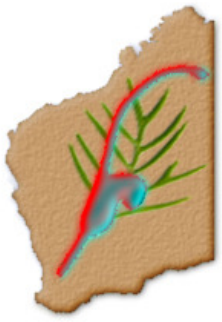

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VEGETATION SURVEY AND RARE FLORA SEARCH

OF THE CAROSUE DAM AIRSTRIP PROJECT

CONDUCTED SEPTEMBER 2016

For

Saracen Gold Mines Pty Ltd

November 2016

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1 INTRODUCTION

In September 2016 Saracen Gold Mines Pty Ltd (Saracen) commissioned Paul Armstrong and Associates to undertake a vegetation and flora survey incorporating searches for Threatened Flora (TF) and Priority Flora (PF), in the Carosue Dam Airstrip Project area (Carosue Dam). This survey covers those Leases (Miscellaneous tenement pegged, L28/54) that are to be impacted in the currently proposed airstrip. This area extends approximately 3.8km south-west to north-east and is approximately 800m wide. The closest named location is the Carosue Dam mine operations, 1.5km to the north-east. The nearest town is Kalgoorlie, 105km to the south-west; the other nearby town is Menzies, 135km to the north-west. Perth is approximately 645km directly, to the west. These locations are shown in the topographic maps of Figure 1 and in more detail in Figure 2.

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The purpose of the study was to identify the locations of any significant vegetation, TF or PF species, or other significant environmental factors in the immediate areas. The study will therefore enable appropriate actions to be taken to minimise impact on any species or factors subsequently found.

Dr Paul Armstrong, a senior botanist from Paul Armstrong and Associates, undertook the associated vegetation survey and rare flora search in September 2016 assisted by Jim Tucker from Karrillon Groundwater BPS Pty. Ltd. (Karrillon).

1.1 The Project

Saracen intend to construct an aerodrome at Carosue Dam to minimise the risk associated with vehicular movements on the Access Road. Vehicle and Traffic Management is listed as one of the company's principal hazards (most likely to result in loss of human life). Flying personnel directly to Carosue Dam will significantly reduce the volume of traffic on the Access Road and subsequently the risk factor.

At the time the field survey was undertaken (September 2016), the exact location of the airstrip had not been determined. Hence, only a generalised survey was undertaken. Since then, a proposed location has been determined and is shown in Figure 3. Although an area of 315ha was proposed for this survey, an area of 105.3ha will be required for the landing strip and associated infrastructures. These will include an access road, taxing strip, refuelling area and passenger waiting area. There are restrictions to orientation of the strip due to the height of the mine site plant. Any environmental restrictions that arise from this study can also be taken into account as well as proximity and height of the Karari waste dump and minimised.

Currently, the proposed area is mostly uncleared native vegetation with a few existing tracks and drill pads. A satellite image with the project area outlined is shown in Figure 3.

The field survey was carried out over four days, 24th to the 27th September 2016. During this time Dr Paul Armstrong undertook the survey with assistance from Jim Tucker. To survey as

much of the area as practical, with no vehicle access, the various vegetation associations were identified from the satellite images and these were walked. These traverses are shown in fig 3.

Dr Paul Armstrong has twenty seven years' experience working as a consulting botanist, largely working in the Goldfields and the South-West areas of Western Australia. Jim Tucker is familiar with the goldfields vegetation, also provided safety backup.

1.2 Rare Flora

There are estimated to be 16,000 species of native vascular plants within Western Australia. Due to the rarity or threatened status of some species, the Minister for the Environment has given them special protection under the *Wildlife Conservation Act 1950-79* (WA). Two broad classifications have been applied to species in need of special protection, the higher level of protection being the Threatened Flora (TF) status, while species requiring less protection are referred to as Priority Flora (PF). These are further divided, depending on levels of rarity and perceived threats. APPENDIX 1 is a listing of the classifications and definitions for the TF and PF.

In November 2015, Department of Parks and Wildlife (DPaW) classified 423 taxa (plant names) as extant (living) TF, with a further fifteen taxa believed to be extinct in the state of Western Australia. In addition, a further 1010 taxa were classified as Priority 1; 787 as P2; 907 as P3 and 357 as P4. These add up to 3,501 taxa believed to be under threat, representing approximately twenty per cent of the State's flora.

Several Western Australian Government departments now require a rare flora search to be undertaken before a permit to clear land can be granted. If a TF species were found on the proposed site, the development would usually need to be changed to avoid damaging that species. However, if the development can be shown to have a minimal impact on the species or if translocation is appropriate, then a permit may be granted to disturb the TF species. Similar but less stringent requirements also apply to disturbing PF.

At the Australian national level, Environment Australia administers the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The levels of threat are again assessed at a number of levels (see APPENDIX 2).

In addition to those taxa classified by DPaW or the EPBC Act, a species may be considered to be Other Significant Flora for several reasons:

- The collection is a range extension of its previously recorded range;
- Anomalous features, possibly indicating a new taxon;
- It has a restricted distribution; or
- It is poorly represented in the collection at the Western Australian Herbarium.

1.3 Threatened Ecological Communities

Because of the extensive land clearing that has occurred in portions of Western Australia, a number of ecological communities have become threatened. In addition, there are a number of communities that would never have been classified as common, and these are also considered as threatened. These communities are referred to as Threatened Ecological Communities (TEC) (English & Blyth 1997). DPaW has compiled a list of the TEC's within Western Australia (English 2002). An Australia wide list has been prepared by Environment Australia (2012) under the *Environment Protection and Biodiversity Conservation Act 1999*.

Similar to the rare flora classification, the TEC's are also classified by the level of threat to their continued survival. The communities under greatest threat are classified in order of descending vulnerability as: presumed totally destroyed; critically endangered; endangered; and vulnerable ecological communities. Those threatened communities under less threat, but still perceived as vulnerable, are classified as Priority Ecological Communities (PEC's). APPENDIX 3 is a listing of definitions and criteria of the DEC classifications.

1.4 Scope

The scope of this study has been based on the Environmental Protection Authority's Guidance No 51 (EPA 2004) documentation. This sets out the criteria under what level of investigation and reporting is required for the different types of impacts associated with various developments, including mine sites and associated infrastructures.

Ten factors for Table 3 of Guidance No 51 (EPA 2004) are considered in this current study. One was classified as High (Size of Proposal), two as Moderate (Other Significant Flora and Heterogeneity or Complexity), seven as Low and one not applicable (Ecological Linkages), in this current study. Using Table 2, with Group 2 (Coolgardie) the level of assessment was determined as Level 2 (criteria, scale and nature of impacts are presented in detail in APPENDIX 4). This indicates the Level of Survey (Table 1) is a Detailed Survey (lower level of Level 2) as the required level for Carosue Dam.

