Eremophila forrestii subsp. viridis targeted flora survey

Memo report

August 2022

Unit 2 2232 Albany Hwy
Gosnells WA 6110
www.andersenvironmental.com.au

MEMORANDUM	
To	Hastings Technology Metals Limited
From	Anders Environmental Consulting
Date	18 August 2022
Subject	Results of the *Eremophila forrestii* subsp. *viridis* July 2022 targeted survey

Chain of authorship and review			
Name	**Task**	**Version**	**Date**
[redacted]	Draft report for client	1.0	August 2022
	Review of draft report	1.1	August 2022
	Final report	2.0	August 2022

Anders Environmental Consulting
U22 2232 Albany Hwy Gosnells WA 6110
P: 08 9398 8837
W: www.andersenvironmental.com.au
E: andersenv@live.com

EXECUTIVE SUMMARY

Hastings Technology Metals Limited are proposing to construct the Onslow Rare Earths Plant (OREP) within the Ashburton North Strategic Industrial Area (ANSIA) to process rare earth concentrate from the Yangibana Rare Earths Project (Yangibana Project) located approximately 270 km north-east of Carnarvon.

One Priority flora species, *Eremophila forrestii* subsp. *viridis* (Priority 3) occurs within the processing plant development footprint, with 839 plants recorded. Known targeted surveys available to Hastings within the Onslow area prior to this survey have recorded 6,446 individuals. In addition to this Project, other proposed projects in the vicinity may impact on the species. A targeted survey was undertaken with the objective of finding additional populations of *Eremophila forrestii* subsp. *viridis* in the region.

This targeted survey was undertaken in July 2022 over three days. Survey areas were based on 16 discreet search areas determined from the modelling of preferred habitats by Eco Logic Australia (ELA 2021). Targeted searches were undertaken within seven of the discreet search areas.

266 individual plants were recorded over the three day survey. The survey has widened the extent of the populations of *E. forrestii* subsp. *viridis* to the west and east of currently known populations of the species. However due to limited time and the requirement for extensive travel on foot to reach populations only seven of the 16 search areas were able to be searched. There is scope to potentially find additional populations of *Eremophila forrestii* subsp. *viridis*. Recommended additional surveys would include targeted searches within:

- Un-surveyed and partially surveyed discreet search areas
- The Cane River Conservation Park
- The eastern side of dunes between Onslow and Cane River Conservation Park.

TABLE OF CONTENTS

DEFINITIONS

Acronym	Definition
Anders	Anders Environmental Consulting
BC Act	*Biodiversity Conservation Act 2016*
BOM	Bureau of Meteorology
Cwth	Commonwealth
DBCA	Department of Biodiversity Conservation and Attractions
DMIRS	Department of Mines, Industry Regulation and Safety
DotEE	Department of the Environment and Energy
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Area
ha	Hectare
IBRA	Interim Biogeographic Regionalisation of Australia
km	Kilometre
m	Metre
mm	Millimetre
MNES	Matter of National Environmental Significance
NVCP	Native Vegetation Clearing Permit
PEC	Priority Ecological Community
TEC	Threatened Ecological Community

1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

Hastings Technology Metals Limited (Hastings) are proposing to construct a processing plant within the Ashburton North Strategic Industrial Area (ANSI) approximately 13 km south-west of Onslow. The processing plant will process rare earth ore transported by haul trucks from the Yangibana Rare Earths Project (Yangibana Project), which is located approximately 270 km north-east of Carnarvon within the Gascoyne Region of Western Australia.

As part of the environmental approvals for the processing plant, several flora and vegetation surveys were undertaken within the processing plant disturbance envelope and the wider Onslow area. One conservation significant species, *Eremophila forrestii* subsp. *viridis* (Priority 3) was recorded with 839 individuals recorded within the development footprint and potentially impacted by the project and individuals recorded regionally. Known targeted surveys available to Hastings within the Onslow area prior to this survey have recorded 6,446 individuals.

