# CAPE PERON 2011
# GRACEFUL SUN MOTH SURVEY

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STRATEGEN

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**Date:** *8 July 2011*

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# STATEMENT OF LIMITATIONS

**Scope of Services**

This environmental site assessment report ("the report") has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and ENV.Australia Pty Ltd (ENV) ("scope of services"). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

**Reliance on Data**

In preparing the report, ENV has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise stated in the report, ENV has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. ENV will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to ENV.

**Environmental Conclusions**

In accordance with the scope of services, ENV has relied upon the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

On all sites, varying degrees of non-uniformity of the vertical and horizontal soil or groundwater conditions are encountered. Hence no monitoring, common testing or sampling technique can eliminate the possibility that monitoring or testing results/samples are not totally representative of soil and/or groundwater conditions encountered. The conclusions are based upon the data and the environmental field monitoring and/or testing and are therefore merely indicative of the environmental condition of the site at the time of preparing the report, including the presence or otherwise of contaminants or emissions. Also it should be recognised that site conditions, including the extent and concentration of contaminants, can change with time.

Within the limitations imposed by the scope of services, the monitoring, testing, sampling and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

**Report for Benefit of Client**

The report has been prepared for the benefit of the Client and no other party. ENV assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of ENV or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

**Other Limitations**

ENV will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

The scope of services did not include any assessment of the title to or ownership of the properties, buildings and structures referred to in the report nor the application or interpretation of laws in the jurisdiction in which those properties, buildings and structures are located.

# EXECUTIVE SUMMARY

ENV.Australia Pty Ltd (ENV) was commissioned by Strategen in February 2011 to undertake a Graceful Sun Moth (*Synemon gratiosa*) survey for the Cape Peron marina-based tourist precinct development. This survey was conducted to provide additional information on the species distribution and abundance of the Graceful Sun Moth following on from it being recorded on-site during the 2010 survey.

The surveys were conducted on four separate dates with a minimum of four days between each survey. All of the surveys were conducted in March, on warm days (28.2°C -34.4°C), between 10:00 am and 3:00 pm, with wind speeds well under the maximum of 5 m/s (1.5-1.7 m/s). Approximately 4.75 km of transects were completed across the project area. This survey has met the criteria set by the Department of Environment and Conservation in regards to Graceful Sun Moth surveys.

No Graceful Sun Moths were observed or caught during the current survey. The lack of records during the current survey has not allowed the species distribution and abundance to be further delineated from that of the 2010 GSM survey. Based on current knowledge of the species no conclusion can be drawn regarding the continued existence (or otherwise) or viability of a population at any particular site. The site will still be considered to constitute habitat for the Graceful Sun Moth.

# 1 INTRODUCTION

ENV.Australia Pty Ltd (ENV) was commissioned by Strategen in February 2011 to undertake a Graceful Sun Moth (GSM) survey for the Cape Peron marina-based tourist precinct development (herein referred to as the project area). The survey was carried out in accordance with the criteria set by the Department of Environment and Conservation (DEC) in relation to Graceful Sun Moth surveys (Bishop *et al.* 2010a). This survey was conducted to provide additional information on the species distribution and abundance of the GSM following on from the species being recorded on-site during the March 2010 survey.

## 1.1 OBJECTIVE

The objective of the GSM survey was to document the presence of the Graceful Sun Moth within areas previously identified as containing Lomandra maritima and/or GSM.

## 1.2 BACKGROUND INFORMATION

The Graceful Sun-moth (GSM) (*Synemon gratiosa*) is a small day-flying moth endemic to south-west Western Australia and distributed from Preston Beach in the south to Leeman in the north (Bishop *et. al*. 2010b).

The GSM is listed as Endangered under the Federal *Environment Protection and Biodiversity Conservation Act 1999*. It is declared specially protected fauna under the Western Australian *Wildlife Conservation Act 1950*, as it is rare or likely to become extinct.

The GSM is relatively small with a wingspan of 25-30 millimetres (mm). It is sexually dimorphic with the female being slightly larger than the males. Both sexes have dark grey upper surface of the forewings and bright orange on the upper surface of the hind wings and the entire underside of the wings (Plate 1).

**Plate 1:** Male and female Graceful Sun-moths. The male specimen is the top row and the larger female is the bottom row (Bishop, Williams and Gamblin 2009).

