CAPE PERON GRACEFUL SUN MOTH SURVEY

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STRATEGEN

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Content Review:	*Teresa Gepp*
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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 was commissioned by Strategen in March 2010 to undertake a survey for the Graceful Sun Moth (*Synemon gratiosa*) for the Mangles Bay area of Cape Peron, Rockingham ('survey area'). The survey was carried out in accordance with the criteria set by the Department of Environment and Conservation in relation to Graceful Sun Moth surveys.

The surveys for the presence of individual Graceful Sun Moths were conducted on four separate dates with a minimum of four days between each survey. All of the surveys were conducted in March, during warm days (24.2°C - 35.2°C), between 10:00 am to 3:00 pm and had wind speeds well under the maximum of 5 metres/second (1.41 – 2.48 metres/second).

One hundred and thirty five quadrats were established within the project area to document the presence of the mat-rushes *Lomandra species*. This number was deemed sufficient to accurately sample the project area due to the disjunct nature of the vegetation on site. *Lomandra maritima* was found only in the eastern section of the survey area in varied densities, ranging from 0% - 50%. The Graceful Sun Moth transects involved approximately 5.75 km. These transects were focused on the areas most likely to contain Graceful Sun Moths including paths and vegetation containing *Lomandra species*.

A total of three Graceful Sun Moths were recorded in the survey area, one within the eastern portion of the project area and the other two in the adjoining bushland directly to the south.

1 INTRODUCTION

ENV.Australia Pty Ltd was commissioned by Strategen in March 2010 to undertake a Graceful Sun Moth (GSM) survey for the Mangles Bay area of Cape Peron, Rockingham (herein referred to as the STET area). The assessment was to be undertaken as part of the concept planning process for the development of the marina-based tourist precinct. The survey was carried out in accordance with the criteria set by the Department of Environment and Conservation (DEC) in relation to GSM surveys (Bishop, William, and Gamblin 2009).

1.1 OBJECTIVES

The objectives of the GSM survey were to:

- document the presence of the GSM within the project area; and
- conduct a *Lomandra species*. density assessment of the project area.

1.2 BACKGROUND INFORMATION

The GSM (*Synemon gratiosa*) is a small day-flying moth endemic to south-west Western Australia and has a limited distribution. It is currently only known from the Swan Coastal Plain between Quinns Rocks and Mandurah. Within this distribution it is known from a few of sites, most of which are isolated pockets of bushland in developed areas (Bishop, Williams and Gamblin 2009).

The GSM is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999.* It is declared specially protected fauna under the *WA 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). They are 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 *Lomandra 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 has a restricted distribution much of which is found on the Swan Coastal Plain in the Perth metropolitan area. The greatest threat to this species is through habitat loss as this region is experiencing extensive urban development. The GSM has limited dispersal ability and so each population is essentially genetically isolated. Other factors that make the GSMs 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).

DEC guidelines indicate that for proposals that occur in the known distribution of both the GSM and the two species of *Lomandra*, a GSM survey is required prior to development.

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) and lies within the suburbs of Peron and Shoalwater on the shores of Mangles Bay, Rockingham. The survey area includes the Core Project Area for the Cape Peron marina-based tourist

precinct development (impact area) (Figure 2) and surrounding bushland with similar habitat potential.

1.4 CLIMATE

The climate of this region is warm Mediterranean, with an average maximum summer temperature of 28.3°C and an average minimum winter temperature of 10.9°C (Bureau of Meteorology (BoM) 2010). The region receives an average annual rainfall of 748.8 mm, with the majority of precipitation occurring in winter (BOM 2010). (Figure 3)

