Settlers Ridge, South West Rocks

Technical Papers

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INTRODUCTION

This bundle of reports has been prepared to be read in conjuction with the Environmental Assessment for the Settlers Ridge Subdivision and Biobanking Concept Plan application.

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A ACCOUSTIC ASSESSMENT

Acoustic Assessment
For
Proposed Residential Subdivision

Lot 31 DP 754396, Lot 57 DP 1117398, & Lot 223 DP 754396

Steve Eagleton Drive
South West Rocks

Prepared For:

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7 September, 2012

1. INTRODUCTION

Hunter Acoustics has been engaged to conduct an assessment of the acoustic impacts of a proposed 154 lot subdivision and biodiversity bank at Steve Eagleton Drive, South West Rocks. The proposed development is described in drawings by RPS Australia East Pty Ltd, Drawing number 102457-15, Revision B, dated 23rd July 2012.

This report assesses the impact of noise associated with the proposed development in accordance with Item 10 of the Director General of Planning's requirements which are stated at as:-

> *The EA should address the potential noise impacts, in particular road traffic noise, for future residents and appropriate mitigation measures. The proposal must be designed, constructed, operated and maintained so that there are no adverse impacts arising from noise (including Traffic Noise.)*

This assessment has been conducted in accordance with relevant DECCW guidelines including, as necessary, the Environmental Criteria for Road Traffic Noise (ECRTN), the Interim Construction Noise Guideline, NSW Industrial Noise Policy, and relevant Australian Standards including AS/NZS 2107 and AS 3671.

2. TERMS AND DEFINITIONS

dB(A) ..... Unit of sound pressure level, modified by the A-weighting network to represent the sensitivity of the human ear.

SPL..... The incremental variation of sound pressure from the reference pressure level expressed in decibels.

SWL (L_W) ..... Sound Power Level of a noise sources per unit time expressed in decibels from reference level $W_{O.}$

L_X ..... Statistical noise descriptor. Where (x) represents the percentage of the time for which the specified noise level is exceeded.

L_{eq}..... Equivalent continuous noise level averaged over time on an equivalent energy basis.

L_1 ..... Average Peak Noise Level in a measurement period.

L_{10} ..... Average Maximum Noise Level in a measurement period.

L_{90} ..... Average Minimum Noise Level in a measurement period.

L_{max} ..... Maximum Noise Level in a measurement period.

Background Noise Level..... Noise level determined for planning purposes as the one tenth percentile of the ambient L_{A90} noise levels.

P_O ..... Reference Sound Pressure for the calculation of SPL in decibels.

W_O..... Reference Sound Power for the calculation of SWL in decibels.

3. ACOUSTIC ISSUES

The proposed development is located on the western side of Gregory Street, which is the main access road to the South West Rocks Central Business District. The proposal provides access to the proposed subdivision lots along Steve Eagleton Drive via the roundabout at Gregory Street and then via local subdivision roads to the individual lots. Access is also available to the northern side of the proposed subdivision via Frank Cooper Street and then to Keith Andrews Avenue via Bruce Field Street, however the primary access will be via Steve Eagleton Drive.

The primary acoustic issue arising from the proposed development is the impact of noise from roadways on the amenity of the residents in the existing dwellings facing Steve Eagleton Drive and on the dwellings within the new subdivision area, that are affected by traffic noise from Gregory Street.

Construction noise and vibration associated with proposed subdivision and its associated roadways and services also needs to be considered under the Qualitative Assessment methodology set out in the DECCW Interim Construction Noise Guide and the relevant guidelines and standards for assessing vibration impacts on dwellings and human comfort.

4. DETERMINATION OF NOISE LEVELS AND CRITERIA.

4.1 EXISTING TRAFFIC NOISE LEVELS

Existing traffic noise levels were determined for traffic on Gregory Street by placing a data logger on the westerns side of the roadway a distance of approximately 6 metres from the kerb over the period 13th to 16th of December 2010. The logger measured existing traffic noise levels from traffic on Gregory Street and the location of the logger is shown in Figure 1 below. No logging was conducted on Steve Eagleton Drive as this is currently a No Through Road at the western end and traffic noise at the eastern end is controlled by noise from Gregory Street. The existing traffic noise levels for residences on Steve Eagleton Drive have been modelled based on exiting peak traffic flows.

Figure 1 Logger Location

4.2 TRAFFIC NOISE IMPACTS ON THE DEVELOPMENT

The DECCW has set out noise level criteria for residential dwellings in its document Environmental Criteria for Road Traffic Noise (ECRTN). Gregory Street is considered to be a sub-arterial road under the ECRTN classification while Steve Eagleton Drive is considered to be a Collector Road under the ECRTN classification.