A Detailed Survey (EPA 2004) is one that incorporates the findings of a Background research and a Reconnaissance Survey, and that:

- Enhances the level of knowledge at the locality scale. This applies where the general context is better known.
- This involves:
    - One or more visit/s in the main flowering season and visit/s in other seasons.
    - Replication of plots in vegetation units, and greater coverage and displacement of plots over the target area.

A Reconnaissance Survey (EPA 2004) is one that:

- Verifies the accuracy of the background study;
- Further delineates and characterises the flora and the range of vegetation units present in the target area;

- Identifies potential impacts;
- Involves a target area visit by suitably qualified personnel to undertake selective low intensity sampling of the flora and vegetation; and
- to produce maps of vegetation units and vegetation condition at an appropriate scale.

With the current studies, it is considered that an adequate survey has been undertaken to achieve the objectives of Guidelines No. 51 (EPA 2004). The survey, which included a field inspection, is considered adequate as a Reconnaissance Survey.

2 OBJECTIVES

A desktop study of the vegetation and flora of the Carosue Dam area has been undertaken, with the objective of identifying potential problems that may impede the proposed airstrip clearing project. Using published material, the vegetation of the Carosue Dam area was identified. In addition, the TF database was searched to identify any rare flora species and the TEC database for any TEC or PEC's that occur in the general area.

The objectives of the botanical field study were to undertake vegetation and flora surveys, and a rare flora search. The vegetation survey was to identify and describe the different plant communities in the Carosue Dam vicinity. The flora survey identified as many of the plant species growing in the area as was practical.

In addition to the flora survey, many species from each vegetation community encountered were recorded, along with their locations, as well as the numbers of any TF or PF. An attempt was made to determine the extent of each of these populations. Similarly, the location of any significant weed species, that is, those classified by the Department of Agriculture and Food (2006) or Hussey *et. al.* (2007), were also recorded.

From the observations made during this study, recommendations are made on how to minimise impacts to the vegetation, flora, and in particular the rare or otherwise significant flora that may be encountered within Carosue Dam area. The findings were then compiled into this report.

3 DESKTOP STUDY

3.1 Climate

The climate of the general area, the Austin Botanical District, as described by Beard (1990) as arid with summer and winter rain, with an average annual rainfall of 200mm. Saracen have been keeping Carosue Dam site rainfall data during the period it has been in operation; that is, 2001 to 2004 and 2009 to the present. In addition, the nearest BOM (2016) suitable weather stations were located approximately 40km, 55km, 107km and 171km from the Project; four stations were used to give approximate values of the local rainfall (two stations) and temperatures (two stations). The additional rainfall stations were: Edjudina and Gindalbie

Homestead. For mean minimum and maximum temperatures, the Kalgoorlie and Leonora BOM stations were used. The locations of these four stations are shown in Figure 4.

An average annual rainfall of 269mm was recorded at Carosue Dam from the eleven years of data available. The monthly mean resulted in a very variable trace (see Figure 5), particularly when compared to the Edjudina and Gindalbie Homestead means, which represent a much longer period of observation. The higher values of the Carosue Dam were produced by the episodic rainfall events recorded. Because of the small sample size, these episodic events show up prominently.

The winter months (June to August) rainfalls for 2016 were nearly 30% greater than the average for the same period, indicating that the season was better than the thirteen year average. Based on observations of much of the Goldfields in the spring of 2016, where it was considered to be a very good flowering season, the Carosue Dam area was not as floriferous, which is contra to the above average winter rainfall.

The nearest BOM weather station with adequate rainfall data was Edjudina (BOM 2016). This station was selected as it has rainfall data since 1900, although not all months recorded. It is located approximately 40km to the north, which has a recorded mean rainfall of 227mm per year, with more rain fall in the first half of the year (see Figure 5). In 2016, up to the end of September, this station recorded a total rainfall of 384mm, approximately 168% of the mean annual rainfall. Most of this, 230mm, fell in January to March, with the months of April and September being lower than the mean.

The other rainfall station used, for comparison, was Gindalbie Homestead, which is located 55km to the west. This has a mean rainfall of 232mm. Up to the end of September 2016, 146mm had been recorded; this is 28% less than the mean for the same period (BOM 2015). Only in April and August 2016 were the mean values exceeded (see Figure 5).

The overall picture of rainfall likely to have been received in the Carosue Dam Project area for the year to September 2016 would be similar or slightly greater to that received long term, particularly given the high variability of the rainfall seasonality and amount.

The nearest BOM weather station to Carosue Dam recording mean temperatures was Kalgoorlie (107km to the south-west). The mean monthly maximum and minimum temperatures are presented in Figure 6. The mean maximum summer recorded was 33.7ºC in the month of January, winter dropping down to 16.7ºC in July (BOM 2016). Minimum mean winter temperatures were 5.0ºC in July and the minimum for summer was 18.3ºC in January.

For comparison, the next nearest suitable BOM station was Leonora, 171km to the north-west. As could be expected, both sets of mean temperatures were warmer in Leonora than Kalgoorlie by 3.3 degrees in January and December (summer) reducing to 1.1 degrees difference in June and July (winter) (BOM 2016).

3.2 Vegetation

Beard (1990) mapped the vegetation system of Carosue Dam area in the Austin Botanical District (Eremaean Region). The climate of the District is arid with both summer and winter rain, with an average annual rainfall of 200mm (Beard 1990). The geology of the area is Archaean granite with infolded volcanics and meta-sediments (greenstone) of similar age, forming the Yilgarn Block. The topography is undulating with occasional ranges of low hills; extensive sandplains in the eastern half. The soils are mainly shallow earthy loam, overlaying red-brown hardpan; shallow stony loams on hill and red earthy sands on the sandplains.

Beard (1976) divided the Austin Botanical District into six sub-regions, with Carosue Dam located in the south-east portion, within the Barlee Sub-region with the Laverton Sub-region to the north, South-West Interzone to the south and the Great Victoria Desert to the east.

Beard's Nullarbor (1975) vegetation map, prepared at a scale of 1:1,000,000, shows Carosue Dam airstrip adjacent (within approximately 20km) to seven different vegetation types; these are presented in Table 2 and mapped in Figure 7. The landing strip areas were mapped as - Sheoak, mulga and eucalyptus low woodland (a_1c_2Li) and adjacent to (north-east corner) sheoak low woodland.

Table 1. Vegetation types described by Beard (1975) as occurring within 20km of the Carosue Dam airstrip (see Figure 7 for map of the area).