Adult GSM are active in late February to early April each year. The time when the adults are active seems to be different each year, possibly as a result of weather conditions. March, especially the first half, seems to be when the species is most active and abundantly recorded.

The larvae are only known to feed on two closely related species of *Lomandra* (mat-rushes) – *Lomandra maritima* and *L. hermaphrodita*. The adults lay their eggs on the base of the plants and when the larvae hatch they burrow into the leaf bases, growing tip and rhizomes where they pupate for the next eleven months.

The GSM is distributed along the coast of Western Australia from Leeman in the north to Preston Beach in the south (Bishop *et al.* 2010b). The greatest threat to this species is through habitat loss, as this region is experiencing urban development. Other factors that make the species' future uncertain are the ongoing threats of track maintenance, inappropriate fire regimes and damage to habitat from the recreational use of four wheel drive vehicles (Threatened Species Scientific Committee 2008).

## 1.3 LOCATION

The survey area is located approximately 39 km to the south-west of Perth's Central Business District in the Swan Coastal Plain region of Western Australia (Figure 1). The survey area lies within the suburbs of Peron and Shoalwater on the shores of Mangles Bay, Rockingham. The current survey focuses on sections that have been previously identified as containing *Lomandra maritima* (Figure 2).

## 1.4 CLIMATE

The climate of this region is warm Mediterranean, with an average maximum summer temperature of 29.4°C and an average minimum winter temperature of 10.6°C [Bureau of Meteorology (BOM) 2011]. The region receives an average annual rainfall of 748 mm, with the majority of precipitation occurring in winter (BOM 2011) (Figure 3).