In 2022 Hastings submitted a Native Vegetation Clearing Permit (NVCP) for clearing within the proposed processing plant development envelope. DWER flagged the likelihood that DBCA will consider the impact of 839 to *E. forrestii* subsp. *viridis* individuals within the development footprint an unacceptable level, in consideration of other proposed projects being planned in the vicinity of the Project. Hastings commissioned a targeted surveys outside the development envelope to reduce the impact on *E. forrestii* subsp. *viridis.*

Hastings engaged Anders Environmental Consulting (Anders) to undertake a targeted survey in July 2022. The purpose of the targeted survey was to identify populations of *E. forrestii* subsp. *viridis* outside the development envelope. This memo outlines the findings of the targeted survey.

1.2 CONSERVATION SIGNIFICANT FLORA

Threatened flora are plants which have been assessed as being at risk of extinction. Under the *Biodiversity Conservation Act 2016* (BC Act), the Western Australian Minister for the Environment may declare species of flora to be protected if they are considered to be in danger of extinction, rare or otherwise in need of special protection. Species that are considered Threatened and need to be specially protected because they are under identifiable threat of extinction are listed under the BC Act. These categories are defined in Table 1.

Table 1 Conservation codes for species listed under the Western Australian BC Act

Code	Category
CR	Critically endangered species Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines".
EN	Endangered species Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines".
VU	Vulnerable species Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines".
EX	Extinct species Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).
EW	Extinct in the wild species Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).
MI	Migratory species Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).
CD	Species of species conservation interest Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).
OS	Other specially protected species Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Species that have not yet been adequately surveyed to warrant being listed under the WC Act, or are otherwise data deficient, are added to a Priority Lists under Priorities 1, 2 or 3 by the Western Australian Minister for the Environment. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. Categories and definitions of Priority Flora and Fauna species are provided in Table 2.

Table 2 Conservation categories for species listed by DBCA and endorsed by the Minister for the Environment

Conservation Code	Category
Priority One	Poorly known species Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g., agricultural, or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority Two	Poorly known species Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g., national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority Three	Poorly known species Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority Four	Rare, Near Threatened and other species in need of monitoring (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

2.0 METHODOLOGY

2.1 DESKTOP ASSESSMENT

Targeted surveys are used to gather comprehensive information on significant flora. A targeted survey aims to determine the size and extent of all significant flora populations in the survey area and to place any impacts into context (EPA 2016).

Several flora and vegetation surveys, including targeted surveys for *E. forrestii* subsp. *viridis* have been undertaken within the Onslow area, these include surveys by:

- Eco Logic Australia (2021)
- Anders Environmental Consulting (2021)
- Spectrum Environmental (2020)
- 360 Environmental (2020)
- RPS (2019).

Eco Logic Australia (ELA) undertook data modelling of the potential distribution of *E. forrestii* subsp. *viridis* within the Onslow area (ELA 2021). The modelling was based on habitat preferences, soils, and landform. The modelling identified 16 discreet search areas. In 2021 ELA conducted a targeted survey of *Eremophila forrestii* subsp. *viridis* within seven of the discreet search areas. A remaining nine search areas were un-surveyed, these areas formed the focus of the July 2022 survey.

2.2 TARGETED FLORA SURVEY

The targeted survey involved undertaking searches within the modelled discreet search areas to locate and map populations of *E. forrestii* subsp. *viridis.* The targeted survey was undertaken in accordance with EPA Flora Guidelines (EPA 2016) over three field days from 27th to 29th July 2022. A team of four people conducted the targeted survey, this included Lead Botanist Catherine Krens (Flora collection licence number FB62000188), one Hastings personnel, and two field assistants.

The survey was undertaken outside the known flowering time for *E. forrestii* subsp. *viridis,* which is during August. It was expected that the survey was too early for any flowers to be present, however, the majority of plants were flowering at the time of survey, which aided in identification of plants within the field (see Plate 1).

Plate 1 ***Eremophila forrestii* subsp. *viridis* flowering**

The targeted survey was undertaken within the remaining un-surveyed discreet search areas. Search areas further from the development envelope were prioritised to record the population extent of *E. forrestii* subsp. *viridis* within the wider Onslow area.