Vegetation structure	Beard's code	Vegetation description
Low Woodland		
	a_1Li	Mulga
	c_2Li	Sheoak
	a_1c_2Li	Sheoak, mulga and eucalyptus
Scrub		
	a_1Si	Mulga
Steppe		
	e_{22}Sr.t_8Hi	Mallee and spinifex (*E. oleosa* and *T. scariosa*)
Lightly wooded Succulent Steppe		
	a_1Lr.k_1Ci	Mulga with saltbush of bluebush
	a_1c_2Lr.k_2Ci	Mulga, sheoak with saltbush or bluebush
Other		
		Playala lakes – usually dry

Beard *et al*. (2013) mapped the vegetation of Western Australia at a scale of 1:3,000,000. The Carosue Dam airstrip area as mapped as one vegetation type and within one kilometre of another. The dominant and most common was the Mulga and associated species (Vegetation

Type 8) and to the east was Other wattle (*Acacia* spp.), cypress pine (Callitris spp.), casuarina (Allocasuarina spp.) (Vegetation Type 9) (see Figure 8).

Both of these Types are common and widespread. Type 8 (Low woodland, open low woodlands and sparse woodlands: Mulga) is the most extensive vegetation type in Western Australia (Beard et al 2013), covering in excess of 30 million hectares. Although not as abundant, Type 9 (Low woodland, open low woodlands: Other) is mainly found in the southern parts of the State covering 2.5 million hectares. This Type includes dominants of Acacia, banksia, peppermint, cypress pine, casuarina and York gum, and is not restricted to the Murchison Bioregion.

3.3 Rare Flora

The DPaW Threatened Flora database was searched for species occurring in the general area of Carosue Dam airstrip. This search area encompassed a rectangle with boundaries well outside the current survey area of the Project, along with location names within the area.
This search was undertaken in August 2016 (DPaW ref: 06-0916). All those taxa identified are listed in APPENDIX 5 along with the current (December 2015) DPaW and EPBC conservation status (Jones 2015).

In the 2016 DPaW search there were no TF and 22 PF taxa identified from the general Carosue Dam area (see APPENDIX 5). This included one record with location details. This was *Thryptomene eremaea* (P2) and was recorded 8km to the east-north-east of the Project area (see Figure 9).

Although DPaW do not list any taxon as being TF, there is one recorded under the EPBC Act. This was the Vulnerable species *Eleocharis papillosa*. Although in W.A. it has a status of P3, in the N.T. it is classified as Vulnerable and in S.A. as Rare.

The 22 PF taxa reported by DPaW (Jones 2015) occurring within the general Carosue Dam areas were five Priority 1 (P1) Flora; six P2; eight P3 and three P4. These are all listed in APPENDIX 5. All of these 22 PF were identified from the TP List from the names of locations within approximately 30km of Carosue Dam.

Most of the species on the DPaW 22 PF listed were perennial shrubs or trees. There were however five taxa that were annual or ephemeral perennial species would only be apparent in appropriate seasons or following a disturbance (for example fire). These annuals were:

- *Calandrinia* sp. Goongarrie (F. Obbens, F. Hort & J. Hort FO 18/13) P1
- *Eleocharis papillosa* P3
- *Gunniopsis propinqua* P3
- *Trachymene pyrophila* P2
- *Vittadinia pustulata* P3

3.4 Threatened Ecological Communities

In addition to the DPaW TF database being searched, the TEC database was also examined. The TEC's search area was larger than that undertaken for the TF and PF for the reason that TEC's are far less common and, as such, a larger catchment is desirable. This search was undertaken in August 2016 (DPaW ref: 07092016).

No TEC's and nineteen occurrences from the eight PEC's that were identified lie within the search area. There were three occurrences of P1 and sixteen of P3. Those PEC recorded as occurring within 100km of Carosue Dam airstrip were:

- Emu Land System P3 6 occurrences
- Mount Belches *Acacia quadrimarginea/Ptilotus obovatus* (banded ironstone formation) P3
- Mount Linden Range vegetation complex (banded ironstone formation) P3
- Yellow sandplain vegetation of the Great Victoria Desert with diverse vertebrate fauna P3

The closest of these were the five Austin Land System areas, located 42km to 48km to the west and a further two 72km to the south-west. Next closest were Yellow sandplain vegetation of the Great Victoria Desert located 83km to the east, Mount Belches 90km to the south and Mount Linden Range 93km to the north. These assemblages are shown mapped in Figure 9 Descriptions of the eight PEC's are given in APPENDIX 6.

4 METHODS AND LIMITATIONS

Guidelines 51 (EPA 2004) were used to assess the level of detail required for this survey. Using Tables 1, 2 and 3 of the Guidelines (see APPENDIX 4 for details); the level of assessment was determined to be a reconnaissance survey.

At the time the field survey was undertaken, it was still undecided as to the exact orientation and location the airstrip was to be placed. Subsequently, in October, the location of the airstrip was tentatively determined, as shown in Figure 3 with the proposed area airstrip to the south, vehicle access and other infrastructure to the north. It is located between the main mine Access Road and the camp access road.

The field survey was undertaken over four days, 24th to 27th September 2016. This corresponded with early to mid spring. There were a fewer than expected ephemeral species observed, although mostly identifiable.

Vegetation descriptions were undertaken for the areas of proposed impact and adjacent (see Figure 4). The structure of each plant community was described using Muir Classification (1977) of the Wheatbelt vegetation (see APPENDIX 6 for definitions). This classification is widely accepted for vegetation descriptions for the state of Western Australia. In addition, the

dominant species and the height of the stratum in which they occurred were recorded. These details are included with the association descriptions.

Vegetation health was assessed using the vegetation condition scale used by Keighery (1994) for the Bush Plant Survey. The classification scale was (see APPENDIX 8 for definitions):

- P - Pristine;
- E - Excellent;
- VG - Very Good;
- G - Good;
- D - Degraded; and
- CD - Completely Degraded.

The DPaW TF database was searched prior to undertaking this botanical study. The search area included the Carosue Dam airstrip. In addition, the location names within this area were also searched.
Prior to undertaking the field studies, various materials (pressed plants and literature) were inspected at the Western Australian State Herbarium (PERTH) to ensure familiarity with all the identified rare flora of the general area.

In addition to the DPaW TF database, the TEC database was also searched. No TEC's and eight PEC's were identified.

During the site inspections, the dominant species, those species suspected to be TF or PF species, and those not immediately recognised were recorded and collected for later identification. In addition to recording the dominant species from the general area, detailed species lists were prepared at sites representative of the different plant associations. Dr Paul Armstrong, or a recognised expert on particular genera, processed all collected plant material at PERTH. A list of all plants recorded and identified from Carosue Dam area is attached as APPENDIX 9. On completion of this study, any specimens of interest of will be lodged at PERTH with suitable documentation attached.

The satellite images supplied by Saracen were imported into EziExplorer. Into the base map the Carosue Dam airstrip and traverses recorded by the GPS were overlaid, the vegetation association names were placed where they were recorded.

From the field notes the various vegetation associations were determined and mapped. Those associations that were close to the areas inspected and recorded would have a high level of mapping accuracy. However, as the distance increases from known areas and the satellite image interpretation becomes critical, the mapping was not as precise. Portions of the area were partially obscured by cloud, making interpretation more difficult.