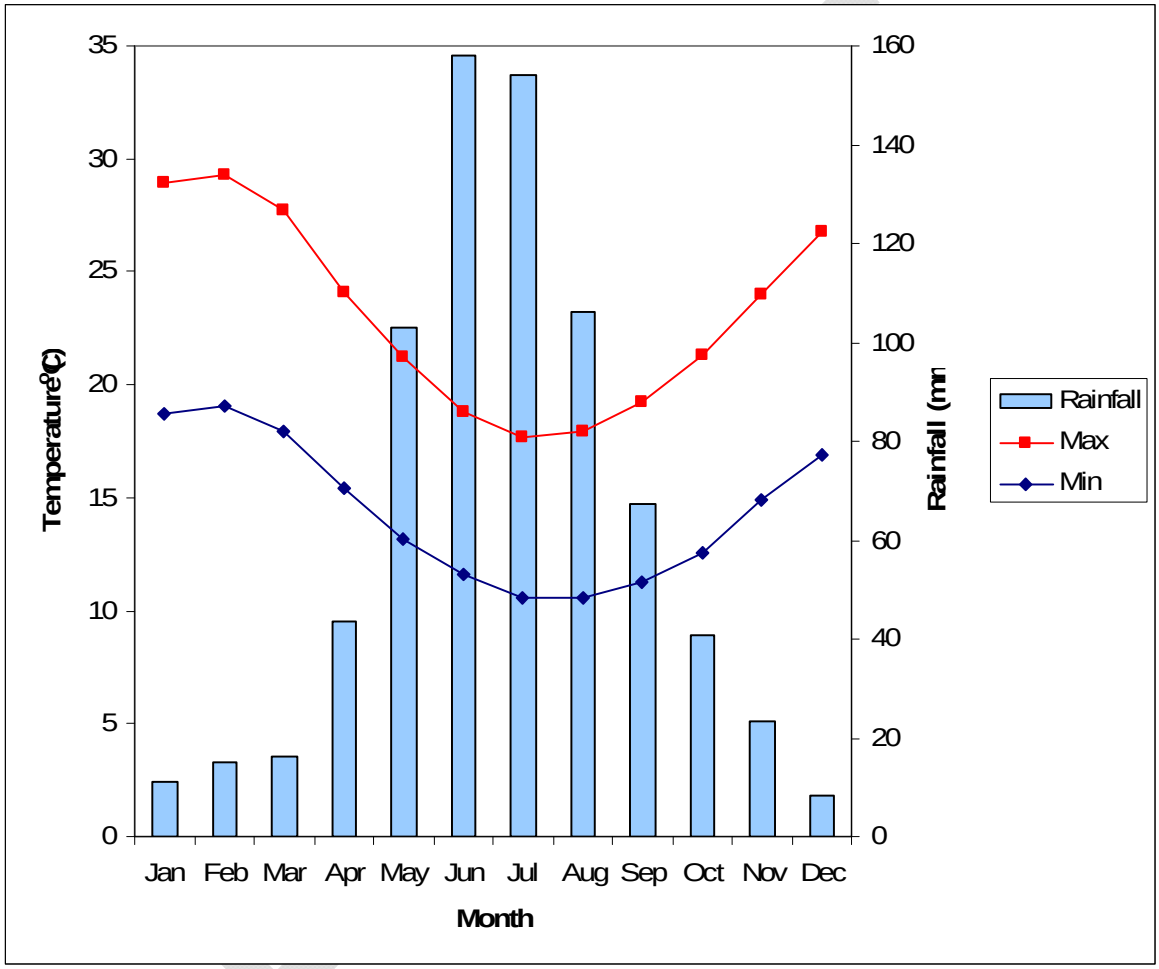

Figure 3: Average Monthly Rainfall and Maximum and Minimum Temperatures at Kwinana BP Refinery (1955-2010) (BoM 2010)

1.5 VEGETATION

In terms of flora and vegetation characteristics, the site is in the Darling Botanical District and in the Swan Coastal Plain Sub region 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).

ENV.Australia Pty Ltd has previously completed a level 2 flora (ENV 2010a) and fauna survey (ENV 2010b) of the same Cape Peron project area. As part of the flora survey it was found that *Lomandra maritima* was present only in certain sections of the project area. The *Lomandra* was limited to the large area of bushland to the east of the impact area and the adjacent bushland to the south. As part of the fauna survey a *Lomandra* density assessment was completed in the impact area (ENV 2010b). The findings of this survey concluded that the project area contained suitable habitat for the GSM and that a GSM survey was required.

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 Environment, Water, Heritage and the Arts (DEWHA) lists protected species and Threatened Ecological Communities (TEC's) by criteria set out in the act (Commonwealth of Australia 2007). 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 WC Act. The GSM is Schedule 1 under the WC Act.

EP Act

The protection of 'significant habitats' in terms of such indigenous Fauna species to Western Australia is a 'clearing principle' for assessing applications for permits to clear native vegetation.

2.2 SURVEY METHODOLOGY

As the GSM is only present in certain circumstances the DEC has set criteria for how surveys are to be conducted and these are outlined below (Bishop, Williams and Gamblin 2009).

Timing: The DEC has specified that all GSM surveys are to be conducted in late February and in March. Although GSMs have been previously recorded from late February to early April, the first half of March is the peak flight period. Only surveys conducted in late February and all of March can provide sufficient information to determine that the GSM is not present at a particular site.

Replication: 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. The DEC has specified that at least four surveys are required 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 required to access the 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 the GSM 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). In March each afternoon, surveys should be conducted prior to the sea breeze arriving.

2.2.1 Sun Moth Transects

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* sp. 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 (m^2) 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 higher densities of *Lomandra*, tracks, fire breaks and hillcrests (Bishop, Williams and Gamblin 2009).

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 following areas that are likely to contain GSM. Transect are 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. Transect are 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 calculated by the following formula as per DEC guidelines:

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

2.2.2 *Lomandra* Species Density

The aim of the *Lomandra* surveys was to determine the density of *Lomandra* at each site and the conditions that may give an indication to *Lomandra* site preference (and hence GSM habitat). Each site was surveyed using 2x2 m quadrats (area of 4 metres square) spaced 50 m apart. A summary of the total number of quadrats required according to the size of the site or habitat area is presented in Table 1 (Bishop, Williams and Gamblin 2009). Quadrats were conducted along a minimum of three transects across the survey area. Each transect starts at a corner of the project area and radiates out at equal angles. For larger or irregularly shaped areas more than one corner may be used to ensure adequate coverage of each site.

Table 1: Quadrat to Area Ratio.

Site Area	Approximate Number of Quadrats
<10 ha	30
11 to 20 ha	60
21 to 50 ha	120
51 to 100 ha	300

The two species of *Lomandra* the GSM utilises can be similar in appearance. Table 2 shows the defining features of each. *Lomandra hermaphrodita* tends to be associated with areas containing Bansksia / Woolly bush Woodlands and is found in low densities. *Lomandra maritima* is found in coastal areas and grows in clumps, usually in higher densities (Bishop, Williams and Gamblin 2009).

