

Golden Flag Level 1 Flora and Vegetation Survey

Tenements: M24/165 and M24/390



March 2013
Final Report

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NORTON GOLD FIELDS
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Executive Summary

Botanica Consulting was commissioned by Norton Gold Fields Ltd Paddington Operations to undertake a Level 1 flora and vegetation survey within the Golden Flag survey area, located approximately 27km north-west of Kalgoorlie-Boulder, Western Australia. The survey was conducted on the 14th February 2013, covering an area of approximately 51ha.

Five vegetation communities were identified within the Golden Flag survey area:

1. Very open tree mallee of *Eucalyptus celastroides*/*Eucalyptus griffithsii* over open low scrub *Allocasuarina helmsii*/*Melaleuca lateriflora* and dwarf shrub of *Scaevola spinescens*;
2. Open low scrub of *Melaleuca* aff. *pauperiflora* over open low scrub *Dodonaea viscosa* subsp. *angustissima* and open dwarf scrub of *Frankenia interioris*/*Tecticornia pergranulata*;
3. Open scrub of *Acacia* sp. narrow phyllode (B.R. Maslin 7831) over open low scrub *Melaleuca lateriflora* and hummock grass of *Triodia scariosa*;
4. Low woodland of *Eucalyptus clelandii* over open scrub of *Acacia* sp. narrow phyllode (B.R. Maslin 7831) and dwarf scrub of *Scaevola spinescens*; and
5. Low woodland of *Eucalyptus salmonophloia* over open scrub of *Casuarina pauper* and dwarf scrub of *Maireana sedifolia*.

These five vegetation communities were represented by a total of 24 Families, 42 Genera and 82 Species (including sub-species and variants). No Declared Rare Flora/Threatened Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950*, the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and as listed by the Department of Environment and Conservation were identified within the Golden Flag survey area. There were no Priority Flora species as listed by the Department of Environment and Conservation identified within the Golden Flag survey area.

None of the vegetation communities have National Environmental Significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. No Threatened Ecological Communities pursuant to Commonwealth legislation or Priority Ecological Communities as listed by the Department of Environment and Conservation were recorded within the Golden Flag survey area. The survey area is not located in an Environmentally Sensitive Area or within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Vegetation) Regulation 2004*.

According to Keighery's vegetation health rating scale (1994), all five vegetation communities within the area surveyed by Botanica Consulting were rated as being in 'good' health. One introduced species were identified within the Golden Flag survey area; *Salvia verbenaca* (Wild Sage). According to the Department of Agriculture and Food Western Australia this species is not listed as a Declared Plant.

1 Introduction

1.1 Project Description

Botanica Consulting (BC) was commissioned by Norton Gold Fields Ltd Paddington Operations (Paddington) to undertake a Level 1 flora and vegetation survey of Golden Flag. The flora survey was conducted within tenements M24/165 and M24/390 (Figure 1). The aim of the survey was to produce a vegetation map (Appendix 2) and species list (Appendix 3) as well as to document and map locations of any Threatened Ecological Communities (TEC), Priority Ecological Communities (PEC), Declared Rare Flora (DRF)/Threatened or Priority Flora species within the Golden Flag survey area.

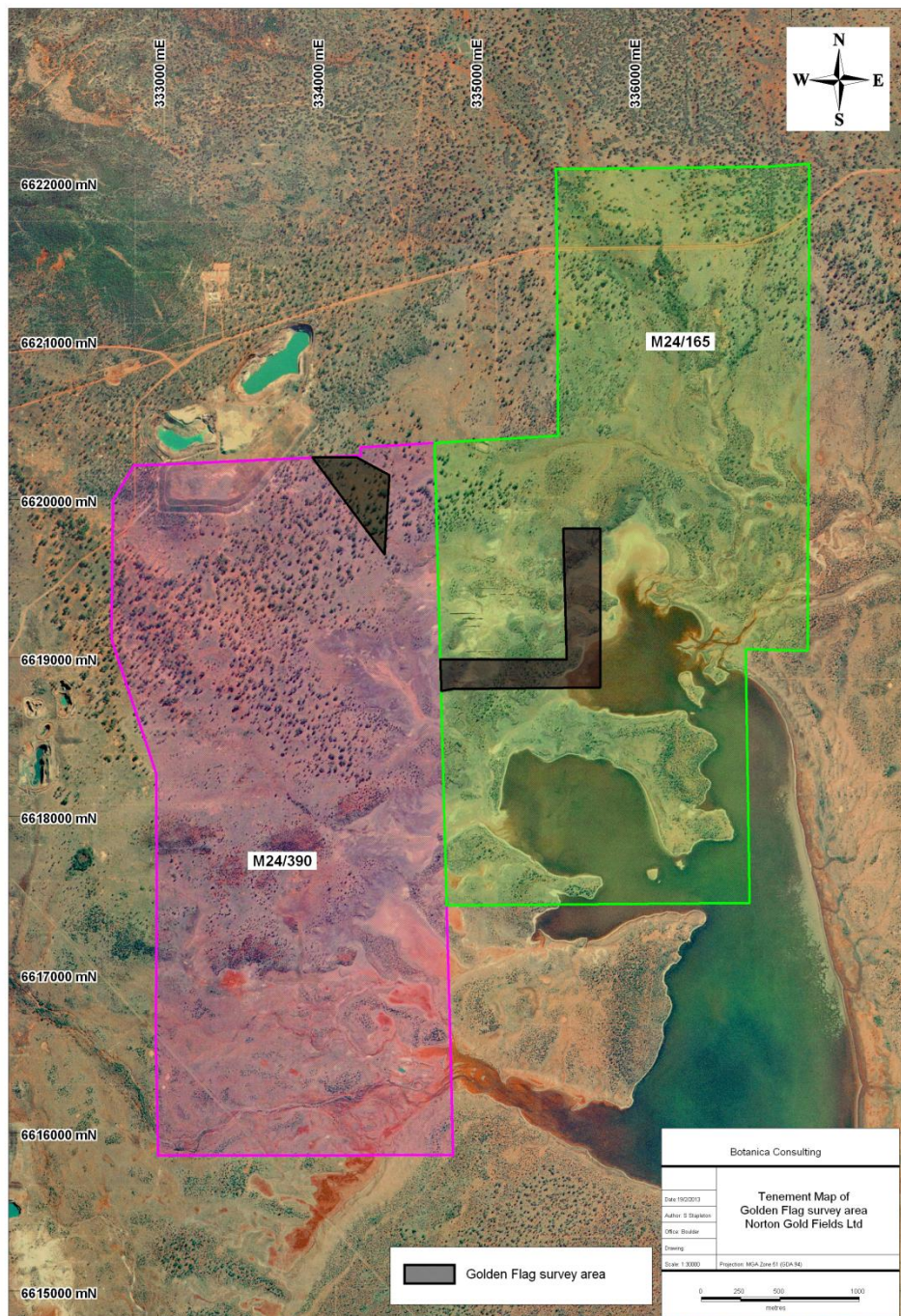


Figure 1: Tenements within the Golden Flag survey area

The Golden Flag survey area is located approximately 27km north-west of Kalgoorlie-Boulder, WA. BC conducted the survey on the 14th February 2013 which covered an area of approximately 51ha. Figure 2 provides a regional location map of the Golden Flag survey area.



Figure 2: Regional map of the Golden Flag survey area (survey area not to scale)

2 Previous Relevant Flora and Vegetation Surveys

2.1 Golden Flag Project: Level 1 Flora and Fauna Assessment, GHD, December 2012

GHD Pty Ltd (GHD) were commissioned by Paddington to undertake a spring Level 1 Flora and Fauna Assessment for their Golden Flag Project. The findings of the flora and vegetation survey and fauna assessment are summarised below:

- The project area is located in the Eastern Goldfields sub-region of the Coolgardie bioregion as described by the Interim Biogeographic Regionalisation of Australia.
- A search of the Landgate WA Atlas Shared Land Information Platform (SLIP) identified no environmentally sensitive areas within 10 km of the project area, but did report on two Schedule 1 areas within 10 km of the site.
- Broadscale vegetation mapping of the area undertaken by Beard (1979) indicates three vegetation associations are present in the project area. Based on the current extent of vegetation associations, all the Beard associations are classified as *Least Concern*.
- A search of the *EPBC Act 1999* Protected Matters database revealed no TECs or PECs within 10 km of the project area.
- Eight vegetation associations (including two cleared/highly disturbed categories) were described within the project area during the October 2012 survey. These vegetation associations are all well represented in the local area and broader region.
- The vegetation condition of the project area was rated as *Very Good* (3) through to *Completely Degraded* (6). The majority of the project area was rated as *Very Good* with the southern section of the site rated as *Degraded*.
- A total of 130 plant taxa (including subspecies and varieties) representing 26 families and 67 genera were recorded in the project area. This total comprised 119 native species and 11 introduced species.
- No Threatened Flora as recognised by the EPBC Act and the State *Wildlife Conservation Act 1950* (WC Act) were recorded within the project area.
- One Priority flora species, *Ptilotus chortophytus* (Priority 1), as listed by the DEC was recorded within the project area. It is recommended that Paddington consider a targeted survey for this flora species.
- Four types of fauna habitat were identified within the project area: aquatic, rocky outcrops, mixed chenopod shrublands and mixed eucalyptus woodlands.
- A total of 53 fauna taxa were recorded within the project area during the survey, this included: 37 birds, nine reptiles, six mammals and one frog.
- Desktop investigations reported nine conservation significant fauna species as potentially occurring within the project area. One DEC listed priority fauna species, *Ardeotis australis* (Australian Bustard) was observed within the project area during the survey.
- This Project has been assessed against the Ten Clearing Principles and it is considered not or unlikely to be at variance with any of the principles.

The current survey area is an extension of the area surveyed by GHD.

3 Regional Biophysical Environment

3.1 Regional Environment

The survey area lies within the Coolgardie Botanical District of the South-Western Interzone of WA. The Coolgardie Botanical District consists of predominantly *Eucalyptus* woodlands that become increasingly more open with a saltbush under-storey with increasing calcareous soils (Beard, 1990). Based on the Interim Biogeographic Regionalisation of Australia (IBRA) the Coolgardie Botanical District is further divided into subregions, with the survey area located within the Coolgardie 3-Eastern Goldfields subregion, approximately 8km west of the Murchison region (Cowan, 2001). A map of the survey area in relation to IBRA subregions is provided in Figure 3 below.