The definition of a TF or PF population, as used by DPaW, has been used in this report. This defines a population of a species that may comprise of one or more subpopulations where they are separated by less than 1km. Greater distances would indicate a separate population.

Locations were recorded using a hand held GPS (Garmin GPSmap 62s) set to UTM with datum GDA '94. Accuracy of locations recorded was typically within 3 to 5m.

A Panasonic DMC-TZ70 camera was used during this survey. Many photos were taken of the various habitat types and of significant species.

Dr Paul Armstrong holds a DPaW issued "Licence to Take Flora for Scientific or Other Prescribed Purposes" (SLO11887) with an expiry date of 25 August 2017. A condition of these licences is that a copy of all completed reports be forward to DPaW and any plant material of interest or significance be lodged at PERTH.

As this report contains confidential information (DPaW listed TF, PF, TEC and PEC data), this report must not be given free circulation. Only those relevant to the issuing of appropriate permits should be allowed access. This report must not be placed on a web server.

Dr Paul Armstrong, a senior botanist from Paul Armstrong and Associates, undertook the vegetation and flora survey, rare flora search, plant identifications (with assistance from various experts) and vegetation condition assessment and prepared this report.

5 VEGETATION

The vegetation was sampled from Carosue Dam Project area, this included all of the different vegetation signatures identified on the satellite image, as shown in Figure 10 and Figure 11. There were fourteen different vegetation associations determined from the notes taken in the field.

The variation between the vegetation associations was largely the result of the different topography, soil type and in an adjacent area, the recent fire history. Each of the various associations is described below, and a map of these associations presented in Figure 10 and Figure 11, north and south portions respectively.

The vegetation descriptions follow that of the Muir (1977) vegetation classification. The common species for each association, those with a canopy cover greater than two per cent, are listed with that association. Also listed are the TF and PF recorded from each association and any species of significance.

There was an extensive area to the north of the main mine Access Road that showed signs of a recent fire, within the last year. Other than this area, there were no obvious signs of any recent (within the last ten years) fires within the areas recorded of the Carosue Dam airstrip.

A portion of this area was inspected, searching for any likely fire ephemeral species. Few were observed, none were of significance.

These vegetation associations were:

- Woodlands
  - *Eucalyptus lesouefii* Low Woodland
  - *Eucalyptus oleosa* Tree Mallee
  - *Eucalyptus salubris* over *Atriplex* Low Woodland
  - *Eucalyptus salubris* with scrub Low Woodland
  - *Eucalyptus transcontinentalis* Low Woodland
  - *Eucalyptus yilgarnensis* Tree Mallee
  - Burnt Tree Mallee
- Tall Shrublands
  - Drainage Line Thicket
  - Laterite Scree Scrub
  - Mixed Heath
  - Mulga Scrub
  - Mulga with other *Acacia* Scrub
- Low Shrublands
  - *Atriplex* and *Frankenia* Dwarf Scrub
  - Rehab Scrub

Based on the interpreted vegetation associations mapped, the GIS program, OziExplorer was used to determine the areas of each association. These areas are presented in

Table 2.

Table 2 Areas of vegetation associations recorded and mapped for the Carosue Dam area. In addition, the relative percentages of the area mapped.

Association		Area (ha)	% of mapped	Abundance
Woodland				
	Eucalyptus lesouefii Low Woodland	3.0	0.59	10
	Eucalyptus oleosa Tree Mallee	64.2	12.6	3
	Eucalyptus salubris over *Atriplex* Low Woodland	27.2	5.35	5
	Eucalyptus salubris with scrub Low Woodland	15.6	3.07	7
	*Eucalyptus transcon*tinentalis Low Woodland	3.2	0.63	13
	Eucalyptus yilgarnensis Tree Mallee	28.9	5.68	4
	Burnt Tree Mallee	117.5	23.1	2
Tall Shrublands				
	Drainage Line Thicket	5.0	0.98	9
	Laterite Scree Scrub	8.9	1.75	8
	Mixed Heath	2.9	0.57	11
	Mulga Scrub	211.8	41.6	1
	Mulga with other *Acacia* Scrub	16.1	3.16	6
Low Shrublands				
	Atriplex and *Frankenia* Dwarf Scrub	1.4	0.27	14
	Rehab Scrub	2.9	0.57	12
Total Area		**508.6**		

Note: Only a portion of the burnt area was mapped.

These fourteen vegetation associations are described in detail, with the various stratum with dominant species and all species with a canopy cover greater than 2% listed by stratum.

5.1 Woodlands

5.1.1 *Eucalyptus lesouefii* Low Woodland

The upper and dominant stratum was Low Woodland of *Eucalyptus lesouefii* growing to 15m tall; over Open Low Scrub dominated by *Acacia acuminatum*, *Dodonaea lobulata* and *Eremophila oppositifolia*; over Open Dwarf Scrub dominated by *Scaevola spinescens*. The soil was pink-brown sandy clay with considerable calcrete on the surface.

Common species recorded were:

Trees (10 to 15m tall)
Eucalyptus lesouefii.
Tall Shrubs (2 to 3m tall)
Eremophila oppositifolia.

Medium Shrubs (1 to 2m tall)
Acacia acuminatum, *Dodonaea lobulata* and *Eremophila oppositifolia.*
Small Shrubs (<1m tall)
Scaevola spinosa.

This association was restricted to a small area of calcrete adjacent to a small salt lake. It was mapped with an area of 3.0ha, the fifth least common association recorded.

5.1.2 *Eucalyptus oleosa* Tree Mallee

The upper and dominant stratum was Open Tree Mallee, with patches of Tree Mallee, dominated by *Eucalyptus oleosa* growing 5 to 10m tall; over Scrub variously dominated by *Acacia acuminatum*, *Acacia aneura* and *Acacia ramulosa* growing 2 to 4m tall; over Open Low Scrub with no species dominating; over Open Dwarf Scrub with no species dominating; over Hummock Grass to Mid-Dense Hummock Grass dominated by *Triodia tomentosa*. The soil was red sandy loam to sandy clay loam.

There was a single variant to this common and widespread association. These were:

- Treeless areas dominated by Mid-Dense Hummock Grass. These were too small and fragmented to be effectively mapped, but did represent a significant habitat.

Common species recorded were:

Trees (4 to 10m tall)
Eucalyptus leptopoda, *Eucalyptus oleosa*, and *Eucalyptus yilgarnensis*.
Tall shrubs (2 to 4m tall)
Acacia acuminatum, *Acacia aneura*, *Acacia hemiteles*, *Acacia ramulosa*, *Casuarina pauper*, *Eremophila scoparia*, *Grevillea nematophylla*, *Melaleuca hamata* and *Senna artemisioides* subsp. *filifolia.*
Medium Shrubs (1 to 2m tall)
Acacia hemiteles, Eremophila forrestii subsp. *forrestii*, *Eremophila caperata*, *Scaevola spinescens* and *Senna artemisioides subsp. filifolia.*
Small Shrubs (<1m tall)
Dodonaea lobulata.
Grasses
Triodia tomentosa

This association was common and widespread. It was mapped with an area of 64ha, the third most common association recorded.