Table 2: Differences Between *Lomandra maritima* and *Lomandra hermaphrodita.*

	Lomandra maritima	*Lomandra hermaphrodita*
Shape and Form	Plants consist of several plantlets forming small tufts – generally uniform in size	Spreading clumps of variable size
Old leaves	Spiraled and red-brown in colour	Spiraled and straw coloured
Leaf length	150 - 450 mm	300 - 600 mm
Leaf width	1 - 2 mm	1 - 2 mm
Leaf base margin	Pale brown, pink or purple, splitting into fibres	White or pale grey, splitting into fibres
Location	Sandy soil on coastal plain and lateritic soil on the Darling Range, growing throughout the Perth region	Sandy soils near the coast. Geraldton to Bunbury

	Lomandra maritima	*Lomandra hermaphrodita*
Density	Often present in reasonable numbers and may even be a dominant understory herb	Tends to be found in low concentrations

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 3.

Table 3: 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. • John Trainer - GSM and *Lomandra* surveys • Mike Brown - GSM and *Lomandra* surveys • Georgia Scott - GSM and *Lomandra* surveys • Kim Dennison - GSM and *Lomandra* surveys • Paula Arthur - GSM survey • Filamena Black - GSM survey • Elaine Chua - GSM survey • Matthew Love - GSM survey • Peter Jobson - GSM survey • Emmanuelle Svartz - GSM survey • Glen Murray - GSM survey
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 (Bishop, Williams and Gamblin 2009).
Timing, weather, season.	The GSM transect surveys and *Lomandra* density surveys were all conducted in the month of March. All survey conditions were within the required standards set by the DEC (Table 4).
Disturbances.	There were no disturbances that impacted the survey.

4 RESULTS

4.1.1 Timing of Survey

The GSM transect surveys were conducted on the 6, 11, 16 and 25 March. The *Lomandra* survey was conducted on the 10 March and 8 April. This meets the DEC requirements for the GSM transects to be conducted during late February and March.

4.1.2 GSM Observations

The project area is approximately 254 ha in size although only certain sections were deemed suitable GSM habitat, including vegetated areas that have paths that could be used by male GSM as leks and areas that contained the highest density of *Lomandra* (Figure 4). These sections of suitable habitat are referred to as the survey area and are approximately 65.1 ha in size. By using the formula specified in Section 2.2, this equates to 5.6 km of transects required to accurately sample the survey area. The required length of transect was exceeded with 5.75 km of transects walked on each survey date. The location of the transects follows the paths and areas deemed likely to contain GSM (Figure 4).

The weather conditions for each of the survey dates are recorded in Table 4. All of the conditions are within the criteria set by the DEC, explained in Section 1.3. 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 4: Weather Conditions During the Graceful Sun Moth Surveys.

Date	Time	Cloud Cover (Percentage)	Average Temperature	Average Wind Speed (m/s)	Wind Direction
6/3/2010	10:20 am - 2:10 pm	clear	30.2˚C	1.46	E
11/3/2010	10:00 am - 1:00 pm	clear	35.2˚C	1.93	NE
16/3/2010	10:00 am - 1:01 pm	0-30%	24.2˚C	2.48	S
25/3/2010	10:30 am - 1:00 pm	70%	26.6˚C	1.41	SW

During the four days of surveys there were three GSM recorded in the survey area. All of these occurred along the existing paths in the survey area. One GSM was caught on the 6 March and this was given to the DEC at their request. The remaining 2 GSM were visually observed on the 6 and 11 March. The GSM that was observed on the 11 March

was the only GSM that was recorded within the impact area, where as the other two were recorded further south, their locations are recorded in Figure 5. The details of the recorded GSM are displayed in Table 5 and photographs of the GSM are located in Appendix B.

Table 5: Details of the Recorded Graceful Sun Moths.

Name	Date	Easting	Northing	Sex	Caught or Observed
GSM 1	6/03/2010	378149	6427224	Female	Caught
GSM 2	6/03/2010	378171	6427429	Female	Observed
GSM 3	11/03/2010	378354	6427793	Male	Observed

4.1.3 *Lomandra* Density

Due to the disjunct vegetation of the survey area, vegetated sections of ample size were surveyed for *Lomandra* density (Figures 6a-c) with the total area surveyed being 108 ha in size. One hundred and thirty five quadrats were conducted within the project area to give an accurate picture of the *Lomandra* density. The *Lomandra* density surveys were completed in the manner specified by the DEC (Bishop, Williams and Gamblin 2009). Quadrats were located 50 m apart along multiple transects radiating out from the corner sections of vegetation.

The species of *Lomandra* present at this site STET *Lomandra maritima*. During the previous flora survey (ENV 2010a) the vegetation of the project area was classified as ranging between Completely Degraded and Very Good condition with some disturbances in the form of paths, rubbish, surrounding developments, grazing by rabbits and weeds. Photos of the site are located in Appendix C.