Transects within discreet survey areas were walked in parallel lines at 20m to 40m spacing and track logs were recorded on GPS units to show survey effort. Locations of individual plants or small groups of plants were recorded up to an area 20m x 20m, with the central point of each location recorded on a GPS. For each location of *E. forrestii* subsp. *viridis* the following information was recorded:

- GPS location
- Photograph of *E. forrestii* subsp. *viridis*
- Number of individual plants within the location
- Size of location (i.e., 10m x 10m).

2.3 LIMITATIONS

Limitations are common in flora surveys which may result in reduced data quality and survey effort and deviations from the EPA guidelines. An assessment of the limitations of the survey as outlined in the EPA guidelines (2016) are addressed in Table 3.

Table 3 Limitations of the flora and vegetation survey

Limitation	Determination	Justification
Availability of contextual information at a regional and local scale	**Not a constraint**	All contextual information including earlier reports and spatial data was available at the time of survey.
Competency/experience of the team conducting the survey, including experience in the bioregion	**Not a constraint**	The survey was led by Catherine Krens who is a Senior Botanist with over 15 years' experience undertaking flora surveys including targeted searches within Western Australia and the Carnarvon bioregion. The field team members have experience undertaking targeted surveys. Prior to beginning the survey, populations of *Eremophila forrestii* subsp. *viridis* were visited and photographs were taken to familiarise the field team with *Eremophila forrestii* subsp. *viridis* features.
Proportion of flora recorded and collected and any identification issues	**Not a constraint**	All locations of *Eremophila forrestii* subsp. *viridis* plants encountered within the transects were recorded on GPS units.
Effort and extent - was the survey area fully surveyed	**Major constraint**	Not all discreet search areas were surveyed. Areas further from the development envelope were focused on to determine population extent within the Onslow area.
Access restrictions within the survey area	**Major constraint**	No access issues were encountered.
Survey timing, rainfall, season of survey	**Major limitation**	The survey was undertaken outside the known flowering time for *Eremophila forrestii* subsp. *viridis,* however, the majority of plants were flowering, which aided in identification in the field.
Disturbance that may have affected the results of survey such as fire, flood or clearing	**Not a constraint**	No disturbance apart from existing tracks and road verges were observed which did not affect the results of this flora survey.

3.0 EXISTING ENVIRONMENT

3.1 CLIMATE

The climate of the Carnarvon bioregion is semiarid to arid with predominantly winter rainfall. Spatially averaged median rainfall is 208 mm (Keogh et. al. 2005). The closest Bureau of Meteorology (BOM) weather station with a temperature and rainfall dataset is Onslow Airport (weather station 005017).

Onslow Airport recorded a long-term mean maximum temperature ranging between 25.6˚C (July) to 36.5˚C (January) (1940 to 2022) (Figure 1) (Bureau of Meteorology 2022). The rainfall in the 12 months prior to the survey (July 2021 to June 2022), was 123.9 mm above the long-term average of 308.9 mm (Bureau of Meteorology 2022). In the three months prior to the survey (April 2022 to June 2022), 395.8 mm of rainfall was recorded, which is 286 mm above the long-term average of 109.8 mm for the same time period (Bureau of Meteorology 2022) (Figure 1). May had a large rainfall spike with 310.4 mm of rainfall recorded.