5.1.3 *Eucalyptus salubris* over *Atriplex* Low Woodland

The upper and dominant stratum was Low Woodland with patches of Low Forest dominated by *Eucalyptus salubris* growing to 12m tall; over patches of Scrub dominated by *Acacia aneura* growing 2 to 5m tall; over Dwarf Scrub dominated by *Atriplex vesicaria*. The soil was pink sandy clay loam with calcrete.

There were two of variations to this association. These were:

- A low breakaway on the sides of the salt lake. The *Acacia aneura* Scrub stratum was replaced by *Casuarina pauper* Scrub growing to 8m tall; over Open Low Scrub dominated by *Dodonaea lobulata*. The soil was pink sandy clay loam on rocky scree with patches of breakaway.
- On a flood plain adjacent to the salt lake. The same upper stratum with only Low Heath dominated by *Atriplex vesicaria*. The soil was red sandy clay.

Common species recorded were:

Trees (6 to 12m tall)
Eucalyptus salubris.
Tall Shrubs
Acacia aneura and *Casuarina pauper.*
Medium Shrubs (1 to 2m tall)
Dodonaea lobulata.
Low Shrubs (<1m tall)
Atriplex vesicaria, *Frankenia fecunda* and *Scaevola spinosa.*

This association was restricted to an area of calcrete adjacent to a small salt lake and a small flood plain. It was mapped with an area of 27ha, the fifth most common association recorded.

5.1.4 *Eucalyptus salubris* with scrub Low Woodland

The upper and dominant stratum was Low Woodland with patches of Low Forest dominated by *Eucalyptus salubris* growing 10 to 15m tall; over Open Low Scrub dominated by *Acacia tetragonophylla* and *Eremophila oppositifolia*; over Open Dwarf Scrub dominated by *Ptilotus obovatus*. The soil was red sandy clay loam frequently with calcrete.

Mapped within this association were several clay pans, which were too small to be effectively mapped. Nothing grew on these areas.

Common species recorded were:

Trees (10 to 15m tall)
Eucalyptus salubris.
Tall Shrubs
Acacia tetragonophylla.
Medium Shrubs (1 to 2m tall)
Acacia tetragonophylla and *Eremophila oppositifolia.*
Low Shrubs (<1m tall)
Ptilotus obovatus.

This association was restricted to small areas of more clay types of soil, frequently with nearby clay pans. It was mapped with an area of 16ha, the seventh most common association recorded.

5.1.5 *Eucalyptus transcontinentalis* Low Woodland

The upper and dominant stratum was Open Low Woodland to Low Woodland dominated by *Eucalyptus transcontinentalis* growing to 10m tall; over occasional patch of Open Scrub dominated by *Acacia aneura* growing 2 to 3m tall; over Open Low Scrub to Low Scrub dominated by *Acacia hemiteles* and *Eremophila caperata*; over Open Dwarf Scrub dominated by *Senna artemisioides* subsp. *filifolia*; over Very Open Hummock Grass dominated by *Triodia tomentosa.* The soil was red sandy clay loam.

Common species recorded were:

Trees (5 to 10m tall)
Eucalyptus transcontinentalis and *Eucalyptus yilgarnensis.*
Tall Shrubs (2 to 4m tall)
Acacia aneura.
Medium Shrubs (1 to 2m tall)
Acacia hemiteles and *Eremophila caperata.*
Low Shrubs (< 1m tall)
Senna artemisioides subsp. *filifolia.*
Grasses
Triodia tomentosa.

This association was restricted to small areas of sandy clay type soil. It was mapped with an area of 3.2ha, the second least common association recorded.

5.1.6 Eucalyptus yilgarnensis Tree Mallee

The upper and dominant stratum was Open Tree Mallee to Very Open Tree Mallee dominated by *Eucalyptus yilgarnensis* growing 4 to 8m tall; over Open Low Scrub to Open Dwarf Scrub dominated by *Eremophila caperata* or *Eremophila scoparia*; over Hummock Grass dominated by *Triodia tomentosa*. The soil was red sandy clay loam with lateritic gravel.

There was a single variation to this association. This was:

- Treeless areas dominated by Mid-Dense Hummock Grass. These were too small and fragmented to be effectively mapped, but did represent a significant habitat.

Common species recorded were:

Trees
Eucalyptus yilgarnensis.
Tall Shrubs (2 to 3m tall)
Acacia aneura and *Eremophila scoparia.*
Medium Shrubs (1 to 2m tall)
Acacia hemiteles, *Eremophila caperata*, *Eremophila scoparia*, *Senna artemisioides* subsp. *filifolia* and *Westringia cephalantha.*
Low Shrubs (<1m tall)
Olearia muelleri.

Grasses
Triodia tomentosa.

This association was common and widespread. It was mapped with an area of 29ha, the fourth most common association recorded.

5.1.7 Burnt Tree Mallee

The upper and dominant stratum was Open Tree Mallee dominated by burnt unidentifiable *Eucalyptus* spp. Growing 3 to 5m tall; over Open Dwarf Scrub with no identifiable dominants; over Very Open Herbs with no species dominating. The soil was red sandy clay loam.

Common species recorded were:

Trees
Eucalyptus spp.
Tall Shrubs
-
Medium Shrubs (1 to 2m tall)
-
Low Shrubs (<1m tall)
Cullen discolor.
Herbs
Goodenia sp.

This association was not within the study area, but included for completeness. Less than half the burnt area (as estimated from satellite image) was mapped. What was mapped covered an area of 118ha, the second most common association recorded.

5.2 Tall Shrublands

5.2.1 Drainage Line Thicket

The upper and dominant stratum was Thicket to Scrub dominated by *Casuarina pauper* growing 4 to 8m tall; over Low Scrub dominated by *Dodonaea lobulata* and *Scaevola spinescens*; over Open Dwarf Scrub with no species dominating. The soil was red sandy clay loam with lateritic and quartz stones.

Common species recorded were:

Trees (3 to 8m)
Eucalyptus yilgarnensis.
Tall Shrubs (3 to 8m tall)
Acacia acuminatum, *Acacia aneura*, *Acacia ramulosa*, *Acacia tetragonophylla* and *Casuarina pauper.*
Medium Shrubs (1 to 2m tall)
Dodonaea lobulata, *Eremophila oldfieldii* and *Scaevola spinescens.*

Low Shrubs (<1m tall)
Eremophila glabra subsp. *glabra*.