The acceptable sound levels from traffic for residential façades have been taken from Table 1 of the ECRTN and are set out in Table 1 below along with the noise levels that have been measured on site and adjusted to the location of the most affected façade on the site.

Table 1 Traffic Noise Criteria and Current Noise Levels

Location	Development Type	Allowable		Existing Measured Noise Levels	
		Daytime 7 am – 10 pm	Nightime 10 pm – 7 am	Daytime 7 am – 10 pm	Night time 10 pm – 7 am
Dwellings affected by noise Gregory Street	New Residential Land Use affected by Arterial Traffic Noise	55 dB $L_{Aeq\ 15\ hr}$	50 dB $L_{Aeq\ 9\ hr}$	67 dB $L_{Aeq\ 15\ hr}$	56 dB $L_{Aeq\ 9\ hr}$
Dwellings affected by noise from Steve Eagleton Drive	Land Use Developments with the Potential to create additional traffic on collector road,	60 dB $L_{Aeq\ 1\ hr}$	55 dB $L_{Aeq\ 1\ hr}$	Not Measured	Not Measured

Australian Standard AS 3671 Acoustics - Road traffic noise intrusion - Building Siting and Construction requires the use of the recommended noise levels in Australian Standard AS/NZS 2107-2000 Acoustics - Recommended design sound levels and reverberation times for building interiors for the assessment of internal noise levels. The noise levels are to be assessed as an L_{Aeq} for the same sampling period as the traffic noise descriptor. For residential uses near major roads AS/NZS 2107-2000 recommends internal design sound levels for sleeping and recreational areas as shown in Table 2.

Table 2 Acceptable Internal Noise Levels

Use	Acceptable Level dB(A)	Maximum Level dB(A)
Work Areas	35	45
Living / Recreation Areas	35	45
Sleeping Areas	30	40

The levels in Table 2 have been set as a result of community studies that have shown that the “acceptable level” will not be found to be intrusive by the majority of people while the

"maximum level" is considered to be at the limit of what the majority of people will find acceptable.

Therefore, the design level used is the daytime traffic noise level with the target noise goals set at the acceptable levels.

5. METHODOLOGY

5.1 ROAD TRAFFIC NOISE ASSESSMENT

Road traffic noise impacts on the proposed development have been modeled in CadnaA environmental noise modelling software. CadnaA implements the CORTN traffic noise model and the Federal Highways TNM noise model both of which are accepted by the DECCW. A digital terrain model was constructed in CadnaA based on drawings of the sub division layout and topographic contours provided by Hopkins Consultants Pty Ltd. The drawing data was overlaid with a bitmap image from the department of lands SX Viewer to confirm the locations of existing residences and cadastral features. Relative levels for the centre line of Gregory Street and the embankment at the side of the road were established from a survey conducted by Peter Hadlow.

Peak traffic volumes for existing and post development traffic flows for Gregory Street and Steve Eagleton Drive were taken from the traffic report by Road Net Pty Limited. Hourly traffic volumes were obtained from Kempsey Shire Council for traffic counts conducted by Council on Gregory Street, north of the roundabout, in March 2010.

The daytime traffic noise levels were modeled in CadnaA for the peak hourly traffic volume for both existing conditions and post development conditions. Night time traffic noise levels were modeled based on Council's traffic count information from March 2010. The noise model was validated against the existing noise levels measured at the logger location.

Table 3 Model Validation

	Daytime $L_{Aeq15hr}$	Night Time L_{Aeq9hr}
Measured Noise Level	67	56
Predicted Noise level at logger location for 2010 conditions	68	56

A noise barrier was included in the model to control noise impacts on the proposed residences that adjoin Gregory Street and its height was iteratively adjusted until compliance with the ECRTN criteria was achieved at the location of the rear façade of a residence constructed on the lots that have exposure to Gregory Street Traffic noise. The rear façade of the residences was assumed to be 20 meters from the front boundary of the subdivided lots giving an allowance of 6 metres for a setback and 14 meters for the overall length of the dwelling.

6. RESULTS

6.1 TRAFFIC NOISE IMPACTS

Tables 3a and 3b give Peak hourly traffic flows and predicted received traffic noise levels at the façades of affected dwellings for the highest traffic hourly traffic flow compared with the ECRTN criteria. The daytime traffic flows produce relatively constant noise over the day and the traffic noise from Gregory Street varies only slightly over the daytime period 7am to 10pm. The noise barrier has been designed to achieve compliance at the residential façade for peak traffic flow conditions post development completion.