As shown in Figures 6a-c the *Lomandra* is localised to the eastern portion of the project area. There was no *Lomandra* found in the western section (Cape Peron itself) of the project area (Figure 6a). Approximately 25% of the quadrats contained *Lomandra maritima* and the density ranged between 0%- 50%. The data for each quadrat is displayed in Appendix D.

5 DISCUSSION AND CONCLUSION

The surveys were conducted on four separate dates with a minimum of four days between each survey. All of the GSM transect surveys were conducted in March, on warm days (24.2°C -35.2°C), between 10:00 am to 3:00 pm and had wind speeds well under the maximum of 5 m/s. One hundred and thirty five quadrats were conducted for the *Lomandra* density survey, this was deemed sufficient to accurately sample the site. *Lomandra maritima* was found in varied densities (0%- 50%) across the project area. The GSM transects exceeded the DECs required transect length with 5.75 km of transects walked each survey date. The transects focused on the area most likely to contain Graceful Sun Moths, including paths and vegetation containing *Lomandra*. This survey meets the criteria set by the DEC in regards to Graceful Sun Moth surveys.

A total of three Graceful Sun Moths were recorded in the survey area, indicating that the site supports a population of GSM. The impact area for the proposed marina contains GSM habitat and this factor will need further consideration in the environmental impact assessment process.

There is currently insufficient knowledge to correlate the presence of GSMs with the extent of habitat at any given site. However the presence of GSMs at Cape Peron has been established, but conclusions regarding the size and extent of a population cannot be made.

The DEC is currently correlating data from 2010 GSM surveys undertaken both by the Department, consultancies and other interest groups. The data collected relates to vegetation condition and the density of *Lomandra* in order to determine if there is a correlation between these factors and the presence and/or numbers of GSMs recorded. Currently there is limited knowledge as to the density of *Lomandra* required to constitute GSM habitat and whether there is a need to define buffer zones around GSM locations.

Until additional information is released from the 2010 survey effort it is not possible to define the extent of suitable habitat and the extent of the potential constrain of GSM for the project area.

In the interim habitat contiguous with that where GSM have been recorded, containing *Lomandra* should be treated as potential habitat..

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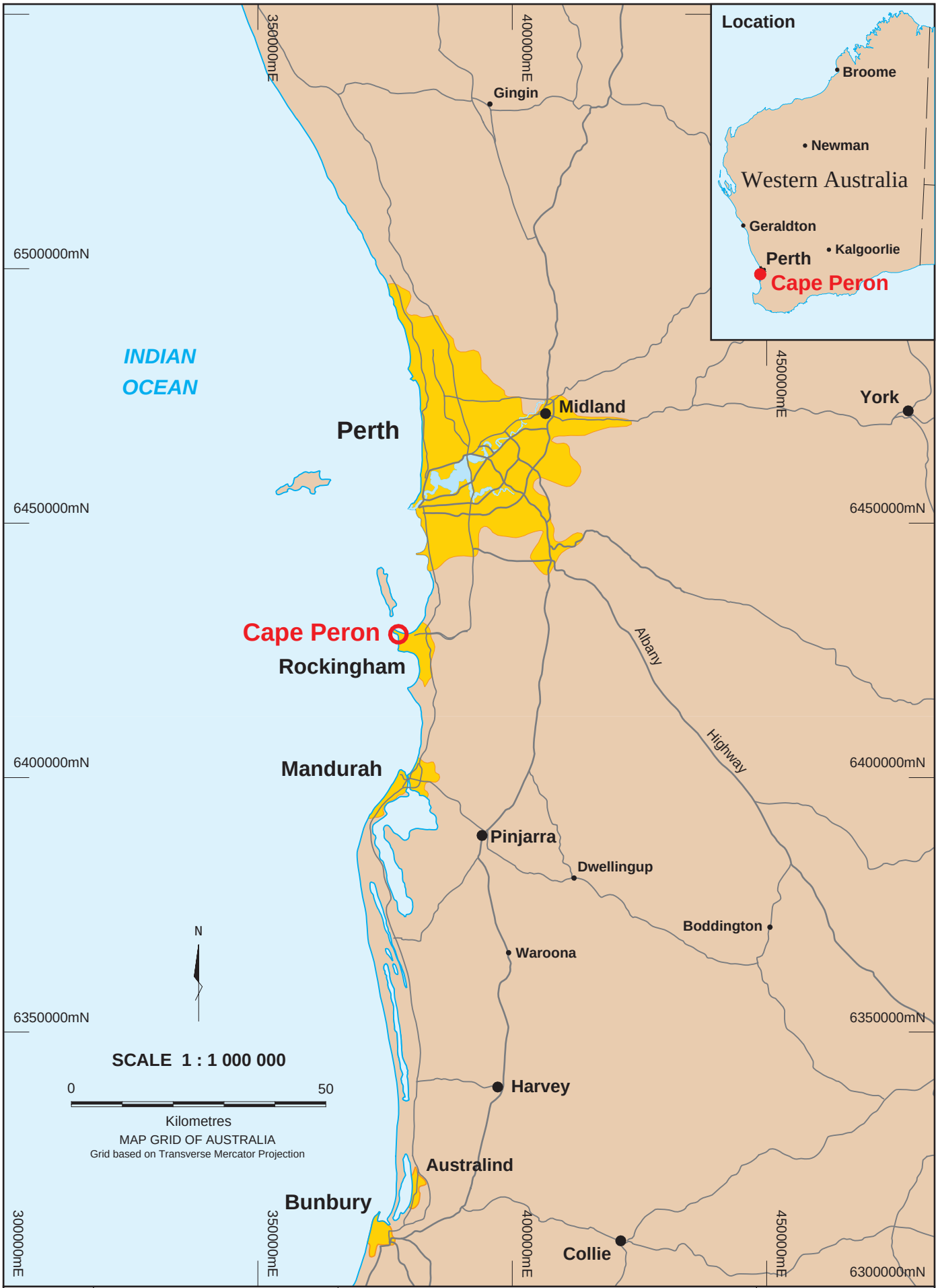
FIGURES