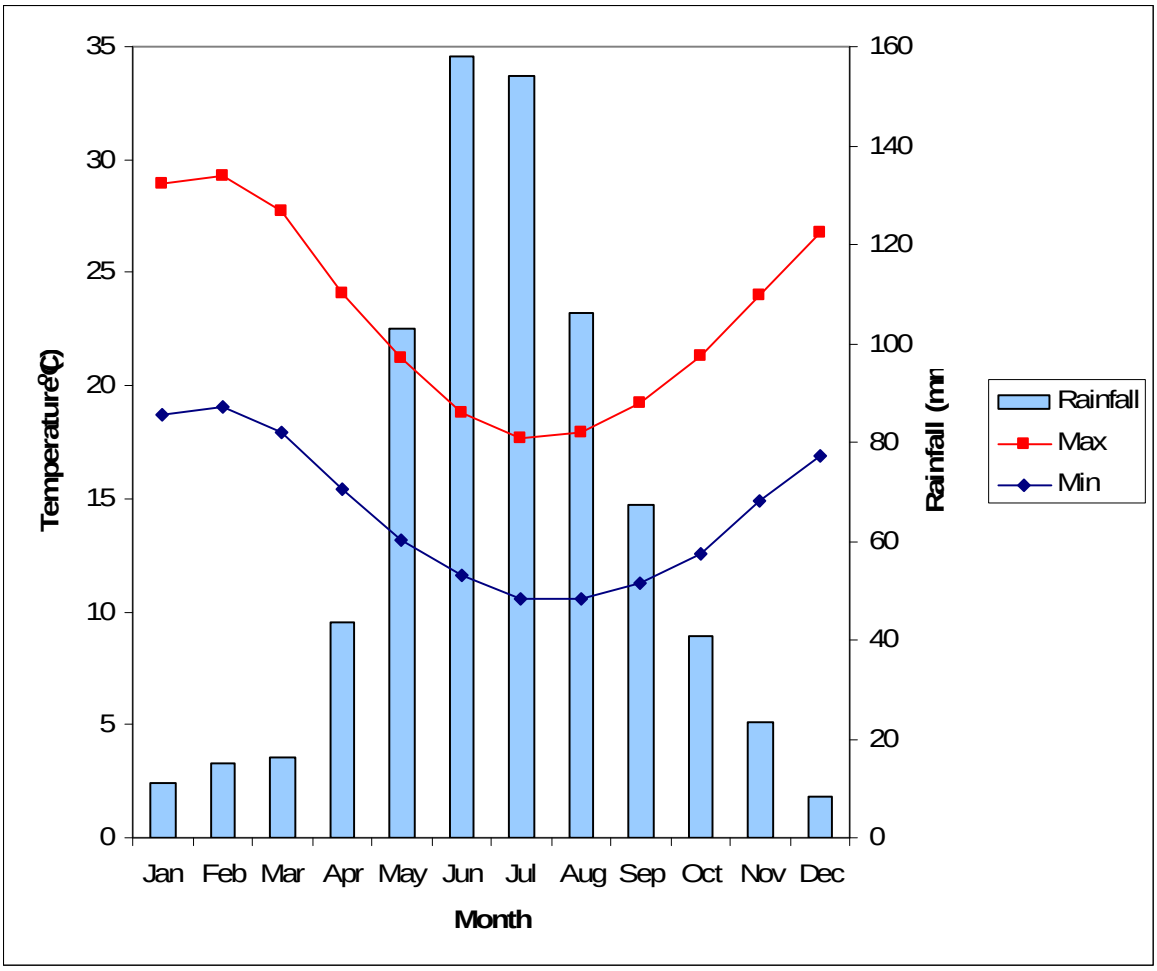


**Figure 3:** Average Monthly Rainfall and Maximum and Minimum Temperatures at Kwinana BP Refinery (1955-2011) (BoM 2011)

## 1.5 VEGETATION

In terms of flora and vegetation characteristics, the site is in the Darling Botanical District and in the Swan Coastal Plain Subregion in the Drummond Botanical Sub-district (Beard 1990). The Drummond Botanical Sub-district consists mainly of the following vegetation communities:

- *Banksia* Low Woodland on leached sands and *Melaleuca* Swamps in poorly-drained areas;
- Woodland of Tuart (*Eucalyptus gomphocephala*); and
- Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) on the less leached soils (Beard 1990).

The Graceful Sun Moth is known only to inhabit areas with two general vegetation types:

- ***Banksia* / Woolly Bush Woodland:** is the vegetation type associated with *Lomandra hermaphrodita* and occurs in the deep sands around the northern suburbs of Perth. *Lomandra hermaphrodita* tends to be found in low concentrations in this vegetation type (Bishop, Williams and Gamblin 2009).

- **Open areas of herbland, heathland and shrubland:** are the vegetation types associated with *Lomandra maritima* and they occur on Quindalup soils (sand and limestone) close to the coast. *Lomandra maritima* is often present in reasonable numbers and may even be a dominant understory herb (Bishop, Williams and Gamblin 2009).

# 2 METHODOLOGY

## 2.1 STATE LEGISLATION

### 2.1.1 Protection of Fauna and Fauna Habitat

Fauna species and their habitat are protected formally and informally by various legislative and non-legislative measures, which are outlined below.

***Legislative Protection***

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act): a Federal Act;
- *Wildlife Conservation Act 1950* (WC Act): a State Act; and
- *Environmental Protection Act 1986* (EP Act): a State Act.

**EPBC Act**

The EPBC Act aims to protect matters of national environmental significance, which are detailed in Appendix A. Under the EPBC Act, the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) lists protected species and Threatened Ecological Communities (TECs) by criteria set out in the Act. The GSM is classified as Endangered under the EPBC Act.

**WC Act**

The DEC lists taxa under the provisions of the WC Act as protected and are classified as Schedule 1 to Schedule 4 according to their need for protection (see Appendix A). The Act makes it an offence to 'take' threatened species without an appropriate licence. There are financial penalties for contravening the Act. The GSM is Schedule 1 under the WC Act.

**EP Act**

Significant habitat necessary for the maintenance of indigenous fauna species to Western Australia as well as TECs are given special consideration in environmental impact assessment, and have special status as Environmentally Sensitive Areas (ESAs) under the EP Act, and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Exemptions for a clearing permit do not apply in an ESA. In addition, habitat necessary for the maintenance of indigenous fauna is a clearing principle and assessed during consideration of applications for a NVCP.

## 2.2 SURVEY METHODOLOGY

### 2.2.1 Survey Guidelines

As the GSM is only present in certain circumstances the DEC has set criteria for how surveys are to be conducted (Bishop *et al.* 2010a).

**Time of year:** The DEC has specified that all GSM surveys are to be conducted from late February through to early April, with the first half of March being considered as peak flight period. This year, GSMs appeared earlier in the season, than in previous years (C. Bishop *pers. com.* DEC).