Table 3a Peak Hourly Traffic Flows and Façade Noise Levels on Gregory Street

Year	am	pm	Predicted Worst Period Traffic Noise Level		Predicted Worst Period Traffic Noise Level	
			Day $L_{Aeq\ 15\ hr}$		Night $L_{Aeq\ 9\ hr}$	
			Without Noise Barrier dB(A)	With 2.5 metre high noise barrier dB(A)	Without Noise Barrier dB(A)	With 2.5 metre high noise barrier dB(A)
2010	573	659	62	53	48	39
2025	860	978	63	55	51.5	43.2
ECRTN Criteria			55			50

Table 3b Peak Hourly Traffic Flows and Façade Noise Levels on Steve Eagleton Drive

Year	am	pm	Predicted Worst Period Traffic Noise Level		Predicted Worst Period Traffic Noise Level	
			Day $L_{Aeq\ 1\ hr}$		Night| $L_{Aeq\ 1\ hr}$	
			Without Noise Barrier dB(A)	With noise barrier dB(A)	Without Noise Barrier dB(A)	With noise barrier dB(A)
2010	57	73	53	N/A	44	N/A
2025	176	220	58	N/A	44	N/A
ECRTN Criteria			60		55	

6.2 TRAFFIC NOISE TREATMENT AND ATTENUATION

The predictive modelling shows that traffic noise levels at lots adjoining Gregory Street (Lots 1 to 8) as shown on the subdivision plan will exceed the criteria in the DECCW ECRTN and sound attenuation will be required. The modelling showed that compliance with ECRTN criteria at facade can only be achieved at dwellings on lots 1 to 8 adjacent to Gregory Street if those dwellings are single storey and a 2.5 metre high noise barrier is provided at the property boundary adjacent to Gregory Street as shown in Appendix 1.

The modelling has assumed existing ground levels and subsequent future changes to finished ground levels may change the height and positioning of the noise barrier. The finished ground levels should be confirmed at final design stage and the barrier height verified after final design is completed.

6.3 CONSTRUCTION NOISE IMPACTS

6.3.1 Construction Noise

Background noise levels were measured on site using a short term monitoring method as set out in the NSW INP and also by using data logging near the roadways. The daytime background sound level in the areas where residences are likely to be affected by construction noise ranges from 42 - 50 dB(A) depending on the distance of the residences from the road.

Typical earthworks machinery that is likely to be used in the construction of the subdivision will have sound power levels in the range of 110 dB(A) to 114 dB(A) depending on the nature of the equipment. The DECCW Interim Construction Noise Guide identifies that residences may be affected by construction noise at 10dB(A) above background and will be seriously affected at construction sound levels of 75 dB(A) and above. There is a potential for local residents to be seriously affected by construction noise when construction with heavy machinery, such as excavators or dozers, is occurring within 60 metres of a residence.

The construction schedule and/or methods have not been developed at this point and the best method to ensure adequate control of construction noise is to provide that a Construction Noise Management Plan is developed in accordance with the DECCW Interim Construction Noise Guide to manage and control noise emissions when equipment is working within 60 metres of an existing residence.

6.3.2 Construction Vibration

Construction vibration will occur during the construction of subdivision road and to a lesser extent for some bulk earthworks. Construction vibration is likely to cause significant adverse comment from people when vibratory rollers for road works are used within 40 metres of a residence and when heavy equipment is used in bulk excavation within 60-80 meters of a residence depending on the works and equipment involved.

There is little risk that the structural damage criteria in BS 7385 will be exceeded by any construction vibration but the likelihood of adverse comment in respect to construction vibration is high when works are carried out within 40 metres of a residence.

It will be necessary to develop a Construction Vibration Management Plan to control vibration impacts having regard to the DECCW Vibration Guideline and the cosmetic damage limits in BS7385.

7. RECOMMENDATIONS

7.1 CONTROL OF TRAFFIC NOISE IMPACTS

In order that traffic noise levels are adequately controlled to the inner residential spaces of the proposed development the following recommendations are made:-

a) Provide 2.5 meter high acoustic barrier to the rear boundaries of Lots 1 to 8 as shown on the attached drawing (Appendix 1).
b) Apply a limit of single storey construction on subdivision Lots 1 to 10 as shown in the attached plan though the relevant planning instrument.

7.2 OPERATIONAL NOISE IMPACTS

To control operational noise impacts between the proposed subdivision and existing residences and within the subdivision limitations are set on the sound emission levels for mechanical plant associated with residential dwellings.

Domestic air conditioners and heat pumps to be installed on lots within the subdivision are to have a Sound Power Levels not in excess of 65dB(A) and are to be installed in accordance with the ANZECC Guideline attached at Appendix 3.

Pumps and filtration equipment for swimming pools and spas are to be installed in accordance with the ANZECC guideline attached at Appendix 4.