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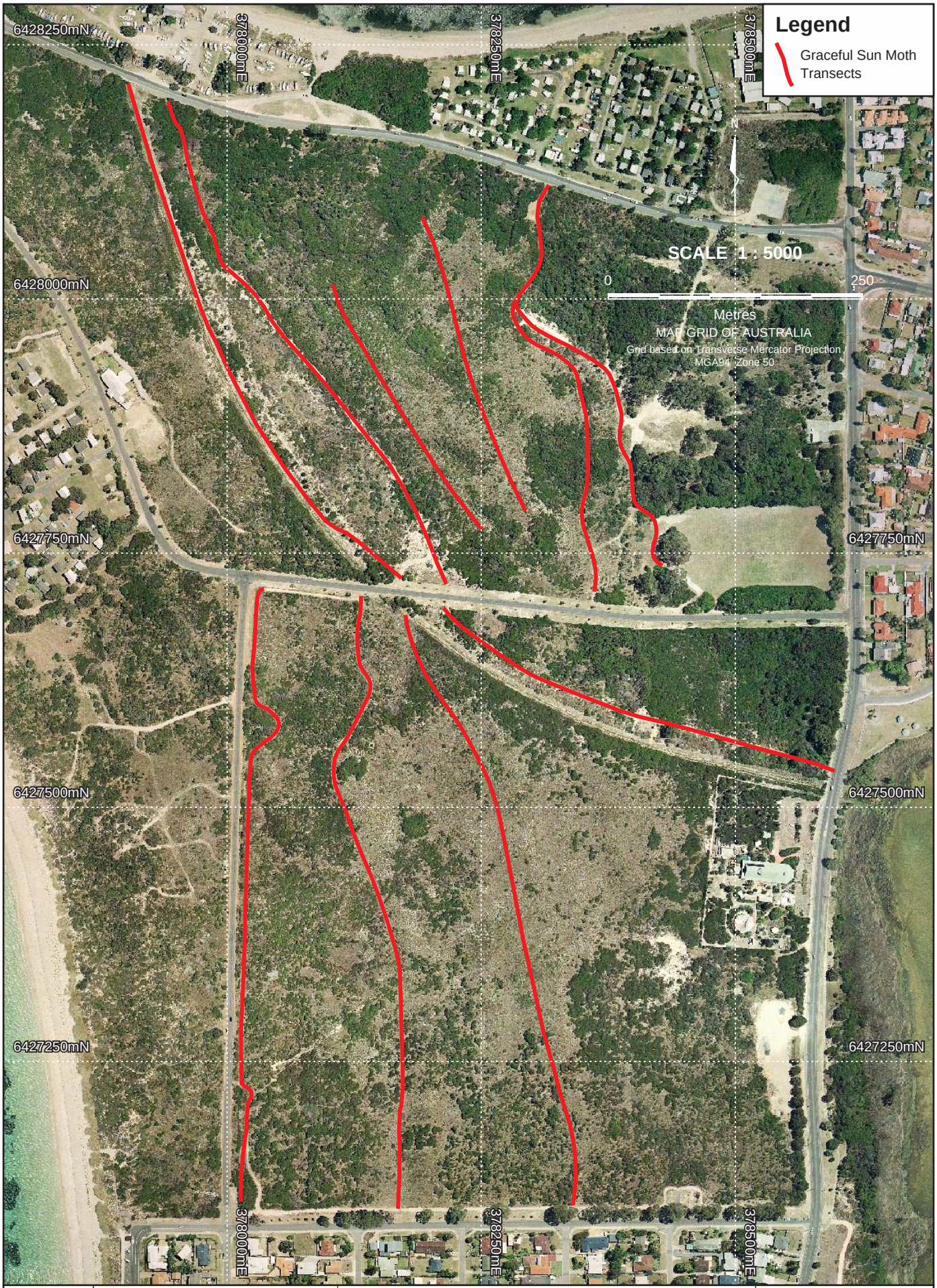
	Project: CAPE PERON GRACEFUL SUN MOTH SURVEY		Scale: 1:1 Million
			Author: J.T. / S.C.
			Figure No. 1
		10.049 A4	Plan No. CP-001

	env Australia	Author: J.Trainer	Client: STRATEGEN	SITE LOCATION	Date: 25 May 2010
		Drawn: S.Coleman	Project: CAPE PERON GRACEFUL SUN MOTH SURVEY		Scale: 1:12 000
		Status:			Figure No. 2
		Job Number: 10.049		A3	Plan No. CP-002