**Replication of surveys:** Due to the nature of the GSM it can be difficult to detect therefore, multiple surveys on a single site during the flight period are necessary. Findings from the 2009 GSM survey season suggest that GSMs occurring on sites containing coastal heathland are in higher numbers than those in *Banksia* woodland (Bishop *et al.* 2010a). The DEC has specified that at least four surveys are required for sites containing coastal heathland and at least six surveys for sites containing *Banksia* woodland, to ensure that the GSM is not present at a particular site. Surveys of a site must be undertaken with no less than four days in between each (M. Williams *pers. com.* DEC). As the GSM only has a life span of a few days it is important to obtain a sample of as many cohorts throughout the breeding period as possible. This is necessary to account for the timing variability in the cohorts as they may differ between sites.

**Time of day:** As the name suggests the GSM are active in warm sunny weather and prefer bright sunshine. Surveys must be conducted between 10 am and 3 pm as this is the time when they are most active.

**Wind speed:** The GSM may become inactive if the wind is too strong, above 18 kilometres per hour (km/h) or 5 metres per second (m/s). Consequently, surveys should be conducted prior to the sea breeze arriving.

**Locations to search:** GSMs do not disperse far in their life time so they are usually found close to their breeding areas or areas containing *Lomandra* spp. During each survey these were identified and targeted to increase the likelihood of observation. Male GSMs are territorial creating small territories called leks that are about 20 square metres and usually occur in cleared areas such as tracks and fire breaks. GSM males also seek out hilltops, crests and dunes. Therefore search techniques focus on areas containing combinations of higher densities of *Lomandra*, tracks, fire breaks and hillcrests (Bishop *et al.* 2010b). Once GSMs have been detected on a site, the remaining surveys should focus on determining the relative distribution across the site for use in future decision making.

**Transect procedure:** The DEC has specified a set way to conduct GSM surveys based on the standard butterfly walk transect method. This is seen as the most effective way to survey for the presence of GSMs. The transect route is to be established using aerial

photos of the site including areas that are likely to contain GSM such as containing a high density of *Lomandra*, tracks, firebreaks or hill crests. A transect is walked at a steady pace by one or more individuals and any GSM observed or caught five metres (m) either side of the track is recorded. Each transect was split into smaller sections of 100 m to make the details easier to record.

The length of transect required to sufficiently sample each site was able to be calculated by the following formula specified by the DEC:

- Transect length in km = 0.7 x square root (area in ha).

# 3 SURVEY VARIABLES

As per *Guidance Statement 56* (EPA 2004), the limitations and constraints associated with a survey need to be documented. These variables are detailed in Table 1.

**Table 1:** Constraints Associated with the Graceful Sun Moth Survey

| Variable | Impact on Survey Outcomes |
|---|---|
| Experience levels/ Resources | The environmental scientists who executed the surveys are practitioners suitably qualified in their field. These environmental scientists have undertaken the DEC GSM training course.<br>• Matthew Love<br>• James Sansom<br>• Bridget Watkins<br>• Mike Brown<br>• Glen Murray<br>• Kellie McMaster<br>• Paula Arthur<br>• Kim Dennison<br>• Hayden Ajduk<br>• Peter Jobson |
| Scope: sampling methods and completeness | All parts of the survey have been completed in full and have been done to the standards required by the DEC. |
| Timing, weather, season. | The GSM transect surveys were all conducted in the month of March. All survey conditions were within the required standards set by the DEC (Table 2). |
| Disturbances. | There were no disturbances that impacted execution of the survey. |

# 4 RESULTS

## 4.1 TIMING OF SURVEY

The GSM transect surveys were conducted on the 4th, 9th, 14th and 22nd of March 2011. This timing meets the DEC requirements for the surveys to be conducted during late February to early April and with a minimum of four days separation between survey events.

## 4.2 GSM OBSERVATIONS

During the 2010 GSM survey *Lomandra maritima* was recorded in a number of parcels of vegetation and three GSM were recorded in the project area (ENV 2010). These areas were the focus of the current survey in an effort to provide additional information on GSM distribution and abundance within the project area.

The existing tracks within the project area were the focus of the transects as these were where the GSMs were previously recorded and are likely positions for leks. Approximately 4.75 km of transects were completed across the project area (Figure 4).