7.3 CONSTRUCTION NOISE AND VIBRATION

A Construction Noise and Vibration Management Plan that specifies approach distances to residences before action must be taken should be developed prior to the commencement of construction works. The plan is to be developed in accordance with BS 7385 and the relevant DECCW guidelines and as a minimum will contain the following:-

a) Limits for Noise and Vibration at affected residences in accordance with the Construction Noise Guide and BS7385.

b) A list of machinery to be used for construction,

c) Approach distances, “Buffer Zone” for each machine type that will trigger relevant management action for that activity.

d) Specific management actions that should be taken for relevant activities inside the “Buffer Zone” for action.

e) Identify the individual responsible for actioning the Management Plan and addressing any complaints.

f) Procedures for receiving, managing and resolving complaints.

8. CONCLUSION

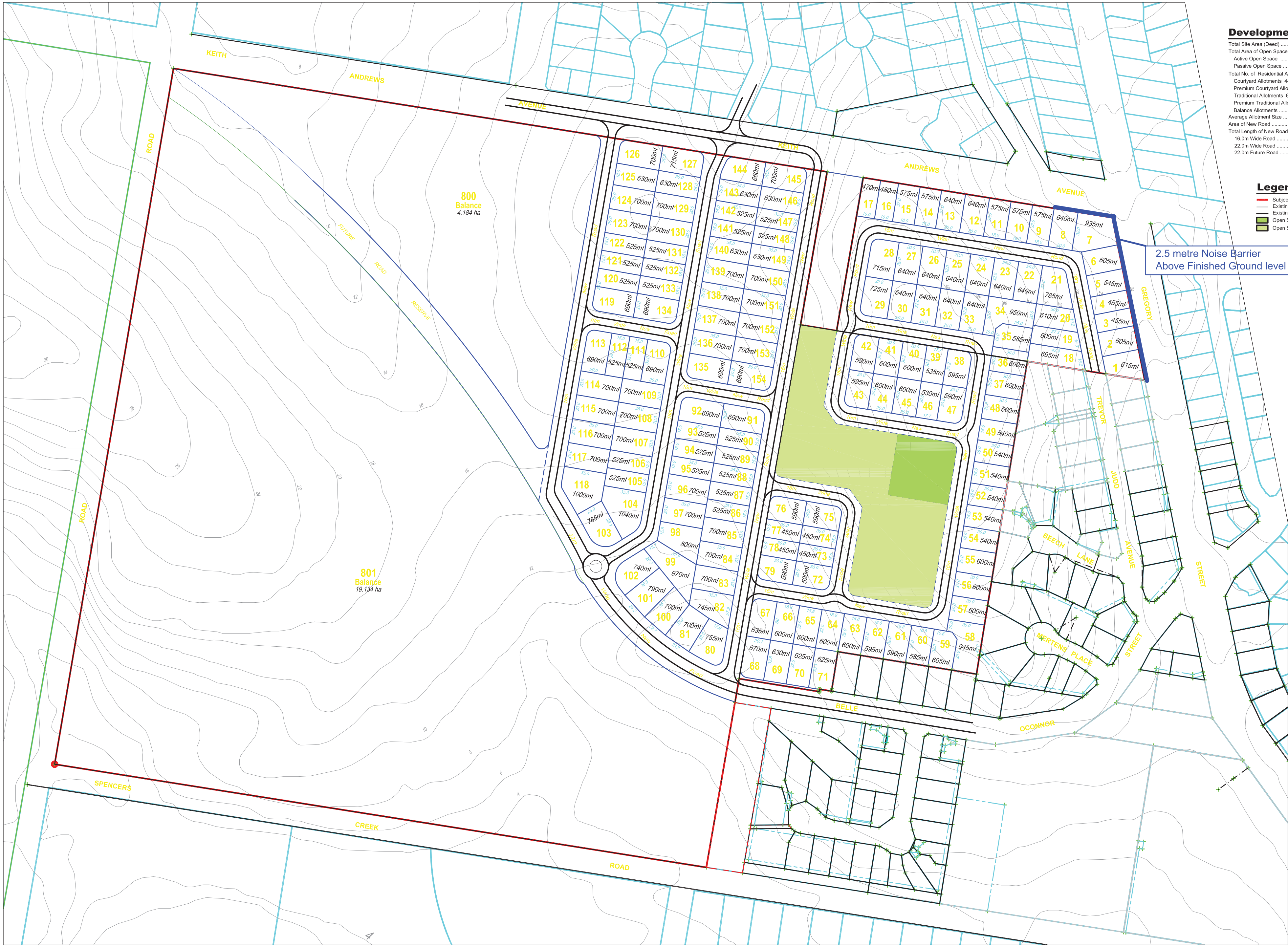
Provided the structure and façade treatments are executed in accordance with this report, the level of internal noise generated by traffic on Gregory Street and Steve Eagleton Drive will remain within the limits specified by AS 3671. Therefore, it is my professional opinion that there are no grounds to refuse the development based on the level of noise impact. Please do not hesitate to contact me if you have any questions regarding this report.