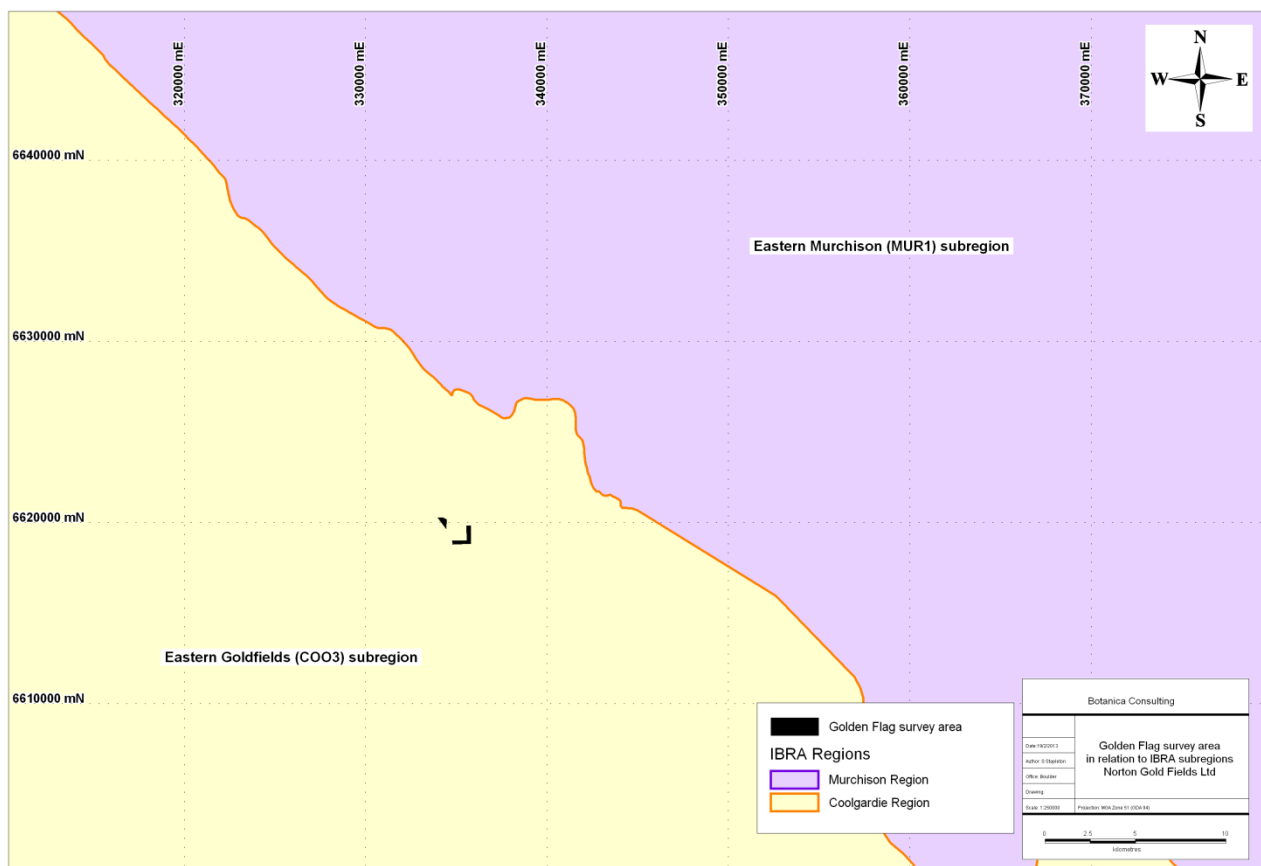


Figure 3: Map of IBRA subregions in the vicinity of the Golden Flag survey area

3.2 Great Western Woodlands

The Golden Flag survey area lies within the Great Western Woodlands. The Great Western Woodlands is considered by The Wilderness Society to be of global biological and conservation importance as one of the largest and healthiest temperate woodlands on Earth, containing many endemic species. The region covers almost 16 million hectares, 160,000 square kilometers, from the southern edge of the Western Australian Wheatbelt to the pastoral lands of the Mulga country in the north, the inland deserts to the northeast, and the treeless Nullarbor Plain to the east (Figure 4).

The area provides an eastward connection between southwest forests and inland deserts (Gondwana Link) as well as linking the north-west passage to Shark Bay. The majority of the Great Western Woodlands is unallocated crown land (61.1%) with other interests including pastoral leases (20.4%), conservation reserves (15.4%) unallocated crown land ex pastoral managed by the DEC (2%) and private land (approximately 1%) (Watson *et. al.*, 2010).

No specific management strategy applies to the Great Western Woodlands, rather an approach to conservation which occurs across all land tenures and when different stakeholders work together with biodiversity in mind. The central component of this approach is to identify and conserve key large-scale, long term ecological processes that drive connectivity between ecosystems and species. The Great Western Woodlands currently includes towns, highways, roads, railways, private property, Crown Reserves, agricultural activities and mining tenements.

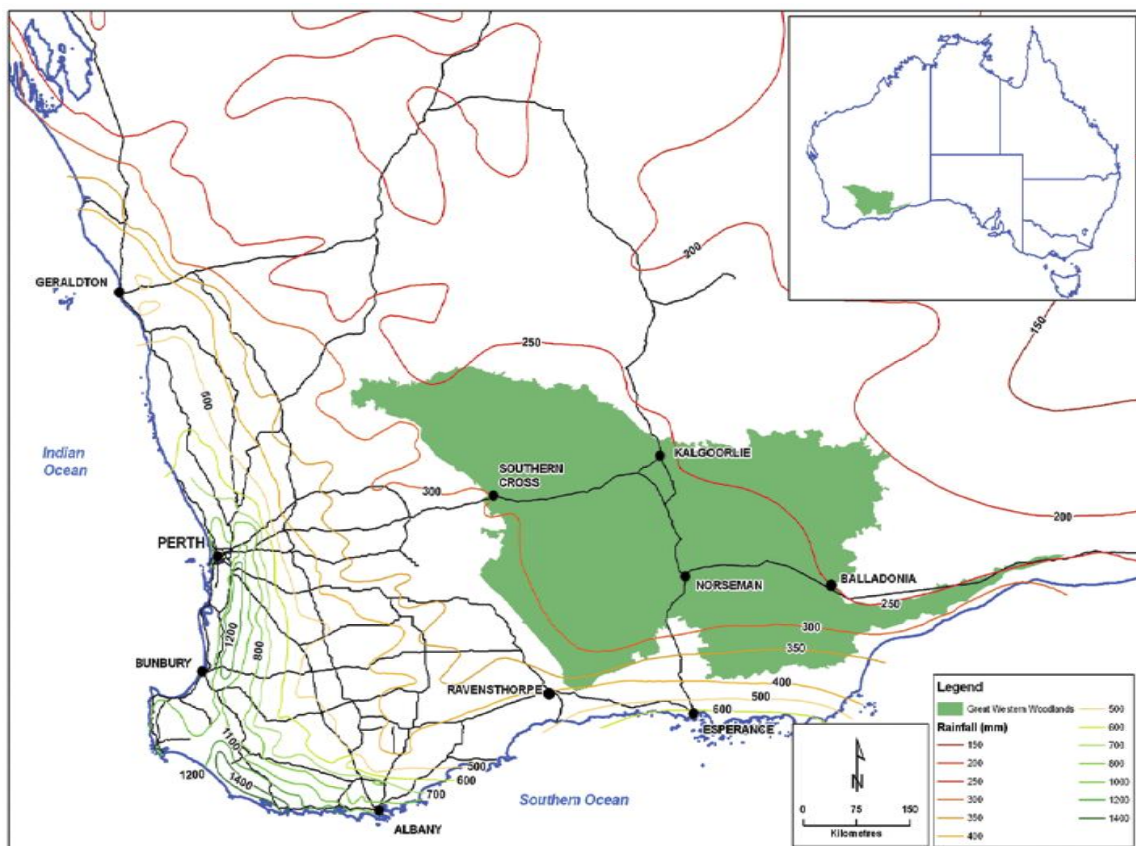


Figure 4: Location map of the Great Western Woodlands (DEC, 2010a).

3.3 Topography & Soils

The Eastern Goldfields subregion lies on the Yilgarn Craton's 'Eastern Goldfields Terrains'. The relief is subdued and comprised of gently undulating plains interrupted in the west with low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite. The underlying geology is of gneisses and granites eroded into a flat plane covered with tertiary soils and with scattered exposures of bedrock. Calcareous earths are the dominant soil group and cover much of the plains and greenstone areas. A series of large playa lakes in the western half are the remnants of an ancient major drainage line (Cowan, 2001).

3.4 Vegetation

Vegetation of the Coolgardie Botanical District is predominantly *Eucalyptus* woodland in the valleys, with dense *Acacia* and *Allocasuarina* thickets dominating the rocky ironstone ridges found near the South-West Province border (Beard, 1990). The under-storey of the *Eucalyptus* woodland is primarily composed of sclerophyllous shrubs such as *Melaleuca* or soft-leaved, glaucous shrubs including *Atriplex* where soils are more alkaline (Beard, 1990).

The vegetation of the Eastern Goldfields subregion is of Mallees, *Acacia* thickets and shrubheaths on sandplains. Diverse *Eucalyptus* woodlands occur around salt lakes, on ranges, and in valleys. Salt lakes support dwarf shrublands of samphire. The area is rich in endemic *Acacias* (Cowan, 2001).

The DAFWA GIS file (2011) indicates that the Golden Flag survey area is located within Pre-European Beard vegetation associations Coolgardie 125 and 540, and Kununulling 468. The extent of these vegetation associations as described by the DAFWA is provided in Table 1.

Table 1: Remaining Beard Vegetation Associations within Western Australia (DAFWA, 2011)

Vegetation association	Pre-European Extent (ha)	Current Extent (ha)	Pre-European extent remaining (%)	% of Current extent within DEC managed lands	Vegetation Description (Beard, 1990)
Coolgardie 125	13,390.82	13,222.82	98.75	0.00	Bare areas; salt lakes
Coolgardie 540	50,554.73	48,376.17	95.69	0.00	Succulent steppe with open low woodland; sheoak over saltbush
Kununulling 468	184,812.50	181,666.50	98.30	53.7%	Medium woodland; salmon gum & goldfields blackbutt

Areas retaining less than 30% of their pre-European vegetation extent generally experience exponentially accelerated species loss, while areas with less than 10% are considered "endangered". Clearing within the Golden Flag survey area will not significantly reduce the extent of these vegetation associations.

3.5 Climate

The climate of the Eastern Goldfields subregion is characterised as an arid to semi-arid climate with rainfall sometimes in summer but mainly winter rainfall and annual rainfall of approximately 200-300mm (Beard, 1990; Cowan, 2001). Rainfall data for the Kalgoorlie weather station (#12117) located approximately 30km south-east of the survey area is shown in Figure 5 (Bureau of Meteorology, BOM, 2012)..