This association was restricted to a small drainage line. It was mapped with an area of 5.0ha, the sixth least common association recorded.

5.2.2 Laterite Scree Scrub

The upper stratum was Very Open Tree Mallee dominated by *Eucalyptus oleosa* growing 4 to 8m tall; over the dominant stratum of Scrub dominated by *Acacia aneura* growing 3 to 6m tall; over Low Scrub dominated by *Acacia acuminatum*; over Open Dwarf Scrub dominated by *Westringia rigida*; over Open Hummock Grass dominated by *Triodia tomentosa*. The soil was red-brown sandy clay loam with lateritic stones 5 to 20cm in diameter.

Common species recorded were:

Trees (5 to 8m tall)
Eucalyptus oleosa.
Tall Shrubs
Acacia aneura and *Casuarina pauper.*
Medium Shrubs (1 to 2m tall)
Acacia acuminatum, *Dodonaea lobulata* and *Ptilotus obovatus.*
Low Shrubs (<1m tall)
Eremophila pustulata and *Westringia rigida.*
Grasses
Triodia tomentosa.

This association was restricted to a small area of laterite ridge top. It was mapped with an area of 8.9ha, the eight most common association recorded.

5.2.3 Mixed Heath

The upper and dominant stratum was Scrub dominated by *Casuarina pauper* growing to 8m tall; over Open Scrub dominated by *Acacia aneura* growing 3 to 5m tall; over Open Low Scrub dominated by *Senna artemisioides* subsp. *filifolia*; over Open Dwarf Scrub dominated by *Olearia muelleri*. The soil was red sandy clay with calcrete and ironstone gravel.

Common species recorded were:

Trees
-
Tall Shrubs
Acacia acuminatum, *Acacia aneura*, *Acacia ramulosa*, *Casuarina pauper* and *Eremophila oppositifolia.*
Medium Shrubs (1 to 2m tall)
Acacia colletioides, *Dodonaea lobulata* and *Senna artemisioides* subsp. *filifolia.*
Low Shrubs (<1m tall)
Olearia muelleri and *Scaevola spinescens.*

This association was restricted to a small area of gravelly sandy clay. It was mapped with an area of 2.9ha, the fourth least common association recorded.

5.2.4 Mulga Scrub

The upper and dominant stratum was Scrub with patches of Thicket dominated by *Acacia aneura* growing 2 to 5m and occasionally to 8m tall; over Low Heath to Dwarf Scrub to Open Dwarf Scrub variously dominated by *Eremophila forrestii* subsp. *forrestii*; over Hummock Grass to Open Hummock Grass dominated by *Triodia tomentosa.* The soil was red sandy loam clay often with ironstone gravel.

There were two variations to this common and widespread association. These were:

- Areas of Scrub dominated by *Acacia aneura* and *Acacia ramulosa* growing 2 to 5m tall with Open Scrub dominated by *Casuarina pauper* growing to 10m tall. Growing on orange-red sandy clay loam with ironstone gravel.
- A small area adjacent to the Hampten Hill fence line (Pinjin Fence). In addition to the typical structure, there was a stratum of Very Open Tree Mallee dominated by *Eucalyptus leptopoda* growing 6 to 8m tall.

Common species recorded were:

Trees (3 to 6m tall)
Eucalyptus leptopoda.
Tall Shrubs
Acacia aneura, *Acacia hemiteles*, *Acacia ramulosa* and *Casuarina pauper*.
Medium Shrubs (1 to 2m tall)
Eremophila forrestii subsp. *forrestii.*
Low Shrubs (<1m tall)
Dodonaea rigida and *Eremophila forrestii* subsp. *forrestii.*
Grasses
Triodia tomentosa.

This association was the most abundant, covering 42% of the mapped area.

5.2.5 Mulga with other *Acacia* Scrub

The upper and dominant stratum was Scrub with patches of Thicket dominated by Acacia aneura with frequent *Acacia acuminatum* or *Acacia ramulosa* growing 2 to 6m and occasionally to 10m tall; over Dwarf Scrub to Open Dwarf Scrub dominated by *Eremophila forrestii* subsp. *forrestii*. The soil was red-orange sandy loam clay with lateritic gravel.

Common species recorded were:

Trees (4 to 8m tall)
Eucalyptus leptopoda.
Tall Shrubs
Acacia acuminatum, *Acacia aneura*, *Acacia ramulosa* and Casuarina pauper.

Medium Shrubs (1 to 2m tall)
Eremophila forrestii subsp. *forrestii.*
Low Shrubs (<1m tall)
Dodonaea rigida and *Eremophila forrestii* subsp. *forrestii.*

This association was restricted to an area red-orange clay soil. It was mapped with an area of 16ha, the sixth most common association recorded.

5.3 Low Shrublands

5.3.1 *Atriplex* and *Frankenia* Dwarf Scrub

The upper stratum was Open Low Scrub dominated by *Eremophila scoparia*; over the dominant stratum Dwarf Scrub dominated by *Atriplex vesicaria* and *Frankenia fecunda*. The soil was white sandy clay in the upper areas and saline light brown loamy clay in the lower areas, all with white quartz.

Common species recorded were:

Trees
-
Tall Shrubs
-
Medium Shrubs (1 to 2m tall)
Eremophila scoparia.
Low Shrubs (<1m tall)
Atriplex vesicaria and *Frankenia fecunda*.

This association was restricted to a small salt lake. It was mapped with an area of 1.4ha, the least common association recorded.

5.3.2 Rehab Scrub

The upper and dominant stratum was Scrub dominated by Acacia aneura growing 1 to 3m tall; over Open Dwarf Scrub with no species dominating. The soil was orange sandy loam with much lateritic gravel.
Common species recorded were:

Trees
-
Tall Shrubs
Acacia aneura
Medium Shrubs (1 to 2m tall)
Acacia aneura
Low Shrubs (<1m tall)
-

This association was restricted to a small area of rehabilitated gravel pit. It was mapped with an area of 2.9ha, the third least common association recorded.

6 FLORA

The species list for this report was compiled from the field inspection undertaken in September 2016. The resulting species list is presented in APPENDIX 9. In total, 110 native plant taxa within 24 families were identified from the Carosue Dam area. No introduced weed species were observed. Most native species were typical of the area, being common and widespread.

As would be expected from a survey conducted in the southern portion of the Coolgardie Region (Beard 1990), the dominant family (with the greatest number of species) was Myrtaceae with seventeen species from seven genera. The next most common was Chenopodiaceae with sixteen species from six genera, Scrophulariaceae with fourteen from a single genus, then Fabaceae with thirteen from four genera. The most common genera were *Eremophila* with fourteen species, then *Eucalyptus* with ten, then and *Acacia* with nine.