Yours Sincerely
Hunter Acoustics

Matthew Bain ADip, Des Sci (Audio Design)
Acoustics Consultant / Technician

Date 7 September 2012

Appendix 1 Noise Barrier Location.



Development Statistics

Total Site Area (Deed)	40.011 ha
Total Area of Open Space	1.584 ha
Active Open Space	2550 ml
Passive Open Space	1.329 ha
Total No. of Residential Allotments	156
Courtyard Allotments 445 - 499 ml	8
Premium Courtyard Allotments 500 - 599 ml	48
Traditional Allotments 600 - 699 ml	54
Premium Traditional Allotments 700 ml +	44
Balance Allotments	2
Average Allotment Size	632 ml
Area of New Road	5.365 ha
Total Length of New Road	2990 m
16.0m Wide Road	2330 m
22.0m Wide Road	210 m
22.0m Future Road	450 m

Legend

- Subject Site Boundary
- Existing Contour
- Existing Internal Boundaries
- Open Space - Active
- Open Space - Passive

REVISION
A : 05/07/12 Amend Road and Site Boundary
B : 23/07/12 Amend Site Boundary

Note
All dimensions and areas are approximate only, and are subject to survey and Council approval.

Dimensions have been rounded to the nearest 0.1 metres.

The boundaries shown on this plan should not be used for final detailed engineers design.

Contours and adjoining information digitized from Kempsey Shire Council Map of South West Rocks

CLIENT

PROJECT
PROPOSED SUBDIVISION

PROPOSED LAYOUT OVER LOTS 31 & 223 ON DP 754396 & LOT 57 ON DP 1117398 SOUTH WEST ROCKS

Level Datum	
Origin	
Date	23 JULY 2012
Comp By.	WW/ FK
DWG Name.	102457-PROP
Local Authority	KEMPSEY SHIRE COUNCIL
Locality	SOUTH WEST ROCKS
Job Reference	102457
Scale	1 : 1000
Sheet	A0
Plan Ref	102457 - 15
Rev	B

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Appendix 2 Noise Contours and Residential Traffic Noise Levels


> 35.0 dB
> 40.0 dB
> 45.0 dB
> 50.0 dB
> 55.0 dB
> 60.0 dB
> 65.0 dB
> 70.0 dB
> 75.0 dB
shopping centre
SPENCERVILLE

Appendix 3 ANZECC Air conditioner Installation Guide

Appendix 5: Australian Environmental Council brochure: Air Conditioner noise

Air conditioner noise

Buying an air conditioner?

Then protect your investment and buy one that will not intrude noisily on your neighbours.

In Australia there are laws that stop noisy air conditioners from being used where the noise is annoying to neighbours. In fact your air conditioner may need to be inaudible to your neighbours if you wish to use it at night.

The best policy is to buy the quietest air conditioner suited to your heating/cooling needs and have it installed as far as possible from neighbours or in a well shielded location. Most air conditioners in Australia have a label which describes the amount of noise they make. **The smaller the number of dBA on the label the quieter the air conditioner.**

OUTSIDE SOUND POWER LEVEL **60** dBA

(LOWER LEVELS MEAN LOWER OUTSIDE NOISE)
THE LEVEL SHOWN ABOVE MAY BE USED TO ESTIMATE WHETHER THE OUTSIDE NOISE FROM THE PROPOSED INSTALLATION OF THIS UNIT WILL BE WITHIN ACCEPTABLE LIMITS

CONSULT YOUR SUPPLIER BEFORE INSTALLATION

(MANUFACTURER) (MODEL No.)

The number on the air conditioner you buy should not exceed the number you calculate using this guide.

Note that the back page provides a quick estimation for some commonly used air conditioner locations.

It is also recommended that you consult your air conditioner salesperson or installer before you commit yourself.

What to do

Follow steps 1 - 4 carefully or make sure that the person selling or fitting your new air conditioner makes a similar check for you.

Step 1 The closer your air conditioner is to your neighbour the quieter it will need to be. Follow the procedure in Appendix A and put your answer in Box 1.

Step 2 If there is a fence or wall between yourself and your neighbour the noise may be reduced. Check this using Appendix B and put your answer in Box 2.

Step 3 Noise can reflect off walls and make your air conditioner appear louder. Follow the instructions in Appendix C and put your answer in Box 3.

Step 4 Add the numbers in Box 1 and Box 2 then subtract the number in Box 3.