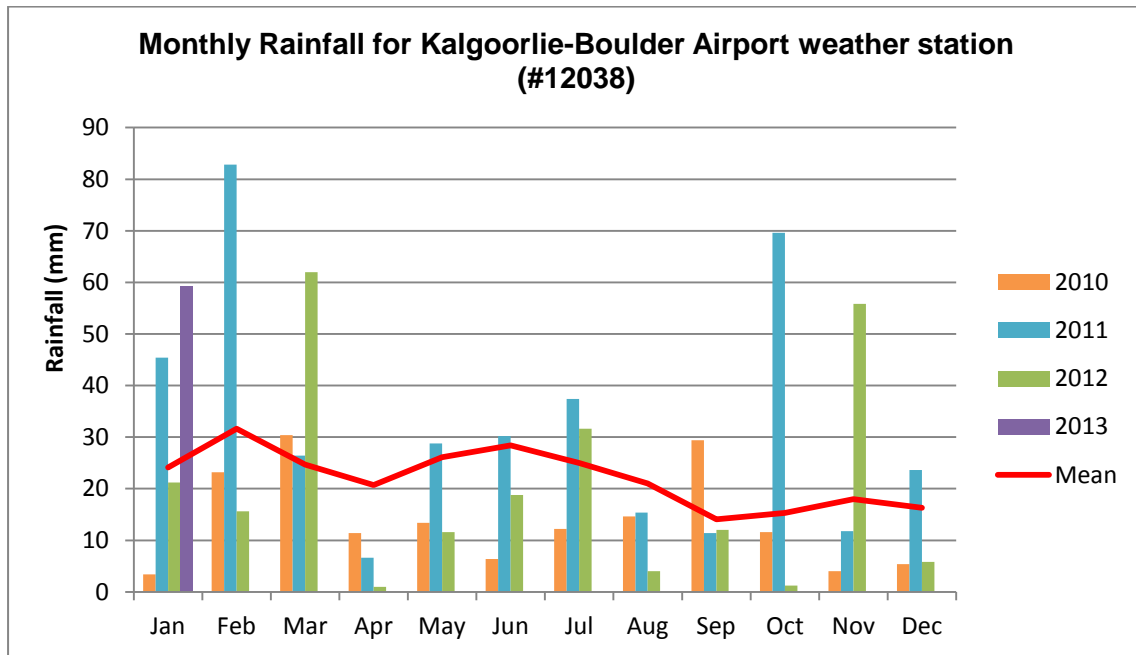


Figure 5: Monthly rainfall from January 2010 to January 2013 and mean monthly rainfall (March 1939 to January 2013) for the Kalgoorlie-Boulder Airport weather station (#12038) (BOM, 2012).

3.6 Land Use

Based on the findings of its 2002 biodiversity audit, CALM identified the dominant land uses of the COO3 IBRA subregion as pasture land (38%), Nature Reserves (4.5%) with the remaining areas used for mining, exploration activities and freehold (Cowan, 2001).

3.7 Survey Objectives

The objectives of the survey were to:

- Compile a broad scale vegetation community flora map and species list of the Golden Flag survey area (Appendix 2);
- Document and map locations of any Threatened or Priority listed flora species located; (Appendix 2 and 4);
- Assess the regional and local conservation status of plant species and ecological communities within the Golden Flag survey area; and
- Identify and map occurrences of any “Declared and Environmental” weeds within the Golden Flag survey area.

4 Survey Methodology

4.1 Desktop Assessment

Prior to the field survey, the results of the combined search of the DEC Flora of Conservation Significance databases (DEC, 2012a), were obtained by BC. These significant flora species were examined on the Western Australian Herbarium's web page (WAHERB, 2013) prior to the survey to familiarise staff with their appearance. Locations of Threatened Flora and Priority Flora species revealed in the databases search were overlaid on aerial photography of the area. Vegetation descriptions of locations and available pictures of the Priority Flora were obtained from Florabase.

Priority Flora and their respective vegetation types were targeted in the Golden Flag survey area and all areas of occurrence were traversed on foot specifically looking for the Threatened flora associated with that vegetation description. Table 2 lists the definitions of Threatened and Priority ratings under the *Wildlife Conservation Act (1950)* as extracted from Florabase (WAHERB, 2013).

Table 2: Definitions of Threatened and Priority Flora Species (WAHERB, 2013)

T: Schedule 1 Threatened Flora under the <i>Wildlife Conservation Act 1950</i>
Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.
X: Declared Rare flora – Presumed Extinct Taxa
Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
1: Priority One – Poorly known Species
Species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
2: Priority Two – Poorly Known Species
Species that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
3: Priority Three – Poorly known Species
Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities 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 localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
4: Priority Four – Rare, Near Threatened and other species in need of monitoring
<ol style="list-style-type: none"> 1. 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. 2. Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. 3. Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
5: Priority 5 – Conservation Dependent Species
Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

4.2 Sampling and Analysis Methods

BC was commissioned by Paddington to undertake a Level 1 flora and vegetation survey of the Golden Flag survey area located approximately 27km north-west of Kalgoorlie-Boulder, Western Australia. The survey was conducted on the 14th February 2013, covering an area of approximately 51ha. The objective of the survey was to document all observed “Declared Rare and Priority Flora” species encountered and the occurrences of any “Environmental or Declared Weeds” observed within or adjacent to the Golden Flag survey area. The Golden Flag survey area was traversed by two people on foot. Figure 6 provides a map of the area traversed throughout the survey.

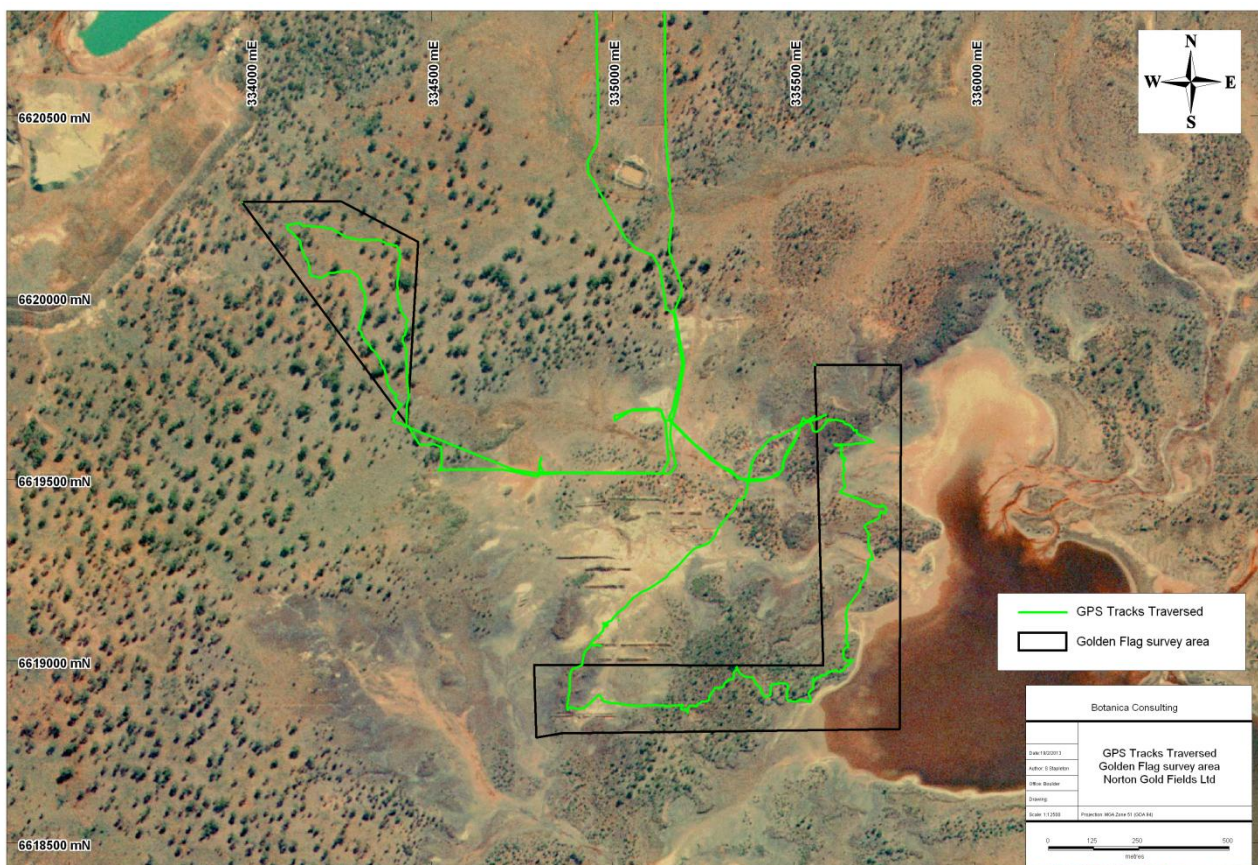


Figure 6: GPS tracks traversed throughout the Golden Flag survey area

Prior to the commencement of field work, aerial photography was inspected and obvious differences in the vegetation assemblages were identified. The different vegetation communities identified were then inspected during the field survey to assess their validity. A handheld GPS unit was used to record the co-ordinates of the boundaries between existing vegetation communities.

At each sample point, the following information was recorded:

- GPS location;
- Photograph of vegetation;
- Dominant species;
- Collection and documentation of unknown plant specimens; and
- GPS location, photograph and collection of Threatened Flora if encountered.

Unknown specimens collected during the survey were identified with the aid of samples housed at the BC Herbarium and the Western Australian Herbarium. Presence/absence data of species from sample sites of similar vegetation was then compiled forming the best representative vegetation communities. Similar vegetation communities were recognised visually in the field.

4.2.1 Personnel involved

Jim Williams - Environmental Consultant/Botanist (Diploma of Horticulture)
Andrea Williams - Environmental Consultant (BSc Hons)

4.2.2 Scientific licences

Table 3: Scientific licenses of Botanica staff coordinating the survey

Licensed staff	Permit Number	Valid Until
Jim Williams	SL009980	25-04-2013
Andrea Williams	SL009981	25-04-2013

4.3 Data Analysis Tools

Once the survey was completed the data obtained was analysed to generate a vegetation map (Appendix 2).

4.4 Flora survey limitations and constraints

It is important to note that there are limitations involved with conducting flora surveys, despite the careful planning that is put into their design. Such limitations that can occur are listed in Table 4 below.