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	Project: CAPE PERON GRACEFUL SUN MOTH SURVEY		Scale: 1:5 000
			Author: J.T. / S.C.
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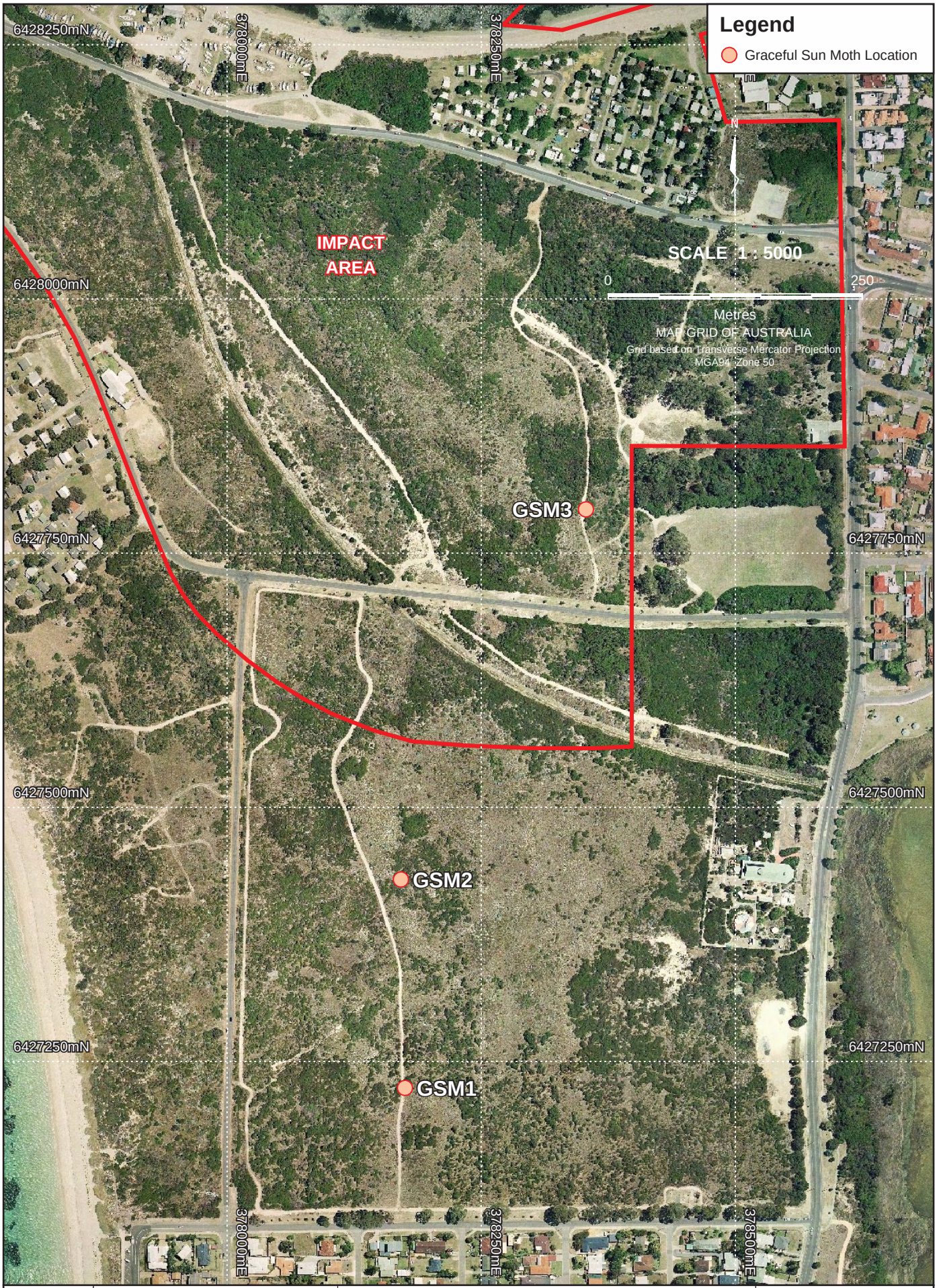