Box 1		Box 2		Box 3		ANSWER
	+		−		→	dBA

The number on the label of your air conditioner should not be more than the number in the answer box.

If you already own an air conditioner and the number on it is bigger than that in the answer box, then you may need to consider the feasibility of installing a noise control device specially designed for the air conditioner, locating the air conditioner elsewhere or replacing it.

AUSTRALIAN ENVIRONMENT COUNCIL

Appendix A

Step 1 Measure the **shortest** distance, in metres, between where you want to put your air conditioner and the nearest neighbouring fence line. Mark the distance with an X in column 1, below.

Bear in mind that to reduce noise, air conditioners are best placed in a location which provides the greatest distance between the air conditioner and neighbours. This could, for example, mean mounting your air conditioner facing the back fence or front street.

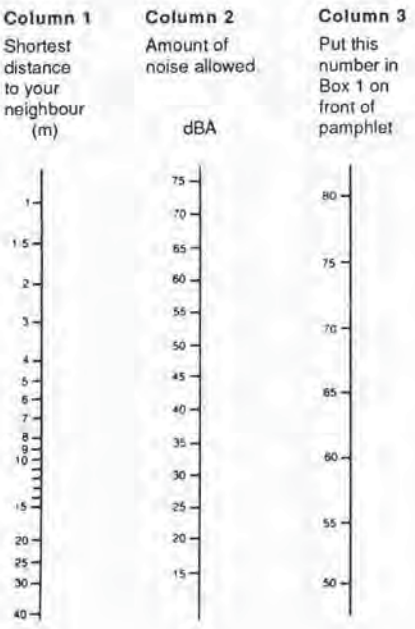
In rural areas you may consider that it is more relevant to measure the distance between your air conditioner and the nearest area used by your neighbour (such as a garden relaxation area).

Step 2 Find out if there are laws regarding noise in your State or local area. Information on who to contact is listed on the back of this pamphlet.

Mark the amount of noise allowed in your area with an X in column 2.

If there is no prescribed maximum amount of noise and you live in a quiet residential area, a mark at 40 dBA or less could be used as a guide. Alternatively you may wish to arrange to have the background noise levels in your area measured.

Step 3 Draw a straight line from the X in column 1 through the X in column 2 to cut through column 3. Write down in Box 1 on the front of this pamphlet the number in column 3 that is on the line you have drawn.



Appendix B

A fence/barrier can reduce the level of air conditioner noise heard in neighbouring premises. To do this a fence/barrier will need to be continuous and solid. It should contain very few gaps, particularly where the fence meets the ground. The fence/barrier must also prevent the airconditioner being seen from noise sensitive locations on neighbouring premises. Noise sensitive locations include windows of bedrooms and living rooms (including those of multistorey dwellings) and outdoor entertaining/ relaxing areas.

What to do

Carefully read through the fence/barrier descriptions below starting at point 1. Select a value that corresponds to the fence/barrier description applicable to your situation. Put this value in Box 2 on the front page.

Value for box 2

1. The fence/barrier does not prevent the airconditioner being seen from between the air conditioner and noise sensitive locations on the neighbouring premises. — 0

2. The fence/barrier only just blocks "line of sight" and it is made of material having gaps, such as a standard picket fence, a brush fence or a brick fence with fancy iron inserts. — 0

3. The fence/barrier only just blocks "line of sight" and is made of solid material. — 5

4. Fence/Barrier with Gaps

   e.g. Hedges/bushes/trees
   Ti tree/brush
   Picket fence
   Fence in disrepair with holes or missing planks
   Cyclone fence
   Masonry fence with decorative open inserts. — 0

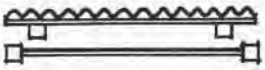
5. The fence/barrier completely blocks "line of sight" of the air conditioner noise sensitive locations.

   Typical Paling Fence  — 6

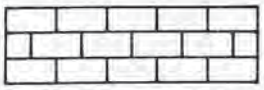
   e.g. Planks overlapped by 25 mm planks, 13 mm thick. Air gaps between palings due to warping etc.

   Solid Fence with no Gaps and Flush to the Ground. — 10

   e.g. Galvanised iron
   Fibre cement sheeting
   20 mm Pine planking with 35 mm overlap.

   Concrete block/ masonry/brick

Special notes

1. If you consider that your house would stop noise reaching your neighbours, consult the authority listed on page 4 for an appropriate value.