The weather conditions for each of the survey dates are recorded in Table 2. All of the conditions are within the criteria set by the DEC, as explained in Section 2.3. Surveys needed to be conducted in March between 10 am and 3 pm, have wind speeds under 5 m/s and have a warm sunny climatic condition. These criteria were met on each of the survey dates and a minimum of four days break between survey dates was adhered to.

**Table 2:** Weather Conditions during the Graceful Sun Moth Surveys

| Date | Time | %Cloud Cover | Average Temperature | Average Wind Speed (m/s) | Wind Direction |
|---|---|---|---|---|---|
| 4/03/2011 | 10:05 am - 11:40 am | 10 % | 33.6°C | 1.6 | SE |
| 9/03/2011 | 10:05 am - 11:40 am | clear | 28.2°C | 1.7 | SE |
| 14/03/2011 | 10:40 am - 11:45 am | clear | 34.4°C | 1.5 | N |
| 22/03/2011 | 10:20 am - 12:10 pm | 5% | 31.6°C | 1.5 | NW |

During the four days of surveys there were no GSM observed or captured in the project area.

## 4.3 *LOMANDRA* DENSITY SUMMARY

The current survey did not contain any *Lomandra* density surveys as this information has been obtained during previous surveys (ENV 2010). In summary, a total of 205 quadrats were conducted in March 2010 and December 2010. The March 2010 survey involved broad scale *Lomandra* mapping where *Lomandra maritima* was found in 25% of the quadrats and varied in density between 0%- 50%. The December 2010 survey focused on areas in which *Lomandra* and GSM were recorded in the March 2010 survey. *Lomandra maritima* was recorded in 73% of the quadrats and also ranged in density from 0%- 50%.

*Lomandra* densities were found to vary significantly across the project area, they also vary significantly within the project area, with quadrats in close proximity to one another varying from 0%- 50% density. Consequently, fine scale mapping of *Lomandra* density cannot be undertaken and hence GSM habitat can be broadly, but not accurately defined. Indicative *Lomandra* density across the survey area is illustrated Figure 5.

# 5 SUMMARY AND CONCLUSION

The surveys were conducted on four separate dates with a minimum of four days between each survey. All of the surveys were conducted in March, on warm days (28.2°C -34.4°C), between 10:00 am and 3:00 pm and had wind speeds well under the maximum of 5 m/s (1.5-1.7 m/s). Approximately 4.75 km of transects were completed across the project area. This survey has met the criteria set by the Department of Environment and Conservation in regards to Graceful Sun Moth surveys.

No GSMs were observed or caught during the current survey.

The lack of GSM records during the current survey has not allowed the species distribution and abundance to be further delineated from that of the 2010 GSM survey. As such, there is currently insufficient knowledge to correlate the presence of GSMs with the extent of habitat at any given site. Although there were no GSM recorded during the current survey, the presence of GSMs at Cape Peron has been previously established, although conclusions regarding the size and extent of a population cannot currently be made. In the interim, habitat contiguous with that where GSM have been recorded containing Lomandra, should be treated as potential habitat. In addition, based on current knowledge of GSMs, no conclusion can be drawn regarding the continued existence (or otherwise) or viability of a population at any particular site. The site will still be considered to constitute habitat for the Graceful Sun Moth.

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# FIGURES


| | | | |
|---|---|---|---|
| CLIENT | | | JOB NO. |
| Strategen | | | 11-048 |
| AUTHOR: | DRAWN | | DATE |
| J Trainer | T Ellis | | 21-04-11 |
| SCALE | PROJECTION | | |
| 1:15,000@A4 | GDA94MGA50 | | |

# Site Location

Cape Peron 2011
Graceful Sun Moth Survey

FIGURE 1


CLIENT: Strategen
JOB NO.: 11-049
AUTHOR: J Trainer
DRAWN: T Ellis
DATE: 27-04-11
SCALE: 1:7,000 @A4
PROJECTION: GDA94MGA50