The two families that were less represented than would be expected were Poaceae and Asteraceae. Both of these would be expected to contain many more ephemeral species than were recorded. Most of the Goldfields have experienced a very good year for annual and other ephemeral species flowering. However, the local area (10 to 20km) would appear not to have received a good rainfall and the flowering has suffered. In the appropriate season, after a good winter rainfall, it could be anticipated the number of grasses would at least double and treble for the daisies. The three annual species that were recorded were:

- *Calandrinia eremaea*
- *Synaptantha tillaeacea* var *tillaeacea*
- *Waitzia aurea*

Most specimens collected from the Carosue Dam area were readily identified at PERTH and were well matched with other specimens. Due to the immature or sterile condition of some specimens collected, identification could not be confirmed. Similarly, some plants observed in the field were too mature to be collected for later identification. Overall, it is estimated that 50 to 60% of the species growing in the area were recorded. There were few ephemeral species observed and recorded, despite the survey was conducted in spring, following a good winter rainfall in this and other parts of the Goldfields.

There were no TF, PF or EPBC Act flora recorded during the Carosue Dam survey. There was one species collected that is considered to be an Other Significant Flora. This was a specimen that could not be adequately identified because the material was inadequate (sterile), *Eremophila* sp. PA16/527 (my collection number). The expert on this genus, Andrew Brown, could not adequately identify it but suspects it could be a new species. Further material, with flowers, is needed to confirm its identity and status.

Of note was that one *Eucalyptus salmonophloia* was recorded during the survey. The tree, 18m tall, was observed growing between the vegetation associations of Mulga Scrub and Mixed Heath on red sandy loam.

Of interest was a poorly collected taxon, *Baeckea* sp. Comet Vale, which was collected along the Access Road approximately 30km south-west of Carosue Dam. This collection is a range extension for this species of 72km to the east and 123km to the south-east of previous records. Being so far away from the current Project it is not treated further in this report.

All specimens of interest, will be lodged at PERTH with appropriate documentation.

7 RARE FLORA

No TF and twenty-two taxa of PF were identified from the general Carosue Dam area in the September 2016 DPaW database search. Of these, there was one taxon with one site location was recorded by DPaW. This site was nearly 8km to the east-north-east of the Project area (see Figure 9).

Spring (typically from August to October in this area) is considered to be the optimal time to undertake a vegetation and rare flora search, coinciding with maximum flowering time and opportunity to observe the ephemeral species. This vegetation survey and rare flora search was undertaken in early to mid spring. Although most of the Goldfield received good rainfalls in 2016 and the Carosue Dam office received 30% above average, it would appear that the local area did not or flowering was poor for some other reason. This was evidenced by the paucity of annuls and ephemeral species being observed. Following a good winter rainfall it would be expected that many more ephemeral species would be apparent and most perennial shrubs would be flowering.

7.1 Threatened Flora

No TF were identified by the DPaW search (Jones 2015). However, one species was classified under the EPBC Act, this was the Vulnerable species *Eleocharis papillosa*. Although classified as P3 in WA it is classified in the NT as Vulnerable, hence, the EPBC classification.

The sedge, *Eleocharis papillosa* was not recorded during the current survey of Carosue Dam. It a habitat requirement of red clay soil over granite or open clay flats and Claypans (FloraBase 2016). Although several claypans were observed, none had any sedges growing.

7.2 Priority Flora

The only PF recorded by DPaW from the search area, with location data, was *Thryptomene eremaea* (P2). This was recorded from nearly 8km to the east-north-east (see Figure 9). FloraBase (2016) gives a description of this species as an erect shrub growing 0.5 to 1.5m tall with pink to white flowers, which occur between July to September. It grows on red or

yellow sand on sandplains. There were no sandplain habitats recorded during the September 2016 survey, hence, it is unlikely that this species would be growing in the Project area.

There were no TF or PF recorded during the September 2016 survey. It is confident that any of the perennial species of PF listed by DPaW would have been collected if they had been present along the traverses undertaken.

There were five annual or ephemeral PF species listed in the DPaW rare flora database search of the area. None of these were supplied with location details:

- *Calandrinia* sp. Goongarrie (F. Obbens, F. Hort & J. Hort FO 18/13) P1
- *Eleocharis papillosa* P3
- *Gunniopsis propinqua* P3
- *Trachymene pyrophila* P2
- *Vittadinia pustulata* P3

The survey was undertaken at an optimal time to observe annual species, although the winter rains were poor and very few annuals were observed. None of these PF annuals were observed.

7.3 Other Significant Flora

There was one Other Significant Flora collected. This was *Eremophila* sp. (Paul Armstrong PA16/527), a suspected new species. Unfortunately the material collected was inadequate for proper identification (sterile). It was a small to medium shrub growing 0.3 to 2m tall, see Figure 12 for a scanned image of the pressed specimen. It was recorded from nine locations; four of these were from the Mulga Scrub vegetation association, two from the and *Eucalyptus yilgarnensis* Tree Mallee, one from each of the Drainage Line Thicket, the breakaway associated with the *Eucalyptus lesouefii* Low Woodland and *Eucalyptus oleosa* (see Figure 13). The locations of the nearest recorded waypoint are presented in APPENDIX 10.

8 THREATENED ECOLOGICAL COMMUNITIES

No TEC and eight PEC's were identified from the area nominated for the DPaW search of the general Carosue Dam area. The only PEC that was recorded within 50km of Carosue Dam were three occurrences of the Emu Land System. These were 42 to 49km to the west of the Project area.

Of those PEC's recorded within 100km, two were Banded Ironstone formation and one sandplain. Neither of these habitats were recorded from Carosue Dam. No descriptions of the Emu Land System could be located, despite several searches.

Of the thirteen natural vegetation associations mapped, three were very common and widespread: Mulga Scrub (41.6%), Burnt Tree Mallee (23.1%) and *Eucalyptus oleosa* Tree Mallee (12.6%). Less common but still widespread were the *Eucalyptus yilgarnensis* Tree

Mallee (5.7%), *Eucalyptus salubris* over *Atriplex* Low Woodland (5.3%) or over Scrub (3.1%) and Mulga with other *Acacia* Scrub (3.1%). The remainder, with less than 2% mapped, were more restricted but not considered to be rare. This was partly due to difficulty in identifying these less common associations and then mapping the small areas. They are very likely to be much more common locally and regionally than the percentage areas indicate. Hence, none of the areas mapped were considered in need of further protection, that is, classification as PEC.

9 VEGETATION HEALTH

There were two distinct levels of vegetation health recorded from the Carosue Dam area. Using the Keighery (1994) scale of vegetation condition, the mostly undisturbed areas the vegetation was Very Good to Excellent. Other than the main mine Access Road and the Hampton Hill (Pinjin Fence) boundary fence, which were both Completely Degraded, there were a few access tracks and drill pads which were Degraded to Completely Degraded. These are shown in Figure 14.