Table 4: Limitations and constraints associated with the flora and vegetation survey.

Variable	Impact on Survey outcomes
Access problems	The survey was conducted on foot. BC staff were able to easily access the area.
Experience levels	<p>The BC personnel that conducted the survey were regarded as suitably qualified and experienced.</p> <p>Coordinating Botanist: Jim Williams Field Staff: Jim Williams & Andrea Williams Data Interpretation: Jim Williams & Samantha Stapleton</p>
Timing of survey, weather & season	Fieldwork was carried out in summer outside of the EPA's recommended timing for flora surveys (i.e. spring). Despite this assessment on vegetation communities were still able to made.
Sources of information	BC was able to obtain information about the area from previous research conducted by BC within the area which enabled adequate background information about the region.
Mapping reliability	BC was able to obtain high quality ortho aerial images in order to reliably determine changes in vegetation within the survey area.
Area disturbance	The Golden Flag survey area has been subject to disturbance from grazing by cattle, timber extraction and exploration activities.
Survey Intensity	Survey intensity was moderate and appropriate for the impact area with a Level 1 survey conducted.
Resources	The DEC provided threatened flora information which was used to complete the survey.
Completeness	<p>In the opinion of BC the Golden Flag survey area was covered sufficiently in order to identify vegetation assemblages. Many of the plants during the survey were not in flower due to the low amount of rainfall received in the previous months. However majority of the flora species, including annual species, could be fully identified as field staff were very familiar with flora within this area. It is estimated that approximately 95% of the flora within the Golden Flag survey area were able to be fully identified.</p> <p>The vegetation communities for this study were based on visual descriptions of locations in the field. The distribution of these vegetation communities outside the study area is not known, however vegetation communities identified were categorized via comparison to vegetation distributions throughout WA given on Australian Natural Resources Atlas (ANRA, 2013).</p>

5 Results

5.1 Summary

Five vegetation communities were identified within the Golden Flag survey area. These five vegetation communities were represented by a total of 24 Families, 42 Genera and 82 Species (including sub-species and variants) (Appendix 3).

No DRF/Threatened Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950*, the Commonwealth *EPBC Act 1999* and as listed by the DEC (Smith, 2012), were identified within the area surveyed. No Priority Flora species as listed by the DEC were identified within the Golden Flag survey area.

None of the vegetation communities have National Environmental Significance as defined by the Commonwealth *EPBC Act 1999*. No TEC pursuant to Commonwealth legislation or PEC as listed by the DEC were recorded within the Golden Flag survey area. The survey area is not located in an ESA or within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Vegetation) Regulation 2004*.

According to Keighery's vegetation health rating scale (1994), all five of the vegetation communities within the area surveyed by BC were rated as being 'good'. One introduced species were identified within the Golden Flag survey area; *Salvia verbenaca* (Wild sage). According to DAFWA this species is not listed as a Declared Plant (DAFWA, 2013).

5.2 Desktop Assessment

The results of the combined search of the DEC's Flora of Conservation Significance databases (DEC, 2012a) revealed no DEC listings of Threatened or Priority Flora species within the Golden Flag survey area. There was however three Priority Flora species listed within a 20km radius of the survey area. One of these Priority Flora species has the potential to occur within the survey area as it occurs in similar habitats and vegetation communities to those identified within the survey area. The nearest DEC known population is located approximately 120m from the survey area. Table 5 identifies the DEC listed Priority Flora species potentially occurring within the Golden Flag survey area.

Table 5: Priority Flora with the potential to occur within the Golden Flag survey area (WAHERB, 2013)

Species	Conservation Code	Description (WAHERB, 2012)
<i>Angianthus prostratus</i>	P3	Prostrate annual, herb. Fl. white-yellow, Jul to Sep. Red clay or loamy soils. Saline depressions.

5.3 Flora of conservation significance

No DRF/Threatened Flora pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, the *EPBC Act 1999* and as listed by the DEC (Smith, 2012), were identified within the survey area. No Priority Flora species as listed by the DEC (2012a) were identified within the survey area. However a population of the Priority Flora species, *Ptilotus chortophytus* (P1), has been previously recorded near the survey area (Appendix 5).

5.4 *Ptilotus chortophytus* (P1)

There is no description from WAHERB available for this plant (Plate 1). This species was identified near the survey area during a Level 1 Flora and Fauna Assessment conducted by GHD in an October 2012 survey (GHD, 2012). A specimen of this plant and location details were provided to the DEC by GHD to update their database. This species was present on rocky quartz outcrops which do not occur in the current survey area (Plate 2). However this species was visited during the survey as it is a significant recording, since it is only the second location recorded for this region.



Plate 1: Photograph taken of *Ptilotus chortophytus* (P1) (outside survey area)



Plate 2: Photograph taken of *Ptilotus chortophytus* (P1) habitat

5.5 Vegetation Communities

Five vegetation communities were identified within the Golden Flag survey area:

1. Very open tree mallee of *Eucalyptus celastroides*/*Eucalyptus griffithsii* over open low scrub *Allocasuarina helmsii*/*Melaleuca lateriflora* and dwarf shrub of *Scaevola spinescens*;
2. Open low scrub of *Melaleuca* aff. *pauperiflora* over open low scrub *Dodonaea viscosa* subsp. *angustissima* and open dwarf scrub of *Frankenia interioris*/*Tecticornia pergranulata*;
3. Open scrub of *Acacia* sp. narrow phyllode (B.R. Maslin 7831) over open low scrub *Melaleuca lateriflora* and hummock grass of *Triodia scariosa*;
4. Low woodland of *Eucalyptus clelandii* over open scrub of *Acacia* sp. narrow phyllode (B.R. Maslin 7831) and dwarf scrub of *Scaevola spinescens*; and
5. Low woodland of *Eucalyptus salmonophloia* over open scrub of *Casuarina pauper* and dwarf scrub of *Maireana sedifolia*.

These vegetation communities were represented by a total of 24 Families, 42 Genera and 82 Species (including sub-species and variants) (Appendix 3). A map showing the vegetation communities present in the Golden Flag survey area is located in Appendix 2 and the area of each is found in Table 6 below.

Table 6: Summary of vegetation communities and the area covered

Vegetation Community	Area (ha)
Very open tree mallee of <i>Eucalyptus celastroides</i> / <i>Eucalyptus griffithsii</i> over open low scrub <i>Allocasuarina helmsii</i> / <i>Melaleuca lateriflora</i> and dwarf shrub of <i>Scaevola spinescens</i>	8.5
Open scrub of <i>Acacia aptaneura</i> over open low scrub <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> and open dwarf scrub of <i>Frankenia interioris</i> / <i>Tecticornia pergranulata</i>	9.8
Open scrub of <i>Acacia</i> sp. narrow phyllode (B.R. Maslin 7831) over open low scrub <i>Melaleuca lateriflora</i> and hummock grass of <i>Triodia scariosa</i>	4.4
Low woodland of <i>Eucalyptus clelandii</i> over open scrub of <i>Acacia</i> sp. narrow phyllode (B.R. Maslin 7831) and dwarf scrub of <i>Scaevola spinescens</i>	10.5
Low woodland of <i>Eucalyptus salmonophloia</i> over open scrub of <i>Casuarina pauper</i> and dwarf scrub of <i>Maireana sedifolia</i>	13.9
Salt Lake	3.8
Total	51

5.6 Very open tree mallee of *Eucalyptus celastroides*/*Eucalyptus griffithsii* over open low scrub *Allocasuarina helmsii*/*Melaleuca lateriflora* and dwarf shrub of *Scaevola spinescens*

5.6.1 Flora

The flora recorded within this vegetation community was represented by a total of 12 Families, 16 Genera and 26 Species (Appendix 3).

No DRF/Threatened Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950*, the *EPBC Act 1999* and as listed by the DEC (Smith, 2012) were identified within this vegetation community. No Priority Flora species were identified within this vegetation community. No introduced species were recorded in this vegetation community.

5.6.2 Vegetation

The flora recorded in this vegetation community was representative by Very open tree mallee of *Eucalyptus celastroides*/*Eucalyptus griffithsii* over open low scrub *Allocasuarina helmsii*/*Melaleuca lateriflora* and dwarf shrub of *Scaevola spinescens* (Plate 3). The species in the upper storey included *Eucalyptus celastroides*, *Eucalyptus griffithsii* and *Casuarina pauper*. The mid-storey species included *Cratystylis microphylla*, *Dodonaea stenozyga*, *Melaleuca lateriflora*, *Acacia caesaneura* and *Eremophila oldfieldii* subsp. *angustifolia*. The understorey species included *Grevillea acuaria*, *Tecticornia disarticulata*, *Olearia muelleri*, *Westringia rigida* and *Triodia scariosa*. Dominant species from the vegetation assemblage according to Muir (1977) are shown in Table 7.

Table 7: Vegetation assemblage for Very open tree mallee of *Eucalyptus celastroides*/*Eucalyptus griffithsii* over open low scrub *Allocasuarina helmsii*/*Melaleuca lateriflora* and dwarf shrub of *Scaevola spinescens* within the survey area

Life Form/Height Class	Canopy Cover	Dominant species present
Mallee Tree Form	2-10%	<i>Eucalyptus celastroides</i> <i>Eucalyptus griffithsii</i>
Shrub 1.5-2m	2-10%	<i>Allocasuarina helmsii</i> <i>Melaleuca lateriflora</i>
Shrub <0.5m	10-30%	<i>Scaevola spinescens</i>

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area. This vegetation community is best represented by the Mallee woodlands and shrublands vegetation community which, according to the ANRA, covers 2% of WA (ANRA, 2013).



Plate 3: Very open tree mallee of *Eucalyptus celastroides/Eucalyptus griffithsii* over open low scrub *Allocasuarina helmsii/Melaleuca lateriflora* and dwarf shrub of *Scaevola spinescens*

5.7 Open low scrub of *Melaleuca* aff. *pauperiflora* over open low scrub *Dodonaea viscosa* subsp. *angustissima* and open dwarf scrub of *Frankenia interioris/Tecticornia pergranulata*

5.7.1 Flora

The flora recorded within this vegetation community was represented by a total of 13 Families, 20 Genera and 29 Species (Appendix 3).

No DRF/Threatened Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950*, the *EPBC Act 1999* and as listed by the DEC (Smith, 2012) were identified within this vegetation community. No Priority Flora species were identified within this vegetation community. No introduced species were recorded in this vegetation community.