2. If in doubt about your fence type, select a low value.

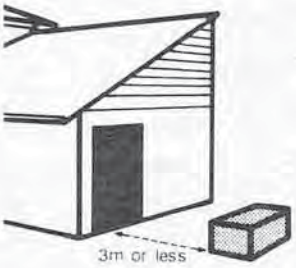
Appendix C

Just as light reflects from mirrored surfaces, sound will reflect from walls, carports, roofs and the like. Find a diagram below which would correspond to the placement of your air conditioner. Put the corresponding value in Box 3 on the front page of this pamphlet and go on to **STEP 4** on the front page.

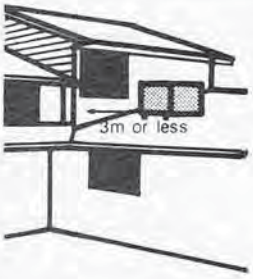
Value for box 3

One reflective surface 3

on side of building

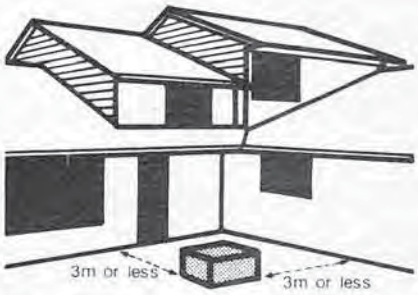


on ground



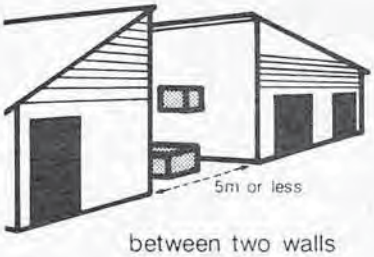
on roof

Two reflective surfaces 6

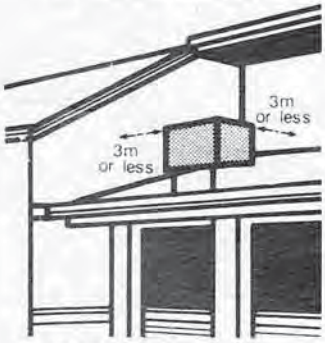


on ground

on side of building



between two walls



on roof

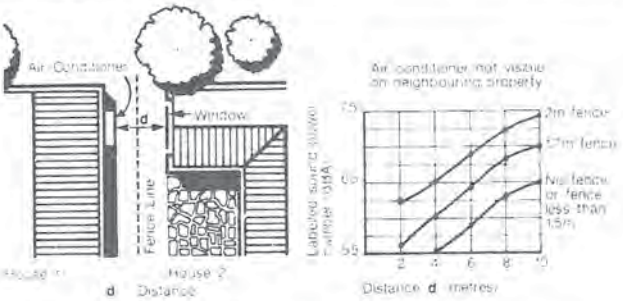
under carport

To find out how much noise your air conditioner is allowed to make talk to:

ACT	Environment Protection Section, ACT Administration
NSW	Your Local Council
NT	Your Local Council or the Conservation Commission
Qld.	Your Local Council
S.A.	Department of Environment and Planning
Tas.	Your Local Council or the Department of the Environment
Vic.	Your Local Council or the Environment Protection Authority
WA	Your Local Council or the Environmental Protection Authority

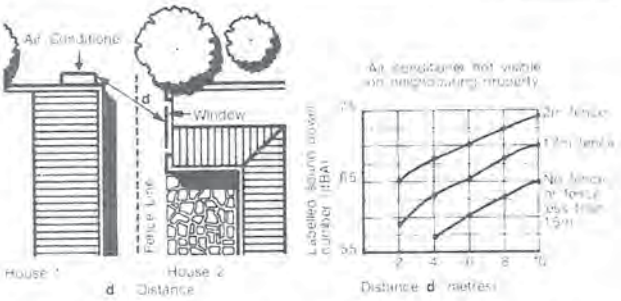
Quick estimations for commonly occurring air conditioner installation locations

Case A An air conditioner between two houses.



1. Measure the shortest distance d, in metres, between where you plan to put the air conditioner and a noise sensitive location on the neighbouring premises.
2. Measure the height of the fence (if any) between your house and your neighbour. Assume the fence is less than 1.5 mm high if it has openings, e.g. picket, brush, poor condition paling fences, brick walls with lots of gaps.

Case B An air conditioner against the front or back wall.



3. Looking at the graph find the applicable distance d then take a vertical line up to meet a line corresponding to the fence height. Read across to the left to determine the maximum sound power number that may be on your air conditioner.

Note 1. Where there is no fence or a fence less than 1.5 m high and d = 2 m, or less, there is unlikely to be an air conditioner suitable for this location.