# *Lomandra maritima* Distribution

Cape Peron 2011
Graceful Sun Moth Survey

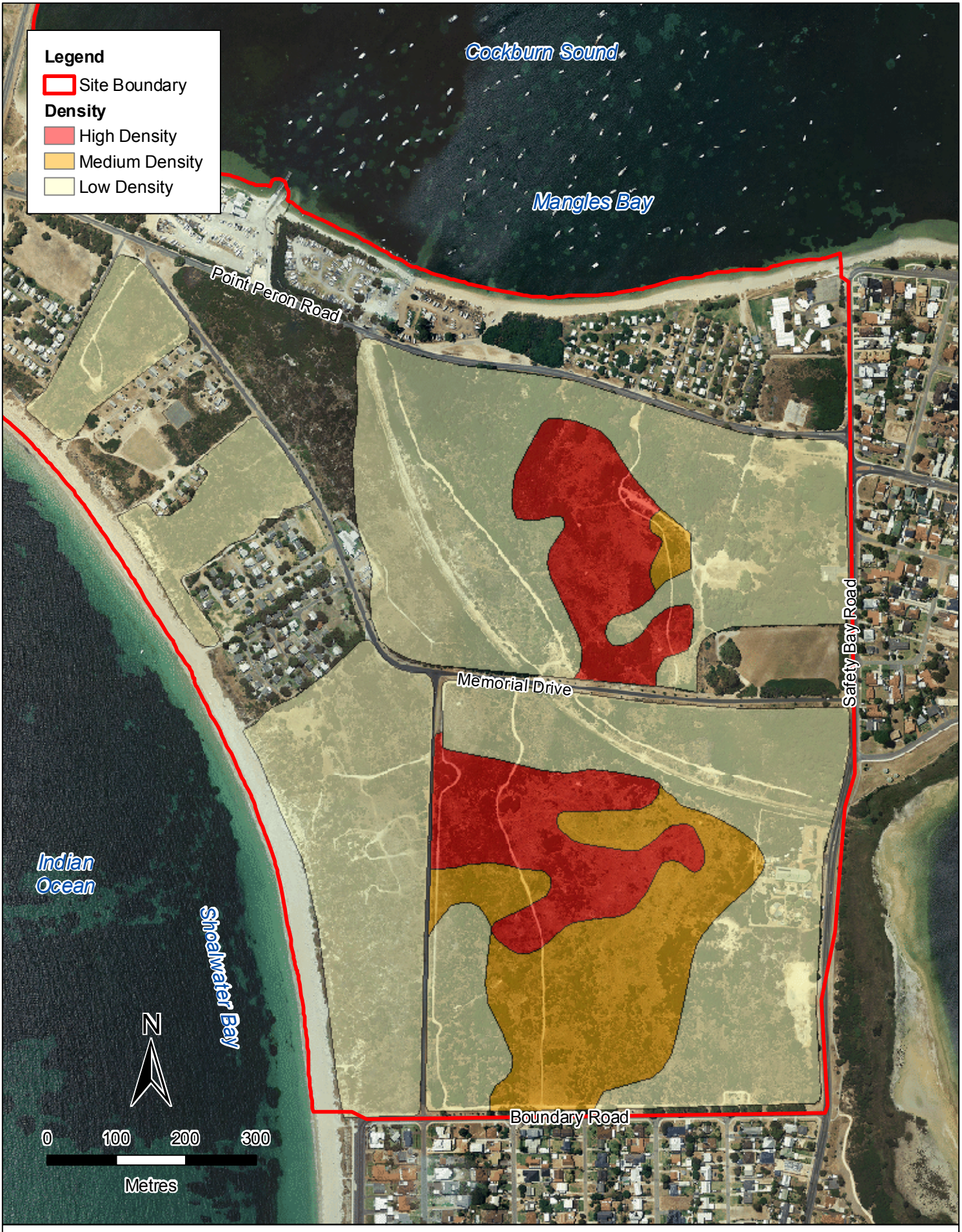
FIGURE 2


CLIENT: Strategen
JOB NO.: 11-049
AUTHOR: J Trainer
DRAWN: T Ellis
DATE: 27-04-11
SCALE: 1:7,000 @ A4
PROJECTION: GDA94MGA50

# Graceful Sun Moth Transects

Cape Peron 2011
Graceful Sun Moth Survey

FIGURE 4




CLIENT: Strategen
JOB NO.: 11-049
AUTHOR: J Trainer
DRAWN: T Ellis
DATE: 27-04-11
SCALE: 1:7,000 @ A4
PROJECTION: GDA94MGA50