5.7.2 Vegetation

The flora recorded in this vegetation community was representative of Open low scrub of *Melaleuca* aff. *pauperiflora* over open low scrub *Dodonaea viscosa* subsp. *angustissima* and open dwarf scrub of *Frankenia interioris/Tecticornia pergranulata* (Plate 4). The species in the upper storey included *Acacia burkittii*, *Codonocarpus cotinifolius*, *Eremophila interstans* subsp. *virgata* and *Melaleuca* aff. *pauperiflora*. The mid-storey species included *Eremophila miniata*, *Jacksonia arida*, *Lycium australe*, *Pittosporum angustifolium* and *Solanum lasiophyllum*. The understorey species included *Lemooria*

burkittii, *Gunniopsis quadrifida*, *Disphyma crassifolium*, *Eragrostis eriopoda* and *Atriplex codonocarpa*. Dominant species from the vegetation assemblage according to Muir (1977) are shown in Table 8.

Table 8: Vegetation assemblage for Open low scrub of *Melaleuca* aff. *pauperiflora* over open low scrub *Dodonaea viscosa* subsp. *angustissima* and open dwarf scrub of *Frankenia interioris*/*Tecticornia pergranulata* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Shrub >2m	2-10%	<i>Acacia aptaneura</i>
Shrub 1.5-2m	2-10%	<i>Melaleuca</i> aff. <i>pauperiflora</i>
Shrub 1-1.5m	2-10%	<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>
Shrub <0.5m	2-10%	<i>Frankenia interioris</i> <i>Tecticornia pergranulata</i>

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area. This vegetation community is best represented by the Other shrublands vegetation community which, according to the ANRA, covers 1.7% of WA (ANRA, 2013).



Plate 4: Open low scrub of *Melaleuca* aff. *pauperiflora* over open low scrub *Dodonaea viscosa* subsp. *angustissima* and open dwarf scrub of *Frankenia interioris*/*Tecticornia pergranulata*

5.8 Open scrub of *Acacia* sp. narrow phyllode (B.R. Maslin 7831) over open low scrub *Melaleuca lateriflora* and hummock grass of *Triodia scariosa*

5.8.1 Flora

The flora recorded within this vegetation community was represented by a total of 11 Families, 12 Genera and 16 Species (Appendix 3).

No DRF/Threatened Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, the *EPBC Act 1999* and as listed by the DEC (Smith, 2012) were identified within this vegetation community. No Priority Flora species were identified within this vegetation community. No introduced species were recorded in this vegetation community.

5.8.2 Vegetation

The flora recorded in this vegetation community was representative Open scrub of *Acacia* sp. narrow phyllode (B.R. Maslin 7831) over open low scrub *Melaleuca lateriflora* and hummock grass of *Triodia scariosa* (Plate 5). The species in the upper storey included *Acacia* sp. narrow phyllode (B.R. Maslin 7831) and *Eremophila oldfieldii* subsp. *angustifolia*. The mid-storey species included *Cryptandra aridicola*, *Solanum lasiophyllum*, *Acacia kalgoorliensis*, *Santalum acuminatum* and *Eremophila scoparia*. The understorey species included *Maireana platycarpa*, *Scaevola spinescens*, *Triodia scariosa* and *Ptilotus obovatus*. Dominant species from the vegetation assemblage according to Muir (1977) are shown in Table 9.

Table 9: Vegetation assemblage for Open scrub of *Acacia* sp. narrow phyllode (B.R. Maslin 7831) over open low scrub *Melaleuca lateriflora* and hummock grass of *Triodia scariosa* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Shrub >2m	2-10%	<i>Acacia</i> sp. narrow phyllode (B.R. Maslin 7831)
Shrub 1-1.5m	2-10%	<i>Melaleuca lateriflora</i>
Hummock Grass	10-30%	<i>Triodia scariosa</i>

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area. This vegetation community is best represented by the *Acacia* shrublands vegetation community which, according to the ANRA, covers 9.5% of WA (ANRA, 2013).



Plate 5: Open scrub of *Acacia* sp. narrow phyllode (B.R. Maslin 7831) over open low scrub *Melaleuca lateriflora* and hummock grass of *Triodia scariosa*

5.9 Low woodland of *Eucalyptus clelandii* over open scrub of *Acacia* sp. narrow phyllode (B.R. Maslin 7831) and dwarf scrub of *Scaevola spinescens*

5.9.1 Flora

The flora recorded within this vegetation community was represented by a total of 12 Families, 16 Genera and 20 Species (Appendix 3).

No DRF/Threatened Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, the *EPBC Act 1999* and as listed by the DEC (Smith, 2012) were identified within this vegetation community. No Priority Flora species were identified within this vegetation community. No introduced species were recorded in this vegetation community.

5.9.2 Vegetation

The flora recorded in this vegetation community was representative Low woodland of *Eucalyptus clelandii* over open scrub of *Acacia* sp. narrow phyllode (B.R. Maslin 7831) and dwarf scrub of *Scaevola spinescens* (Plate 6). The species in the upper storey included *Eucalyptus clelandii*, *Eucalyptus griffithsii* and *Casuarina pauper*. The mid-storey species included *Santalum spicatum*, *Acacia colletioides*, *Exocarpos aphyllus*, *Alyxia buxifolia* and *Allocasuarina helmsii*. The understorey species included *Austrostipa nitida*, *Westringia rigida*, *Dodonaea stenozyga*, *Eremophila pustulata* and

Olearia muelleri. Dominant species from the vegetation assemblage according to Muir (1977) are shown in Table 10.

Table 10: Vegetation assemblage for Low woodland of *Eucalyptus clelandii* over open scrub of *Acacia* sp. narrow phyllode (B.R. Maslin 7831) and dwarf scrub of *Scaevola spinescens* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5-15m	10-30%	<i>Eucalyptus clelandii</i>
Tree <5m	2-10%	<i>Casuarina pauper</i>
Mallee Tree Form	2-10%	<i>Eucalyptus griffithsii</i>
Shrub >2m	2-10%	<i>Acacia</i> sp. narrow phyllode (B.R. Maslin 7831)
Shrub 1.5-2m	2-10%	<i>Allocasuarina helmsii</i>
Shrub <0.5m	10-30%	<i>Scaevola spinescens</i>

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area. This vegetation community is best represented by the *Eucalyptus* woodlands vegetation community which, according to the ANRA, covers 3.5% of WA (ANRA, 2013).



Plate 6: Low woodland of *Eucalyptus clelandii* over open scrub of *Acacia* sp. narrow phyllode (B.R. Maslin 7831) and dwarf scrub of *Scaevola spinescens*

5.10 Low woodland of *Eucalyptus salmonophloia* over open scrub of *Casuarina pauper* and dwarf scrub of *Maireana sedifolia*

5.10.1 Flora

The flora recorded within this vegetation community was represented by a total of 15 Families, 23 Genera and 38 Species (Appendix 3).

No DRF/Threatened Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, the *EPBC Act 1999* and as listed by the DEC (Smith, 2012) were identified within this vegetation community. No Priority Flora species were identified within this vegetation community. One introduced species *Salvia verbenaca* was recorded in this vegetation community. According to the DAFWA database this species is not listed as a Declared Plant (DAFWA, 2013).

5.10.2 Vegetation

The flora recorded in this vegetation community was representative Low woodland of *Eucalyptus salmonophloia* over open scrub of *Casuarina pauper* and dwarf scrub of *Maireana sedifolia* (Plate 7). The species in the upper storey included *Eucalyptus salubris*, *Eucalyptus celastroides*, *Eucalyptus clelandii* and *Eucalyptus salmonophloia*. The mid-storey species included *Senna artemisioides* subsp. *x artemisioides*, *Pimelea microcephala*, *Pittosporum angustifolium*, *Eremophila glabra* and *Atriplex nummularia*. The understorey species included *Cratystylis microphylla*, *Sida spodochroma*, *Euphorbia drummondii*, *Solanum nummularium* and *Enneapogon caerulescens*. Dominant species from the vegetation assemblage according to Muir (1977) are shown in Table 11.

Table 11: Vegetation assemblage for Low woodland of *Eucalyptus salmonophloia* over open scrub of *Casuarina pauper* and dwarf scrub of *Maireana sedifolia* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5-15m	10-30% 2-10%	<i>Eucalyptus salmonophloia</i> <i>Eucalyptus salubris</i>
Shrub >2m	2-10%	<i>Casuarina pauper</i>
Shrub 1.5-2m	2-10%	<i>Alectryon oleifolius</i>
Shrub 0.5-1m	30-70% 2-10%	<i>Maireana sedifolia</i> <i>Maireana pyramidata</i>

No broad scale clearing for agricultural purposes has occurred in this vegetation community within the survey area. This vegetation community is best represented by the *Eucalyptus* woodlands vegetation community which, according to the ANRA, covers 3.5% of WA (ANRA, 2013).



Plate 7: Low woodland of *Eucalyptus salmonophloia* over open scrub of *Casuarina pauper* and dwarf scrub of *Maireana sedifolia*

5.11 Vegetation of Conservation Significance

None of the vegetation communities within the Golden Flag survey area were found to have National Environmental Significance as defined by the Commonwealth *EPBC Act 1999*. There were no TECs or PECs listed under Commonwealth legislation or as defined by the DEC located within the Golden Flag survey area (DEC 2011b; DSEWPaC, 2013).

The Golden Flag survey area is not located within any DEC managed land or ESA's. The survey area is not located within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. The nearest DEC managed lands is the Kalgoorlie Arboretum which is located approximately 26km south-east of the Golden Flag survey area. Any development within the Golden Flag survey area should not pose any threat to these areas.

The Golden Flag survey area lies within the Great Western Woodlands, an area recognised as the largest remaining area of intact Mediterranean-climate on Earth, and for its natural and cultural values and its natural resource-related productivity (DEC, 2010a). The Great Western Woodlands does not currently have any formal legal protection.

5.12 Vegetation condition

Based on Keighery's (1994) vegetation health rating scale (Appendix 7), all five vegetation communities within the Golden Flag survey area were rated as being in 'good' health. A 'good' health rating depicts that although the vegetation structure has been affected by multiple disturbances, in this instance as a result of timber extraction, grazing by cattle and exploration activities, it retains its basic structure and has the ability to regenerate.

5.13 Introduced Plant Species

One introduced species was identified within the Golden Flag survey area; *Salvia verbenaca* (Wild Sage). According to the DAFWA database this species is not listed as a Declared Plant (DAFWA, 2013).

5.14 *Salvia verbenaca* (Wild Sage)

This species is described as being a slight aromatic perennial herb that can grow between 0.1-1m high. It has blue-pink-purple flowers in April, or July to October. It is often found along roadsides (WAHERB, 2013). *Salvia verbenaca* was recorded in the one vegetation community; Low woodland of *Eucalyptus salmonophloia* over open scrub of *Casuarina pauper* and dwarf scrub of *Maireana sedifolia*.