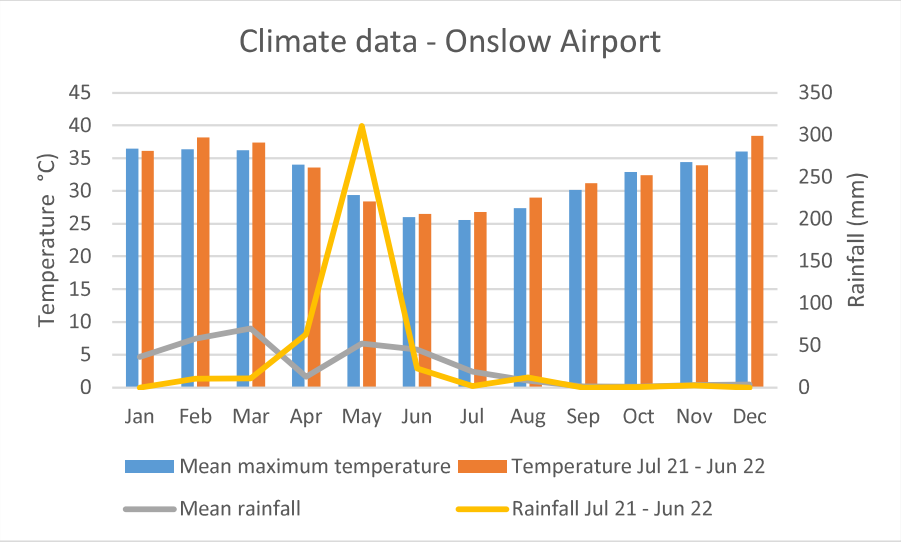

Figure 1 Climate data recorded at Onslow Airport weather station (Rainfall and maximum temperature 12 months prior to survey and long-term average) (Bureau of Meteorology 2022).

3.2 IBRA BIOREGION

The survey area occurs within the Carnarvon Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion and specifically the Cape Range Subregion (CAR01). The Carnarvon Bioregion is characterised by low and gently undulating landscape with open drainage. Vegetation is mainly acacia shrublands and saltbush/bluebush shrublands, with areas of tussock grassland in the north (Rangelands 2008).

3.3 VEGETATION

Mapping of pre-European vegetation units within Western Australia is based on broad scale mapping by Beard (1976) at 1:3,000,000 which showed the distribution of 75 major categories of plants at the time of European settlement. Beards mapping was re-assessed by Shepherd et al. (2002) with some larger vegetation units divided into smaller units. Together, this pre-European database contains a total of 819 vegetation types recognised within Western Australia.

Some vegetation types have been extensively cleared since European settlement and have been constrained by development. The EPA has an objective to seek to retain at least 30% of the pre-clearing extent of each ecological community (DBCA 2019).

Four broad vegetation associations are mapped within the discreet search areas and are described below and their representation at a local, regional, and state level is shown in Table 4.

- **Cape Yannare Coastal Plain 127:** Bare areas, mud flats
- **Cape Yannare Coastal Plain 589:** Hummock grasslands, grass steppe; soft spinifex
- **Cape Yannare Coastal Plain 670:** Hummock grasslands, shrub steppe; scattered shrubs over Triodia basedowii
- **Cape Yannare Coastal Plain 676:** Succulent steppe; samphire.

Table 4 Broad vegetation types within the state, regional and local representation (DPIRD 2019b)

Vegetation association	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Current extent managed in DBCA lands (%)
Representation across Western Australia				
Cape Yannare 127	737,724.05	697,871.38	94.60	11.64
Cape Yannare 589	807,698.58	802,713.40	99.38	1.89
Cape Yannare 670	147,897.10	147,794.60	99.93	11.66
Cape Yannare 676	2,063,413.95	1,963,881.55	95.18	14.69
Representation across the Carnarvon Bioregion				
Cape Yannare 127	102,780.91	101,489.55	98.74	1.94
Cape Yannare 589	78,100.80	77,834.93	99.66	0.0
Cape Yannare 670	147,808.61	147,792.06	99.99	11.67
Cape Yannare 676	51,983.51	51,232.57	98.56	28.92
Representation across the Shire of Ashburton				
Cape Yannare 127	95,314.48	93,097.98	97.67	0.01
Cape Yannare 589	92,433.42	92,167.55	99.71	13.93
Cape Yannare 670	130,267.09	130,164.59	99.92	1.99
Cape Yannare 676	45,155.52	44,695.18	98.98	25.23

4.0 RESULTS

4.1 DESKTOP ASSESSMENT

A number of targeted surveys have been undertaken within the Onslow area which have identified 6446 plants (ELA 2021, Anders 2021, Spectrum 2020, 360 Environment 2020 and RPS 2019). *Eremophila forrestii* subsp. *viridis* is known to occur from three records around the Onslow area (Florabase 2022). One population has been recorded within the Cane River Conservation Park approximately 60 km south-east of the Onslow records (Florabase 2022).

4.2 TARGETED SURVEY

The focus of the targeted search was to locate populations of *Eremophila forrestii* subsp. *viridis* outside the development envelope. Three days was dedicated to surveying the discreet search areas, however not all 16 search areas were surveyed due to the limited survey time.