Vegetation health within 1m of the tracks and usually within 3m of the major roads and other cleared areas was in Degraded to Completely Degraded condition, but further away it reverted to Very Good to Excellent.

The area surveyed was weed free. To maintain this condition great care must be exercised when undertaking the clearing of the airstrip. All vehicles must be thoroughly washed down to remove all soil with any possible plant fragments and seeds.

10 ANIMALS OF SIGNIFICANCE

During the September 2016 survey no Mallee Fowl nest was observed.

11 DISCUSSION

Prior to undertaking this survey, Saracen had not made plans for the location of the Carosue Dam airstrip. Consequently a general survey of the area was undertaken, surveying those areas identified from the satellite image as different. Subsequent to the field survey the airstrip location was determined. Most of the areas that are currently proposed for clearing were in Very Good to Excellent condition with only a few drill access lines and pads in the area.

This survey identified thirteen natural vegetation associations and one disturbed habitat, 108 taxa of native plants, no introduced weed species, no TP, no PF and no Other Significant Flora.

There were no significant conservation issues identified during the current survey of the Carosue Dam airstrip area. Of interest were the vegetation associations that were uncommon, mapped with an area of less than 2%. Although these are likely to be much more widespread locally and regionally, they are still unlikely to be plentiful.

These and other conservation issues are treated in the following discussion.

11.1 Vegetation

Based on the vegetation mapping and the resulting areas mapped of each vegetation association (and variations) it would appear that the dominant vegetation were, Mulga Scrub (42%) and *Eucalyptus oleosa* Tree Mallee (13%). The other common association, Burnt Tree Mallee, was mapped at 23% of the area, however, this was not within the Project area and less than half of the association was mapped.

The six natural associations with less than 2% of the mapped area are very likely to be more abundant within the Carosue Dam local area and regional they are still of some conservation interest. These associations and the areas they were mapped at were:

- *Atriplex* and *Frankenia* Dwarf Scrub – 1.4ha
- Drainage Line Thicket – 5.0ha
- *Eucalyptus lesouefii* Low Woodland – 3.0ha
- *Eucalyptus transcon*tinentalis Low Woodland – 3.2ha
- Laterite Scree Scrub – 8.9ha
- Mixed Heath – 2.9ha

11.2 Flora

The flora recorded during the Carosue Dam Project were mostly common and widespread in the region.

It was estimated that the 110 taxa of native plants recorded would represent 50 to 60% of all plants occurring within the Carosue Dam area. This was based on the small numbers of annual and ephemeral species recorded although the survey being undertaken in early to mid spring, usually an optimal time for flowering. However, following better than average winter rainfall, it was surprising to encounter so few annuals in flower. Similarly many of the perennial shrubs were not or poorly in flower, making identification more difficult.

There were no recent fires within the Project area. However, an extensive area adjacent to the main mine Access Road had been burnt within the last twelve months. A brief inspection of this area did not produce any species of significance. There are frequently species present in post fire areas which only persist for several years, otherwise they are not normally observed. These fire ephemerals can increase species diversity significantly. There are also several TP and PF that are known to be fire ephemerals.

11.3 Rare Flora

Of the twenty-two flora of significance identified in the DPaW search, there was no TF reported. There was one species listed under the EPBC Act, *Eleocharis papillosa*, it was

classified as Vulnerable. It is classified by DPaW as P3 in WA but in the NT it is classified as a Vulnerable species.

Of the twenty-two PF identified from the DPaW search, only *Thryptomene eremaea* was provided with location data. This was located approximately 8km to the east-north-east of the proposed airstrip. Neither this, nor any of the other PF taxa were observed during the current survey.

One Other Significant Flora was recorded, *Eremophila* sp. (Paul Armstrong PA16/527), a suspected new species. Unfortunately the specimen was inadequate to confirm identification, with only old flower bases (calyx) remaining on the plant. To enable identification, flowering material is required, which will most likely not be available until September next year.

This potentially new *Eremophila* is likely to be restricted in its distribution and to be considered rare, being so poorly collected (this is likely to be the first collection). It is possible that this species could delay the Carosue Dam airstrip clearing, given it has not been recorded elsewhere. This survey recorded it from nine locations, three of which would be cleared if the project were to proceed as currently planned.

To reduce the significance of the potentially new *Eremophila* from the Carosue Dam airstrip, it is suggested that an additional survey be undertaken in the general area, away from any proposed clearing. Targeted areas should include the Mulga Scrub and Eucalyptus oleosa Tree Mallee vegetation associations. If more populations of the *Eremophila* can be located, this would indicate that it is more widespread than just the airstrip area and hence, not as restricted as the limited locations would indicate.

The perennial PF identified by the DPaW search would have likely been apparent during the September 2016 survey, then presumably observed and recorded. There were five annual or ephemeral PF taxa also recorded. Had these species been present in the areas that were inspected it is not likely that they would have been observed and recorded. This is due to very few other annual species being recorded.

The number of TF and PF identified by the DPaW Threatened Flora database search with location data was relatively low (one record). However, it would be typical of many of the DPaW records for the TF and PF to be clustered around the main roads of the area and areas of mineral exploration. When additional surveys are conducted, many more populations of these species are likely to be discovered and the distribution is likely to increase for some of the currently suspected rare species. This is likely to result in the downgrading, or delisting, of species currently believed to be rare or under threat. However, additional botanical surveys are likely to find previously unrecorded species that will possibly be classified as rare.

12 RECOMMENDATIONS AND CONCLUSIONS

It is recommended that the following procedures be adopted for any clearing required:

- Where practical, use existing roads or tracks for the various access roads required;
- Any viable seed should be collected and returned to the site during rehabilitation operations or nearby areas to be rehabilitated;
- Top soil, branches and other vegetation debris should be stockpiled and returned directly to the disturbed areas during rehabilitation operations; and
- Before any vehicles enter the project area they should be thoroughly washed down to remove any soil that could possibly contain weed seeds or other plant fragments. For this reason, tracked vehicles should be avoided if at all possible.

During the site inspection of the Carosue Dam areas no TF, PF or EPBC Act listed species were recorded.

However, a species of Other Significant Flora was recorded, *Eremophila* sp. (Paul Armstrong PA16/527). It is suspected to be a new species. To increase the small number of locations recorded, it is recommended that an additional survey be undertaken in areas away from any proposed clearing. This would reduce the significance of the plants recorded that are in the proposed area for clearing.

Due to the large amount of cleared plant material, much more than is likely to be conserved on site for later rehabilitation use, take this excess to similar nearby areas for rehabilitate.

All flora species, irrespective of conservation value, are protected under the Wildlife Conservation Act 1950-79 (WA). Before any clearing can be undertaken the appropriate clearing permits are required. To minimise the impact on the local environment and its flora, clearing and construction activities should be kept to an absolute minimum.

13 ACKNOWLEDGEMENTS

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Yours sincerely

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