Plate 8: Image of *Salvia verbenaca* (Wild Sage)

6 Relevant Legislation and Compliance with Recognised Standards

6.1 Commonwealth Legislation

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The aim of this Act is to protect matters of national environmental significance and is used by the Commonwealth DSEWPaC to list threatened species and ecological communities into categories based on the criteria set out in the Act (www.environment.gov.au/epbc/index.html). The Act provides a national environmental assessment and approval system for proposed developments and enforces strict penalties for unauthorised actions that may affect matters of national environmental significance.

The Golden Flag survey area does not have national environmental significance under the *EPBC Act 1999*. There are no TEC or Threatened Flora as listed under the *EPBC Act 1999* identified within the survey area.

6.2 State Legislation

Clearing of Native Vegetation

The *Environmental Protection (Clearing of Native Vegetation) Regulations WA 2004* establish that any clearing of native vegetation in Western Australia requires a permit from the DEC. Under Section 51A of the *WA Environmental Protection Act, 1986 (EP Act 1986)* native vegetation includes aquatic and terrestrial vegetation indigenous to Western Australia, and intentionally planted vegetation declared by regulation to be native vegetation, but not vegetation planted in a plantation or planted with commercial intent. Section 51A of the EP Act defines clearing as “*the killing or destruction of; the removal of; the severing or ringbarking of trunks or stems of; or the doing of substantial damage to some or all of the native vegetation in an area, including the flooding of land, the burning of vegetation, the grazing of stock or an act or activity that results in the above*”.

Regulation 6 of the 2004 Regulations defines ESA as “*the area covered by vegetation within 50 m of Rare Flora, to the extent to which the vegetation is continuous with the vegetation in which the Rare Flora is located*”.

A clearing permit must be granted prior to any clearing within a minimum of 50m surrounding all populations of Rare Flora. The area covered by a TEC is also considered an ESA wherein clearing cannot occur unless a clearing permit is granted. Exploration activities are exempt from the requirement for clearing permits if undertaken pursuant to a Mining Act approval, for example through a “Programme of Work” provided the area involved does not occur in an ESA.

The survey area is not located within an ESA (as listed by the DEC) or Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*

Environmental Protection Act WA 1986

The *EP Act 1986* includes requirements relating to the protection of DRF and TEC, and to the assessment of applications for clearing permits. TEC are protected even where exemptions for a clearing permit may apply. The *EP Act 1986* enforces both financial and/or imprisonment penalties on those who unlawfully damage a TEC. Under Schedule 5 of the *EP Act 1986* there are ten principles for clearing of native vegetation. These clearing principles (relevant to flora and vegetation) are outlined in Section 5.4 of the report.

The survey area does not contain any TEC or Threatened Flora as listed under the *EPBC Act 1999* or by the DEC.

Wildlife Conservation Act WA 1950

The DEC uses the provisions of this Act to list flora taxa as protected and the level of protection assigned to such flora. Flora species are classified as DRF when their populations are geographically restricted or are threatened by local processes. Under this Act, all native flora (spermatophytes, pteridophytes, bryophytes and thallophytes) are protected throughout the State. Financial penalties pursuant to the Act can be imposed if threatened plant species are collected without an appropriate licence.

DEC Priority lists

The DEC lists 'Priority' flora species which are under consideration for declaration as Threatened Flora. Species classed as Priority 1-3 are in urgent need of further survey, whereas Priority 4 species are considered to have been adequately surveyed but may become vulnerable or rare in future years. Priority 4 species are also species that have been removed from the threatened species list in the past 5 years. Priority 5 species are those species which are not currently threatened but are likely to become threatened within 5 years if not subject to a specific conservation program. The DEC also lists PEC as a mechanism for identifying communities that may need monitoring before possible nomination for TEC status. These priority species and communities have no formal legal protection until they are endorsed by the Minister as being Threatened Flora and TEC respectively.

Results from the DEC database searches identified three Priority Flora species recorded within a 20km radius of the Golden Flag survey area. No Priority Flora species were identified within the Golden Flag survey area. However a population of the Priority Flora species, *Ptilotus chortophytus* (P1), has been previously recorded near the survey area. The Golden Flag survey area contains no PEC.

6.3 EPA Position Statements

The EPA develops Position Statements to inform the public about environmental issues facing Western Australia and the plans for the future to ensure protection and ecological sustainability of

environmentally important ecosystems. It provides a set of principles to assist the public and decision-makers on their responsibilities for managing land with care. These principles also provide the basis for the Environmental Protection Authority to evaluate and report upon achieving environmental and ecological sustainability and the protection of natural resources.

Position Statement No. 2 *Environmental Protection of Native Vegetation in Western Australia* (EPA 2000) outlines EPA policy on the protection of native vegetation in Western Australia, particularly in the agricultural area. It identifies basic elements that the EPA should consider when assessing proposals that impact on biological diversity. These include comparison of all proposal options; avoidance of species and community extinctions; an expectation that implementing the proposal will not take a vegetation type below the “threshold level” of 30%; and that proponents should demonstrate that on- and off-site impacts can be managed.

The survey area does not contain any Threatened Flora or TEC suggesting that clearing within the survey area will meet the EPA standards outlined in Position statement No. 2. According to DAFWA (2011), the survey area occurs in pre-European Beard vegetation associations Coolgardie 125 and 540, and Kununulling 468 of which 98.75%, 95.69% and 98.30% of the original vegetation extent remains respectively.

Position Statement No. 3 *Terrestrial Biological Surveys as an Element of Biodiversity Protection* establishes that the EPA has adopted the definition and principles of biological diversity as defined in the *National Strategy for the Conservation of Australia’s Biological Diversity* (Commonwealth of Australia, 1996), and has stipulated the following requirements:

- The quality of information and scope of field surveys should meet standards, requirements and protocols as determined and published by the EPA; and
- The IBRA regionalisations should be used as the largest unit for environmental impact assessment (EIA) decision-making in relation to the conservation of biodiversity.

Pursuant to the IBRA regionalisations, 26 bioregions in WA, which are affected by a range of different threatening processes and have varying levels of sensitivity to impact, have been identified. Terrestrial biological surveys should provide sufficient information to address both biodiversity conservation and ecological functional values within the context of proposals and the results of surveys should be publicly available.

The flora survey of the study area was planned and implemented as far as practicable according to the EPA Guidance Statement No. 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004). Also, the IBRA regionalisations have been used in preparing the report to identify the conservation status of the area and identify the main threats to the biodiversity of plant species in the region.

6.4 Native Vegetation Clearing Principles

Based on the outcomes from the survey undertaken, as presented in this report, BC provides the following comments regarding the native vegetation clearing principles listed under Schedule 5 of the *EP Act 1986*:

a. **Native vegetation should not be cleared if it comprises a high level of biological diversity.**

This survey revealed diverse flora that are not restricted to the Golden Flag survey area and occur across this and other regions.

b. **Native vegetation should not be cleared if it includes, or is necessary for the continued existence of rare flora.**

No DRF/Threatened Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)*, the *EPBC Act 1999* and as listed by the DEC (Smith, 2012), were identified within the Golden Flag survey area.

c. **Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of a threatened ecological community (TEC).**

No TEC listed under the *EPBC Act 1999* (DSEWPaC, 2012) or by the DEC (2011b) occur within the Golden Flag survey area.

d. **Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.**

According to DAFWA (2011), the survey area occurs in pre-European Beard vegetation associations Coolgardie 125 and 540, and Kununulling 468 of which 98.75%, 95.69% and 98.30% of the original vegetation extent remains respectively.

e. **Native vegetation should not be cleared if it is growing, in, or in association with, an environment associated with a watercourse or wetland**

Two vegetation communities were found to be growing in or associated with a watercourse or wetland: Open low scrub of *Melaleuca aff. pauperiflora* over open low scrub *Dodonaea viscosa subsp. angustissima*; and Open dwarf scrub of *Frankenia interioris/Tecticornia pergranulata*.

f. **Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.**

The Golden Flag survey area is not located within any conservation areas. The closest conservation area is the Kalgoorlie Arboretum, which are located 26km south-west of the Golden Flag survey area. Development within the Golden Flag survey area will not impact on this conservation area.

7 Conclusions and Recommendations

7.1 Conclusions

Five vegetation communities were identified within the Golden Flag survey area. These five vegetation communities were represented by a total of 24 Families, 42 Genera and 82 Species (including sub-species and variants) (Appendix 3).

No DRF/Threatened Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950*, the Commonwealth *EPBC Act 1999* and as listed by the DEC were identified within the area surveyed. No Priority Flora species as listed by the DEC were identified within the Golden Flag survey area.

None of the vegetation communities have National Environmental Significance as defined by the Commonwealth *EPBC Act 1999*. No TEC pursuant to Commonwealth legislation or PEC as listed by the DEC were recorded within the Golden Flag survey area. The survey area is not located in an Environmentally Sensitive Area or within a Schedule 1 Area, as described in Regulation 6 and Schedule 1, clause 4 of the *Environmental Protection (Clearing of Vegetation) Regulation 2004*.

According to Keighery's vegetation health rating scale (1994), all five of the vegetation communities within the area surveyed by Botanica Consulting were rated as being in 'good' health. One introduced species were identified within the Golden Flag survey area; *Salvia verbenaca* (Wild sage). According to the DAFWA this species is not listed as a Declared Plant.