Seven discrete search areas were surveyed, as well as two areas considered to contain suitable habitat (Figure 2). Some discreet search areas contained very few individuals, with several areas with less than 10 individuals recorded. A total of 266 individuals from 101 locations were recorded (Appendix A). *Eremophila forrestii* subsp. *viridis* occurred in a range of densities from 1 to 4 plants within a $10m^2$ area to dense patches up to 10 plants within a $10m^2$ area. The *Eremophila forrestii* subsp. *viridis* locations is provided in Figure 3.

4.2.1 *EREMOPHILA FORRESTII* SUBSP. *VIRIDIS*

Eremophila forrestii subsp. *viridis* is a much-branched shrub with pink to cream flowers which are known to flower during August (Plate 2). The July survey also recorded the majority of plants in flower, suggesting the flowering time may range from July to August.

Plate 2 ***Eremophila forrestii* subsp. *viridis* in situ**

Eremophila forrestii subsp. *viridis* occurs on and between red-brown sandy dunes. In general, plants appeared to favour the eastern sides of dunes, occurring mainly below or at the base of dunes (Plate 3).

Plate 3 ***Eremophila forrestii*** **subsp.** ***viridis*** **occurring at the base of dunes**

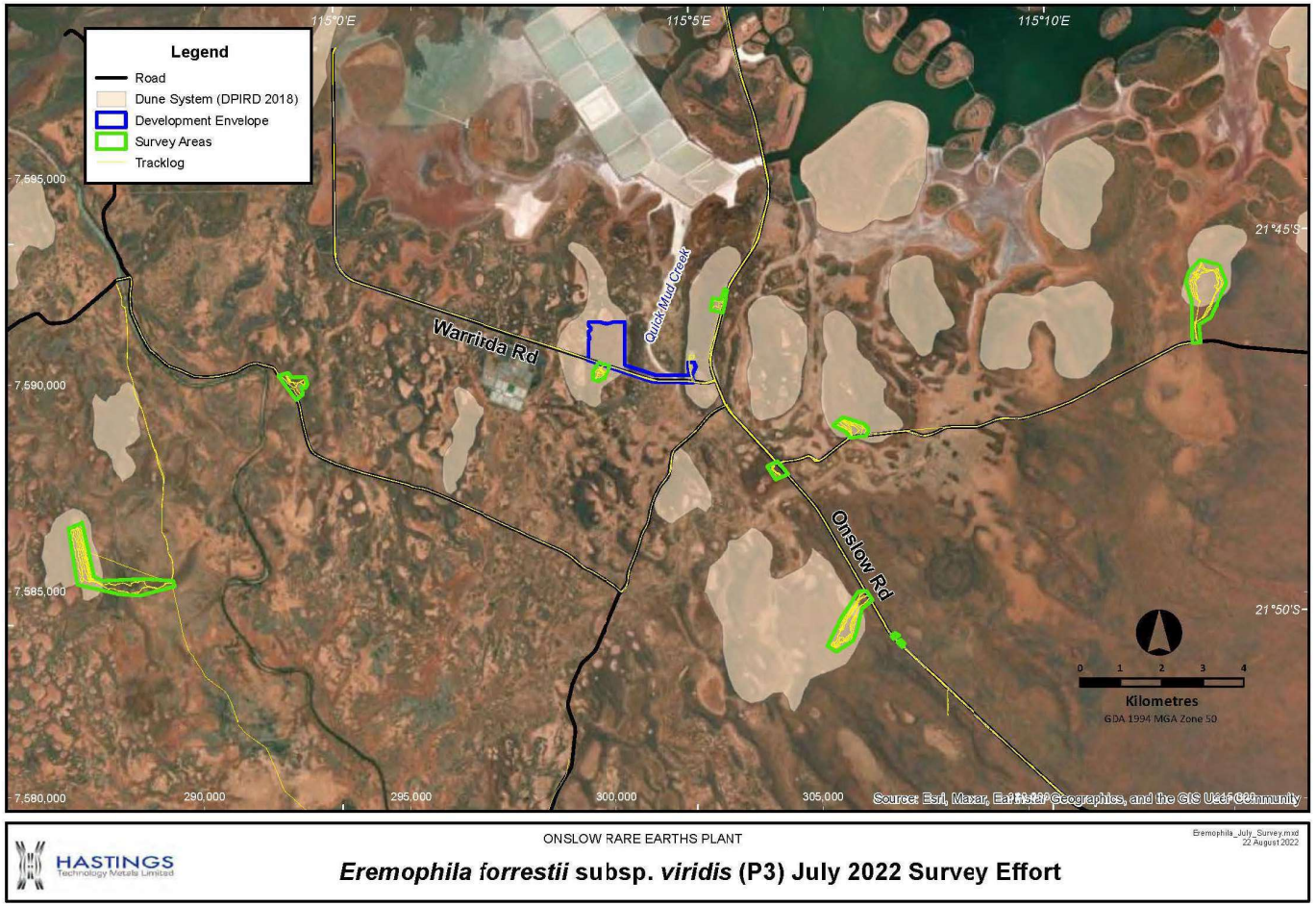

Figure 2 Targeted search locations

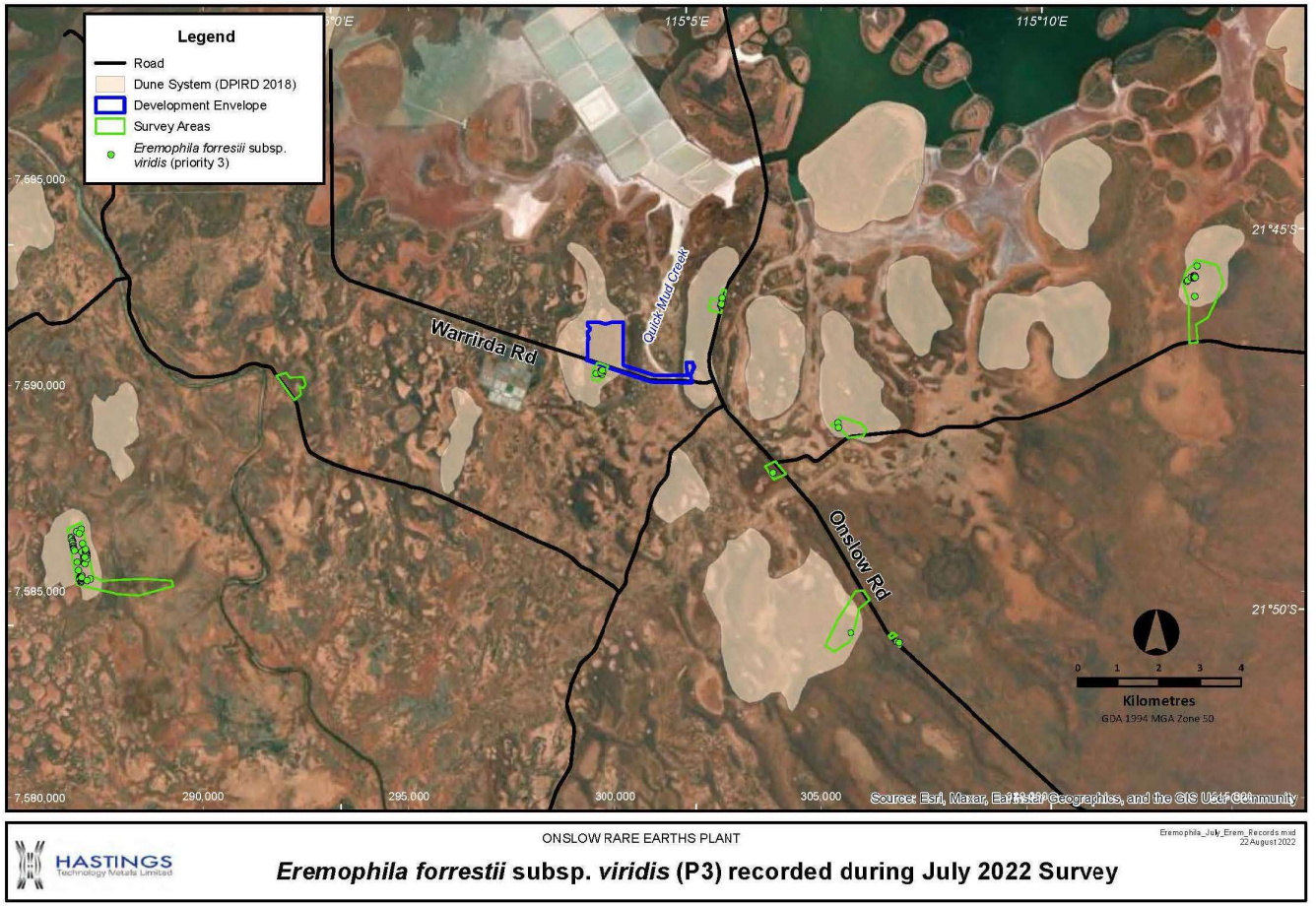

Figure 3 ***Eremophila forrestii*** **subsp.** ***viridis*** **recorded during the survey**

5.0 DISCUSSION