# Summary of *Lomandra maritima* Densities

Cape Peron 2011
Graceful Sun Moth Survey

FIGURE 5

# APPENDIX A

# DEFINITIONS OF CONSERVATION CODES FOR FAUNA OF CONSERVATION SIGNIFICANCE

# CAPE PERON 2011 GRACEFUL SUN MOTH SURVEY

## APPENDIX A

## DEFINITIONS OF CONSERVATION CODES FOR FAUNA OF CONSERVATION SIGNIFICANCE

### *Environment Protection and Biodiversity Conservation Act 1999* (*Cth*): Threatened Species and Threatened Ecological Communities Codes

The EPBC Act prescribes seven matters of national environmental significance:-

- World Heritage properties;
- National Heritage places;
- Wetlands of international importance;
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

Species in the categories ExW, CE, E, V and M (see below), and *Threatened Ecological Communities* in the CE and E categories are protected as matters of national environmental significance under the EPBC Act.

| Category | Code | Category |
|---|---|---|
| **Extinct** | **Ex** | Taxa for which there is no reasonable doubt that the last member of the species has died. |
| **Extinct in the Wild** | **ExW** | Taxa known to survive only in cultivation, in captivity or as a naturalised population well outside its past range; or not recorded in its known and/or expected habitat at appropriate seasons anywhere in its past range despite exhaustive surveys over a timeframe appropriate to its life cycle and form. |
| **Critically Endangered** | **CE** | Taxa facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria. |
| **Endangered** | **E** | Taxa not critically endangered and facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria. |
| **Vulnerable** | **V** | Taxa not critically endangered or endangered and facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria**.** |

| Category | Code | Category |
|---|---|---|
| **Conservation Dependent** | **CD** | Taxa which are the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within five years. |
| **Migratory** | **Mi** | Taxa that migrate to Australia and its external territories, or pass through or over Australian waters during their annual migrations, that are included in an international agreement approved by the Minister for the Environment, Heritage and the Arts and that have been placed on the national List of Migratory Species under the provisions of the EPBC Act. At present there are four such agreements:<br>• the Bonn Convention<br>• the China-Australia Migratory Bird Agreement (CAMBA)<br>• the Japan-Australia Migratory Bird Agreement (JAMBA)<br>• the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) |
| **Marine** | **Ma** | Taxa protected in a Commonwealth Marine Protected Area by virtue of section 248 of the EPBC Act. These taxa include certain seals, crocodiles, turtles and birds, as well as various marine fish.<br>Commonwealth marine areas are matters of national environmental significance under the EPBC Act.<br>An action will require approval if the:<br>• action is taken in a Commonwealth marine area and the action has, will have, or is likely to have a significant impact on the environment, or<br>• action is taken outside a Commonwealth marine area and the action has, will have, or is likely to have a significant impact on the environment in a Commonwealth marine area[1]<br>The Commonwealth marine area is any part of the sea, including the waters, seabed, and airspace, within Australia's exclusive economic zone and/or over the continental shelf of Australia, that is not State or Northern Territory waters.<br>The Commonwealth marine area stretches from 3 to 200 nautical miles (approximately 5-370 km) from the coast. Marine protected areas are marine areas which are recognised to have high conservation value. |

## Western Australian Threatened Fauna Categories

### *Wildlife Conservation Act 1950* (WA)

| Category | Code | Description |
|---|---|---|
| Schedule 1 | S1 | Rare or likely to become extinct. |
| Schedule 2 | S2 | Presumed extinct. |
| Schedule 3 | S3 | Birds subject to an agreement between the governments of Australia and Japan, the People's Republic of China & the Republic of Korea relating to the protection of migratory birds and birds in danger of extinction. |
| Schedule 4 | S4 | Other specially protected fauna. |

## Department of Environment and Conservation Fauna Priority Codes

| Category | Code | Description |
|---|---|---|
| Priority 1 | P1 | Taxa with few, poorly known populations on threatened lands. |
| Priority 2 | P2 | Taxa with few, poorly known populations on conservation lands. |
| Priority 3 | P3 | Taxa with several, poorly known populations, some on conservation lands. |
| Priority 4 | P4 | Taxa in need of monitoring: not currently threatened or in need of special protection, but could become so.<br>Usually represented on conservation lands. |
| Priority 5 | P5 | Taxa in need of monitoring: not considered threatened, but the subject of a specific conservation program, the cessation of which would result in the species becoming threatened within five years. |