7.2 Recommendations

- Any proposed clearing is to be confined to the area surveyed.
- *Ptilotus chortophytus* (P1) population located near the survey area to be fenced off to protect the known population and information signs erected
- Consultation with the DEC prior to clearing within vegetation communities associated with a watercourse or wetland

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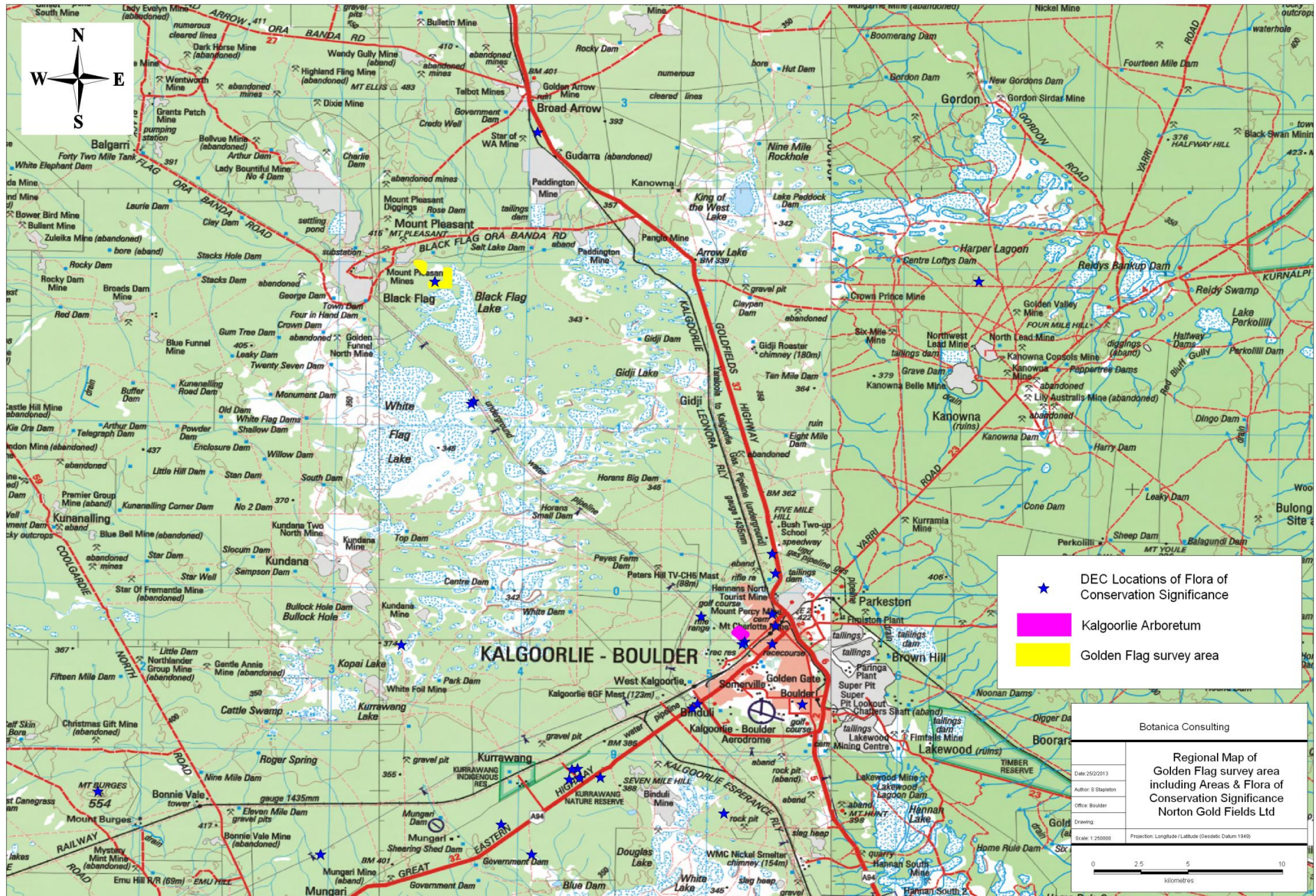
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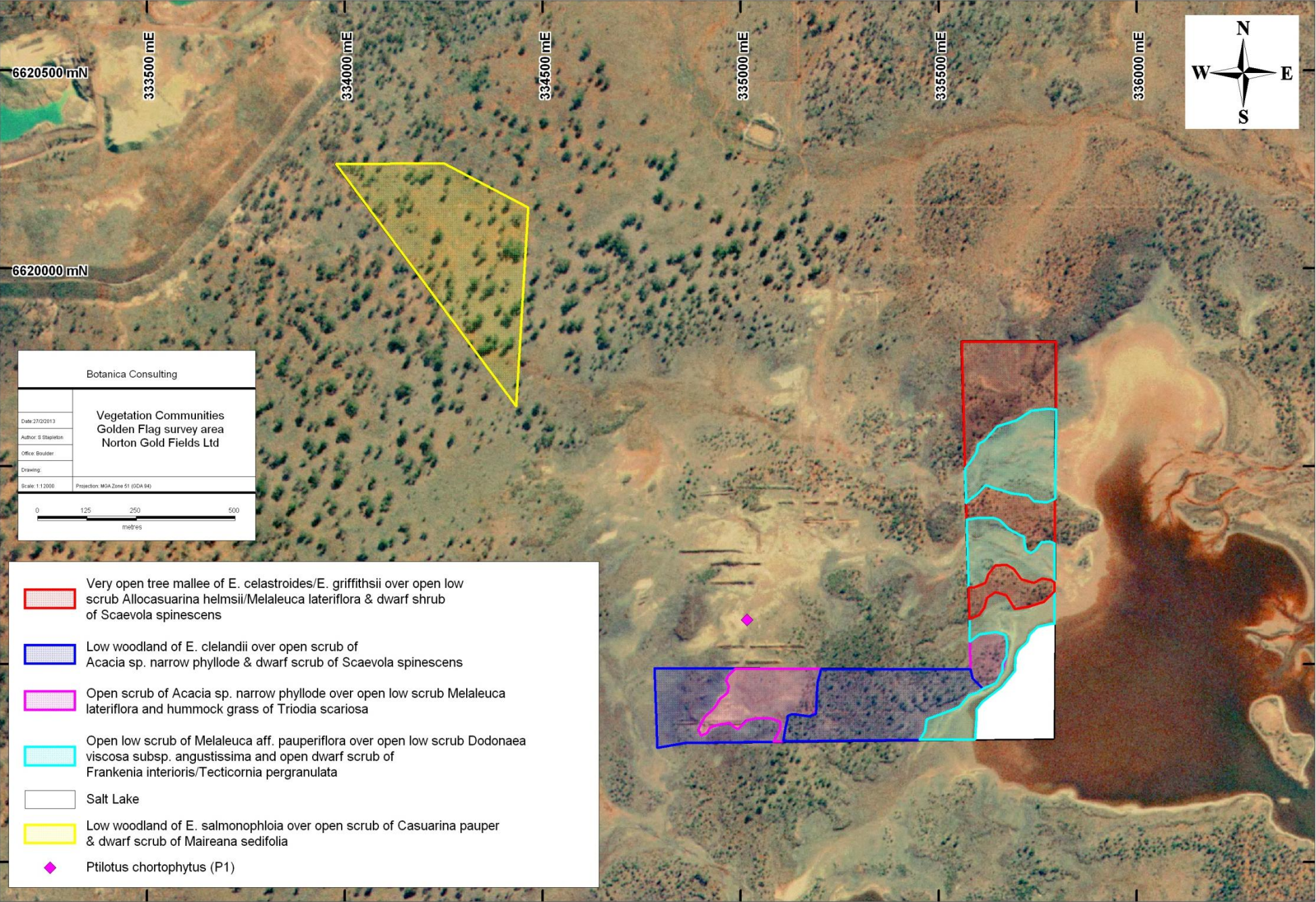
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9 Appendices

Appendix 1: Regional map of the Golden Flag survey area including DEC locations of Flora of Conservation Significance and Kalgoorlie Arboretum (survey area not to scale).



Appendix 2: Vegetation map of the Golden Flag survey area



Appendix 3: List of species identified within each vegetation community

(A) Denotes Annual species; (W) Denotes a weed species. Listed on Florabase (WAHERB, 2013).

Family	Genus	Species	Very open tree mallee of <i>E. celastroides</i> / <i>E. griffithsii</i> over open low scrub <i>Allocasuarina helmsii</i> / <i>Melaleuca lateriflora</i> & dwarf shrub of <i>Scaevola spinescens</i>	Open low scrub of <i>Melaleuca</i> aff. <i>pauperiflora</i> over open low scrub <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> & open dwarf scrub of <i>Frankenia interioris</i> / <i>Tecticornia pergranulata</i>	Open scrub of <i>Acacia</i> sp. narrow phyllode (B.R. Maslin 7831) over open low scrub <i>Melaleuca lateriflora</i> & hummock grass of <i>Triodia scariosa</i>	Low woodland of <i>E. clelandii</i> over open scrub of <i>Acacia</i> sp. narrow phyllode (B.R. Maslin 7831) & dwarf scrub of <i>Scaevola spinescens</i>	Low woodland of <i>E. salmonophloia</i> over open scrub of <i>Casuarina pauper</i> & dwarf scrub of <i>Maireana sedifolia</i>
Aizoaceae	<i>Disphyma</i>	<i>crassifolium</i>		*			
Aizoaceae	<i>Gunniopsis</i>	<i>quadrifida</i>		*			
Amaranthaceae	<i>Ptilotus</i>	<i>obovatus</i>			*		
Apocynaceae	<i>Alyxia</i>	<i>buxifolia</i>				*	
Apocynaceae	<i>Marsdenia</i>	<i>australis</i>				*	
Asteraceae	<i>Cratystylis</i>	<i>microphylla</i>	*				
Asteraceae	<i>Cratystylis</i>	<i>subspinescens</i>	*				*
Asteraceae	<i>Lemooria</i>	<i>burkittii</i>		*			
Asteraceae	<i>Olearia</i>	<i>dampieri</i> subsp. <i>eremicola</i>			*		
Asteraceae	<i>Olearia</i>	<i>muelleri</i>	*			*	*
Casuarinaceae	<i>Allocasuarina</i>	<i>helmsii</i>	*			*	
Casuarinaceae	<i>Casuarina</i>	<i>pauper</i>	*			*	*
Chenopodiaceae	<i>Atriplex</i>	<i>codonocarpa</i>		*			
Chenopodiaceae	<i>Atriplex</i>	<i>nummularia</i>		*			*
Chenopodiaceae	<i>Atriplex</i>	<i>stipitata</i>		*			
Chenopodiaceae	<i>Atriplex</i>	<i>vesicaria</i>					*
Chenopodiaceae	<i>Maireana</i>	<i>georgei</i>		*			
Chenopodiaceae	<i>Maireana</i>	<i>glomerifolia</i>		*			*
Chenopodiaceae	<i>Maireana</i>	<i>pentatropis</i>					*
Chenopodiaceae	<i>Maireana</i>	<i>platycarpa</i>			*		
Chenopodiaceae	<i>Maireana</i>	<i>pyramidata</i>					*
Chenopodiaceae	<i>Maireana</i>	<i>sedifolia</i>		*			*
Chenopodiaceae	<i>Sclerolaena</i>	<i>diacantha</i>					*
Chenopodiaceae	<i>Sclerolaena</i>	<i>drummondii</i>		*			
Chenopodiaceae	<i>Sclerolaena</i>	<i>parviflora</i>					*
Chenopodiaceae	<i>Tecticornia</i>	<i>disarticulata</i>	*	*			*
Chenopodiaceae	<i>Tecticornia</i>	<i>indica</i>					*
Chenopodiaceae	<i>Tecticornia</i>	<i>pergranulata</i>	*	*			