The objective of the survey was to find populations of *E. forrestii* subsp. *viridis* outside the OREP development envelope. The data modelling for the predicted occurrence of *E. forrestii* subsp. *viridis* (ELA 2021a) identified 16 discreet search areas within the Onslow area. Population densities within the seven discreet search areas surveyed varied from none to over 100 individuals, with highest density occurring within the western most search area.

E. forrestii subsp. *viridis* habitat preference appeared to be rather specific, with populations occurring mostly on the eastern side of dunes and mostly at the base of dunes. On the western side of dunes, even with the same vegetation type, populations were not present or in few numbers. *E. forrestii* subsp. *viridis* also occurred within degraded areas where dunes extended to roadside verges. Habitat preferences appears to mainly be associated with dunes and particularly on the eastern side of dunes.

The majority of *E. forrestii* subsp. *viridis* was flowering during the July survey, which is earlier than the known August flowering period. Onslow had experienced very high rainfall in May (310 mm), two months before the survey. This may have triggered early flowering within some of the plants.

6.0 CONCLUSION AND RECOMMENDATIONS

The targeted survey identified 266 individual plants of *E. forrestii* subsp. *viridis*. Additional populations are likely to be present as not all discreet search areas were surveyed. Eight search areas were not searched at all, and three search areas were only partially searched.

The majority of survey efforts on *E. forrestii* subsp. *viridis* have concentrated within the town of Onslow. *Eremophila forrestii* subsp. *Viridis* has also been recorded further inland of Onslow. A 2011, a two week survey in the Cane River Conservation Park which aimed to increase survey areas of recent