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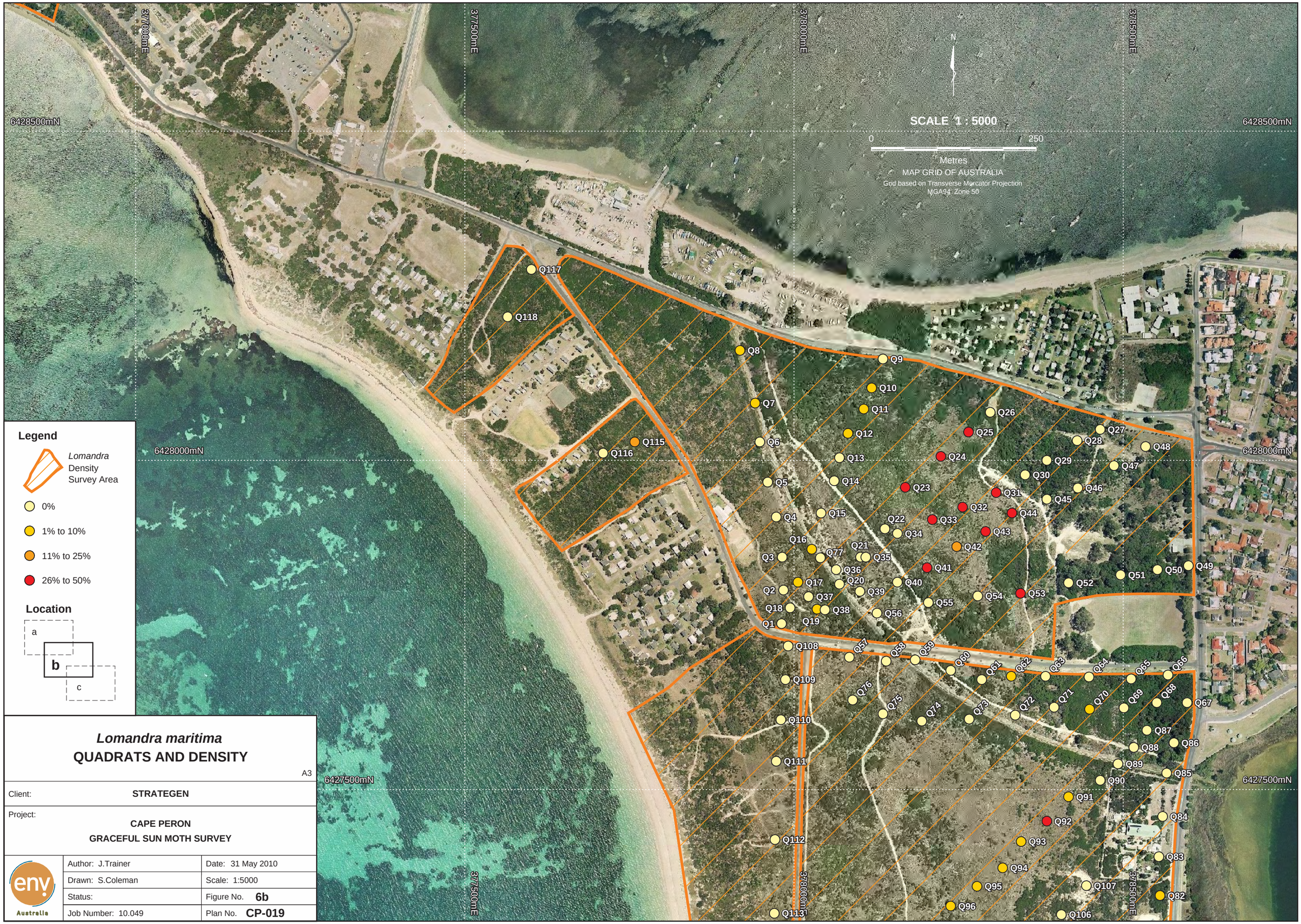
	Project: CAPE PERON GRACEFUL SUN MOTH SURVEY	GRACEFUL SUN MOTH LOCATIONS	Scale: 1:5 000
			Author: J.T. / S.C.
			Figure No. 5
		10.049 A4	Plan No. CP-017

Lomandra maritima
QUADRATS AND DENSITY

A3

Client:	**STRATEGEN**
Project:	**CAPE PERON** **GRACEFUL SUN MOTH SURVEY**

env Australia	Author: J.Trainer	Date: 31 May 2010
	Drawn: S.Coleman	Scale: 1:5000
	Status:	Figure No. **6a**
	Job Number: 10.049	Plan No. **CP-018**



Legend

Lomandra Density Survey Area

- 0%
- 1% to 10%
- 11% to 25%
- 26% to 50%

Location

a
b
c

Lomandra maritima
QUADRATS AND DENSITY

A3

Client:	**STRATEGEN**
Project:	**CAPE PERON** **GRACEFUL SUN MOTH SURVEY**

env Australia	Author: J.Trainer	Date: 31 May 2010
	Drawn: S.Coleman	Scale: 1:5000
	Status:	Figure No. **6b**
	Job Number: 10.049	Plan No. **CP-019**

Lomandra maritima

QUADRATS AND DENSITY

A3

Client:	**STRATEGEN**
Project:	**CAPE PERON** **GRACEFUL SUN MOTH SURVEY**

env Australia	Author: J.Trainer	Date: 31 May 2010
	Drawn: S.Coleman	Scale: 1:5000
	Status:	Figure No. **6c**
	Job Number: 10.049	Plan No. **CP-020**

APPENDIX A

DEFINITIONS OF CONSERVATION CODES FOR FAUNA OF CONSERVATION SIGNIFICANCE

CAPE PERON 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: • the Bonn Convention • the China-Australia Migratory Bird Agreement (CAMBA) • the Japan-Australia Migratory Bird Agreement (JAMBA) • 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. Commonwealth marine areas are matters of national environmental significance under the EPBC Act. An action will require approval if the: • 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 • 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] 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. 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. 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.