Family	Genus	Species	Very open tree mallee of <i>E. celastroides</i> / <i>E. griffithsii</i> over open low scrub <i>Allocasuarina helmsii</i> / <i>Melaleuca lateriflora</i> & dwarf shrub of <i>Scaevola spinescens</i>	Open low scrub of <i>Melaleuca</i> aff. <i>pauperiflora</i> over open low scrub <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> & open dwarf scrub of <i>Frankenia interioris</i> / <i>Tecticornia pergranulata</i>	Open scrub of <i>Acacia</i> sp. narrow phyllode (B.R. Maslin 7831) over open low scrub <i>Melaleuca lateriflora</i> & hummock grass of <i>Triodia scariosa</i>	Low woodland of <i>E. clelandii</i> over open scrub of <i>Acacia</i> sp. narrow phyllode (B.R. Maslin 7831) & dwarf scrub of <i>Scaevola spinescens</i>	Low woodland of <i>E. salmonophloia</i> over open scrub of <i>Casuarina pauper</i> & dwarf scrub of <i>Maireana sedifolia</i>
Euphorbiaceae	<i>Euphorbia</i>	<i>drummondii</i>					*
Fabaceae	<i>Acacia</i>	<i>aptaneura</i>		*			
Fabaceae	<i>Acacia</i>	<i>burkittii</i>		*			
Fabaceae	<i>Acacia</i>	<i>caesaneura</i>	*				
Fabaceae	<i>Acacia</i>	<i>collettioides</i>				*	
Fabaceae	<i>Acacia</i>	<i>hemiteles</i>			*	*	
Fabaceae	<i>Acacia</i>	<i>kalgoorliensis</i>			*		
Fabaceae	<i>Acacia</i>	sp. narrow phyllode (B.R. Maslin 7831)			*	*	
Fabaceae	<i>Acacia</i>	<i>tetragonophylla</i>	*				*
Fabaceae	<i>Jacksonia</i>	<i>arida</i>		*			
Fabaceae	<i>Senna</i>	<i>artemisioides</i> subsp. <i>filifolia</i>	*				*
Fabaceae	<i>Senna</i>	<i>artemisioides</i> subsp. x <i>artemisioides</i>					*
Frankeniaceae	<i>Frankenia</i>	<i>interioris</i>		*			
Goodeniaceae	<i>Scaevola</i>	<i>spinescens</i>	*		*	*	*
Gyrostemonaceae	<i>Codonocarpus</i>	<i>cotinifolius</i>		*			
Lamiaceae	<i>Salvia</i>	<i>verbenaca</i> (W)					*
Lamiaceae	<i>Westringia</i>	<i>rigida</i>	*			*	
Malvaceae	<i>Sida</i>	<i>spodochroma</i>					*
Myrtaceae	<i>Eucalyptus</i>	<i>celastroides</i>	*				*
Myrtaceae	<i>Eucalyptus</i>	<i>clelandii</i>				*	*
Myrtaceae	<i>Eucalyptus</i>	<i>griffithsii</i>	*			*	
Myrtaceae	<i>Eucalyptus</i>	<i>salmonophloia</i>					*
Myrtaceae	<i>Eucalyptus</i>	<i>salubris</i>					*
Myrtaceae	<i>Melaleuca</i>	aff. <i>pauperiflora</i>	*	*			
Myrtaceae	<i>Melaleuca</i>	<i>lateriflora</i>	*		*		
Pittosporaceae	<i>Pittosporum</i>	<i>angustifolium</i>		*			*
Poaceae	<i>Austrostipa</i>	<i>elegantissima</i>		*		*	
Poaceae	<i>Austrostipa</i>	<i>nitida</i>				*	*
Poaceae	<i>Enneapogon</i>	<i>caerulescens</i>					*
Poaceae	<i>Eragrostis</i>	<i>dielsii</i> (A)		*			

Family	Genus	Species	Very open tree mallee of <i>E. celastroides</i> / <i>E. griffithsii</i> over open low scrub <i>Allocasuarina helmsii</i> / <i>Melaleuca lateriflora</i> & dwarf shrub of <i>Scaevola spinescens</i>	Open low scrub of <i>Melaleuca</i> aff. <i>pauperiflora</i> over open low scrub <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> & open dwarf scrub of <i>Frankenia interioris</i> / <i>Tecticornia pergranulata</i>	Open scrub of <i>Acacia</i> sp. narrow phyllode (B.R. Maslin 7831) over open low scrub <i>Melaleuca lateriflora</i> & hummock grass of <i>Triodia scariosa</i>	Low woodland of <i>E. clelandii</i> over open scrub of <i>Acacia</i> sp. narrow phyllode (B.R. Maslin 7831) & dwarf scrub of <i>Scaevola spinescens</i>	Low woodland of <i>E. salmonophloia</i> over open scrub of <i>Casuarina pauper</i> & dwarf scrub of <i>Maireana sedifolia</i>
Poaceae	<i>Eragrostis</i>	<i>eriopoda</i>		*			
Poaceae	<i>Triodia</i>	<i>scariosa</i>	*		*	*	
Proteaceae	<i>Grevillea</i>	<i>acuaria</i>	*				
Rhamnaceae	<i>Cryptandra</i>	<i>aridicola</i>			*		
Santalaceae	<i>Exocarpos</i>	<i>aphyllus</i>	*		*	*	
Santalaceae	<i>Santalum</i>	<i>acuminatum</i>			*		
Santalaceae	<i>Santalum</i>	<i>spicatum</i>				*	
Sapindaceae	<i>Alectryon</i>	<i>oleifolius</i>					*
Sapindaceae	<i>Dodonaea</i>	<i>lobulata</i>	*	*			*
Sapindaceae	<i>Dodonaea</i>	<i>stenozyga</i>	*			*	
Sapindaceae	<i>Dodonaea</i>	<i>viscosa</i> subsp. <i>angustissima</i>	*	*			
Scrophulariaceae	<i>Eremophila</i>	<i>glabra</i>	*				*
Scrophulariaceae	<i>Eremophila</i>	<i>interstans</i> subsp. <i>virgata</i>		*			*
Scrophulariaceae	<i>Eremophila</i>	<i>latrobei</i> subsp. <i>filiformis</i>			*		
Scrophulariaceae	<i>Eremophila</i>	<i>miniata</i>		*			*
Scrophulariaceae	<i>Eremophila</i>	<i>oldfieldii</i> subsp. <i>angustifolia</i>	*		*		
Scrophulariaceae	<i>Eremophila</i>	<i>parvifolia</i> subsp. <i>auricampa</i>	*				*
Scrophulariaceae	<i>Eremophila</i>	<i>pustulata</i>				*	
Scrophulariaceae	<i>Eremophila</i>	<i>scoparia</i>	*		*		*
Solanaceae	<i>Lycium</i>	<i>australe</i>		*			*
Solanaceae	<i>Solanum</i>	<i>lasiophyllum</i>		*	*		*
Solanaceae	<i>Solanum</i>	<i>nummularium</i>					*
Thymelaeaceae	<i>Pimelea</i>	<i>microcephala</i>					*
Zygophyllaceae	<i>Zygophyllum</i>	<i>eremaeum</i> (A)		*		*	

Appendix 4: DEC Threatened Flora Database search results within 20km of Golden Flag survey area (DEC, 2012a)

Species	Conservation Code
<i>Angianthus prostratus</i>	P3
<i>Eremophila praecox</i>	P1
<i>Ptilotus chortophytus</i>	P1

Appendix 5: Location of Priority species (GDA94) visited near the Golden Flag survey area

Species	Zone	Easting	Northing	No. of plants
<i>Ptilotus chortophytus</i> (P1)	51J	335016	6619112	30+

Appendix 6: Muir Life Form/Height Class (Muir, 1977).

LIFE FORM/HEIGHT CLASS	CANOPY COVER			
	DENSE 70% -100%	MID DENSE 30% -70%	SPARSE 10% -30%	VERY SPARSE 2% -10%
Trees > 30m Trees 15 – 30m Trees 5 – 15m Trees < 5m	Dense Tall Forest Dense Forest Dense Low Forest A Dense Low Forest B	Tall Forest Forest Low Forest A Low Forest B	Tall Woodland Woodland Low woodland A Low Woodland B	Open Tall Woodland Open Woodland Open Low Woodland A Open Low Woodland B
Mallee Tree Form Mallee Shrub Form	Dense Tree Mallee Dense Shrub Mallee	Tree Mallee Shrub Mallee	Open Tree Mallee Open Shrub Mallee	Very Open Tree Mallee Very Open Shrub Mallee
Shrubs > 2m Shrubs 1.5 – 2m Shrubs 1 – 1.5m Shrubs 0.5 – 1m Shrubs 0 – 0.5m	Dense Thicket Dense Heath A Dense Heath B Dense Low Heath C Dense Low Heath D	Thicket Heath A Heath B Low Heath C Low Heath D	Scrub Low Scrub A Low Scrub B Dwarf Scrub C Dwarf Scrub D	Open Scrub Open Low Scrub A Open Low Scrub B Open Dwarf Scrub C Open Dwarf Scrub D
Mat Plants Hummock Grass Bunch grass >0.5m Bunch grass < 0.5m Herbaceous spp.	Dense Mat Plants Dense Hummock Grass Dense Tall Grass Dense Low Grass Dense Herbs	Mat Plants Mid-dense Hummock Grass Tall Grass Low Grass Herbs	Open Mat Plants Hummock Grass Open Tall Grass Open Low Grass Open Herbs	Very Open Mat Plants Open Hummock Grass Very Open Tall Grass Very Open Low Grass Very Open Herbs
Sedges > 0.5m Sedges < 0.5m	Dense Tall Sedges Dense Low Sedges	Tall Sedges Low Sedges	Open Tall Sedges Open Low Sedges	Very Open Tall Sedges Very Open Low Sedges
Ferns Mosses, liverworts	Dense ferns Dense Mosses	Ferns Mosses	Open Ferns Open Mosses	Very Open Ferns Very Open Mosses

Appendix 7: Keighery Health rating scale (1994).

Health Rating	Health Description	Definition
6	Pristine	No obvious signs of disturbance
5	Excellent	Vegetation intact despite disturbance affect, weeds are non-aggressive individual species
4	Very Good	Vegetation altered due to obvious signs of disturbance
3	Good	Structure affected multiple disturbances. Retains basic structure, has ability to regenerate
2	Degraded	Structure severely disturbed. Can regeneration to good condition, but requires intensive management
1	Completely Degraded	Completely bare no native species