additions to the National Reserve System found populations within the Conservation Park, located approximately 100km southeast of Onslow (Commonwealth of Australia, 2014). Dune systems not identified in the modelling were present between Onslow and Cane River Conservation Park and there is potential for addition populations to occur in these areas.

The low number of records may not be sufficient to reduce the impact to the species and additional targeted searches may be required. There is scope to potentially record additional populations of *Eremophila forrestii* subsp. *viridis*. Recommended additional surveys would include targeted searches within:

- The un-surveyed and partially surveyed discreet search areas
- Within the Cane River Conservation Park
- The eastern side of dunes between Onslow and Cane River Conservation Park.

REFERENCES

Bureau of Meteorology, 2022. Climate data for Minnie Creek. Website accessed www.bom.gov.au/

Commonwealth of Australia.2014. Cane River Conservation Park WA. A Bush Blitz survey report, Commonwealth of Australia.

DPIRD, 2019a. Soil Landscape Mapping - Best Available (DPIRD-027) dataset.

DPIRD, 2019b. DBCA State-wide Vegetation Statistics

DPIRD, 2018. 1:500 000 State interpreted bedrock geology (DMIRS-016) dataset.

Eco Logical Australia (ELA), 2021. *Onslow– Habitat Desktop Assessment.* Prepared for Hastings Technology Metals Ltd.

EPA, 2016a. *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment.* EPA, Western Australia.

Keogh, D.U. et. al., 2005. Rangeland NRM Regional Plan. http://regionalplan.rangelandswa.com.au/wp-content/uploads/2015/Rangelands_CD-ROM_INTRO.pdf#[6,{%22name%22:%22FitR%22},-3,-31,685,514]