APPENDIX B

GRACEFUL SUN MOTH PHOTOGRAPHS

CAPE PERON GRACEFUL SUN MOTH SURVEY

APPENDIX B

GRACEFUL SUN MOTH PHOTOGRAPHS
Graceful Sun Moth 1: Female

APPENDIX C
SITE PHOTOGRAPHS

CAPE PERON GRACEFUL SUN MOTH SURVEY

APPENDIX C

SITE PHOTOGRAPHS

APPENDIX D

SUMMARY OF *LOMANDRA MARITIMA* IN THE PROJECT AREA

CAPE PERON GRACEFUL SUN MOTH SURVEY

APPENDIX D
SUMMARY OF *LOMANDRA MARITIMA* IN THE PROJECT AREA

Quadrat number	Easting	Northing	Percentage Cover of *Lomandra maritima*
Q1	377981	6427752	nil
Q2	377984	6427803	nil
Q3	377982	6427853	nil
Q4	377973	6427914	nil
Q5	377960	6427967	nil
Q6	377948	6428028	nil
Q7	377941	6428087	<6
Q8	377918	6428167	<6
Q9	378135	6428154	nil
Q10	378118	6428110	6
Q11	378106	6428078	<6
Q12	378082	6428041	6
Q13	378069	6428004	nil
Q14	378061	6427969	nil
Q15	378041	6427920	nil
Q16	378027	6427865	<6
Q17	378006	6427815	6
Q18	377994	6427776	nil
Q19	378035	6427774	<6
Q20	378069	6427812	nil
Q21	378101	6427853	nil
Q22	378138	6427896	nil
Q23	378169	6427959	<50
Q24	378223	6428006	50
Q25	378265	6428043	50
Q26	378298	6428073	nil
Q27	378465	6428047	nil
Q28	378430	6428030	nil
Q29	378384	6428000	nil
Q30	378351	6427978	nil
Q31	378307	6427951	<50
Q32	378256	6427929	<50
Q33	378210	6427910	50
Q34	378157	6427889	nil
Q35	378109	6427853	nil
Q36	378064	6427834	nil
Q37	378022	6427793	nil
Q38	378047	6427773	nil

Quadrat number	Easting	Northing	Percentage Cover of *Lomandra maritima*
Q39	378100	6427801	nil
Q40	378157	6427815	nil
Q41	378202	6427837	<50
Q42	378247	6427869	20
Q43	378291	6427892	50
Q44	378331	6427920	<50
Q45	378384	6427941	nil
Q46	378431	6427958	nil
Q47	378486	6427992	nil
Q48	378534	6428021	nil
Q49	378599	6427840	nil
Q50	378552	6427834	nil
Q51	378496	6427826	nil
Q52	378417	6427814	nil
Q53	378344	6427798	50
Q54	378279	6427794	nil
Q55	378204	6427784	nil
Q56	378126	6427768	nil
Q57	378084	6427701	nil
Q58	378140	6427695	nil
Q59	378184	6427697	nil
Q60	378238	6427681	nil
Q61	378285	6427667	nil
Q62	378330	6427672	10
Q63	378382	6427672	nil
Q64	378448	6427671	nil
Q65	378512	6427668	nil
Q66	378568	6427674	nil
Q67	378597	6427632	nil
Q68	378551	6427632	nil
Q69	378501	6427624	nil
Q70	378449	6427622	10
Q71	378395	6427625	nil
Q72	378336	6427613	nil
Q73	378266	6427607	nil
Q74	378194	6427604	nil
Q75	378135	6427615	nil
Q76	378089	6427636	nil
Q77	378040	6427852	nil
Q78	378555	6427112	nil
Q79	378566	6427164	nil
Q80	378556	6427215	nil
Q81	378554	6427274	nil
Q82	378556	6427339	5

Quadrat number	Easting	Northing	Percentage Cover of *Lomandra maritima*
Q83	environmental centre		nil
Q84	environmental centre		nil
Q85	378566	6427525	nil
Q86	378577	6427571	nil
Q87	378536	6427590	nil
Q88	378516	6427564	nil
Q89	378492	6427539	nil
Q90	378465	6427514	nil
Q91	378417	6427489	10
Q92	378384	6427452	30
Q93	378345	6427421	10
Q94	378317	6427381	5
Q95	378278	6427353	5
Q96	378238	6427323	5
Q97	378228	6427272	nil
Q98	378199	6427222	10
Q99	378148	6427203	10
Q100	378114	6427169	nil
Q101	378070	6427135	nil
Q102	378268	6427122	nil
Q103	378309	6427156	10
Q104	378338	6427204	15
Q105	378386	6427247	nil
Q106	378406	6427310	nil
Q107	378444	6427354	nil
Q108	377991	6427718	nil
Q109	377987	6427667	nil
Q110	377980	6427606	nil
Q111	377973	6427543	nil
Q112	377971	6427424	nil
Q113	377970	6427312	nil
Q114	377960	6427202	nil
Q115	377758	6428028	15
Q116	377710	6428011	nil
Q117	377601	6428290	nil
Q118	377565	6428218	nil
Q119	376843	6428704	nil
Q120	376729	6428791	nil
Q121	376401	6428898	nil
Q122	376387	6428965	nil
Q123	376380	6429037	nil
Q124	376359	6429136	nil

Quadrat number	Easting	Northing	Percentage Cover of *Lomandra maritima*
Q125	376282	6429218	nil
Q126	376210	6429238	nil
Q127	376369	6429221	nil
Q128	376419	6429176	nil
Q129	376459	6429108	nil
Q130	376594	6429050	nil
Q131	376643	6429010	nil
Q132	376574	6428997	nil
Q133	376518	6428964	nil
Q134	376476	6428925	nil
Q135	376354	6428876	nil