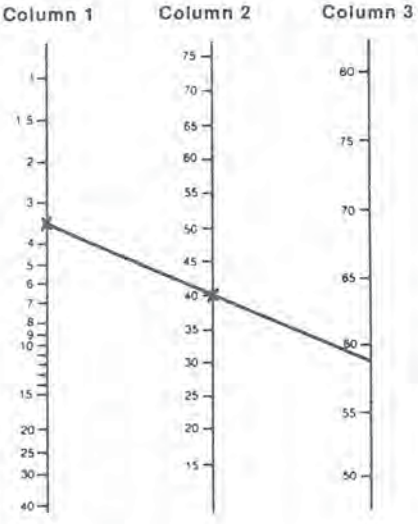
Note 2. These examples are based on single storey homes located on flat ground. If your situation differs you are advised to use the full calculation method.

Example of full estimation method

Step 1 You plan to locate your air conditioner 3.5 metres from your neighbour's patio so you put a mark at 3.5 in column 1.
The Local Council advises you that the noise level at your neighbour's property should not exceed 40 dBA, so you put a mark at 40 in column 2. Joining these two points with a straight line through column 3 gives a value of 58.

Step 2 The fence between the air conditioner and your neighbours would block "line of sight" and is made of galvanised iron. Put 10 in Box 2.

Step 3 The air conditioner is between two walls as shown in Appendix C example 3 d. Put 6 in Box 3.

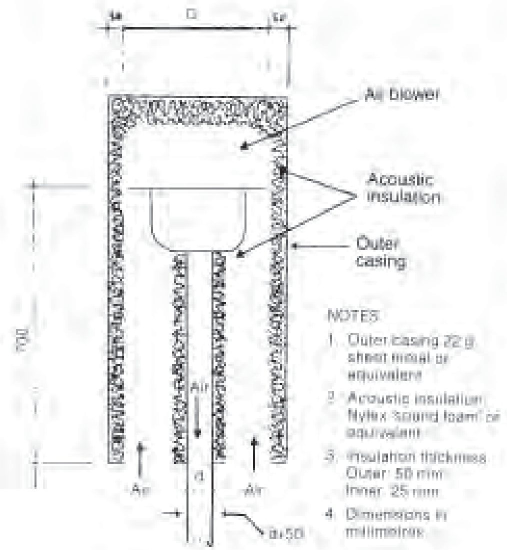


58	+	10	−	6	→
Box 1		Box 2		Box 3	

You have therefore found that the number on the air conditioner you buy should not exceed 62 dBA if you install it at this location.

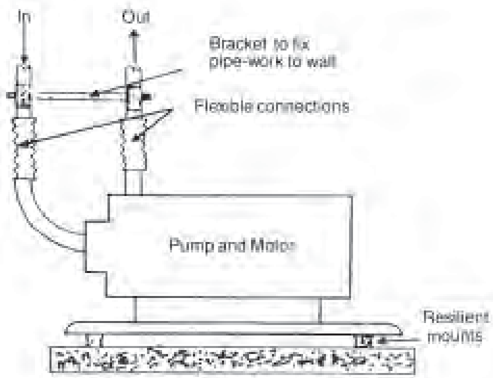
Appendix 4 ANZECC Pool pump Installation Guide

Appendix 6: Australian Environmental Council brochure: Noise from swimming and spa pools



Acoustic Attenuator for Spa Blower

Vibration – problems can be overcome by isolating the equipment using antivibration mounts and flexible connections on the pipework as shown in the following sketch.



Example of a good pump installation

State and Territory Noise Control Authorities

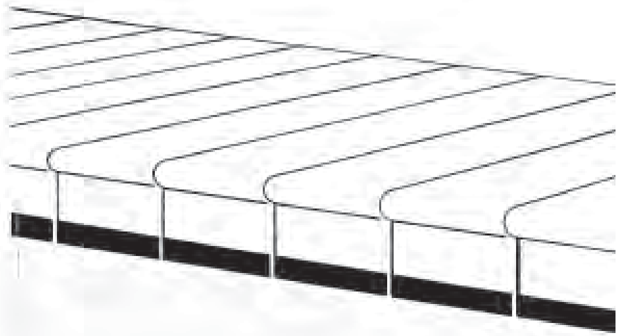
ACT	Department of the Arts, Sport, the Environment, Tourism and Territories Telephone: (062) 467 2211
NSW	State Pollution Control Commission Telephone: (02) 265 8888
Northern Territory	Conservation Commission of the Northern Territory Telephone: (089) 22 0211
Queensland	Contact your local council
South Australia	Department of Environment and Planning Telephone: (08) 216 7600
Tasmania	Department of the Environment Telephone: (002) 30 2770
Victoria	Environmental Protection Authority Telephone: (03) 628 5111
Western Australia	Environmental Protection Authority Telephone: (09)222 7000

Before you take the plunge consider . . .

NOISE!

from

swimming & spa pools



THE AUSTRALIAN ENVIRONMENT COUNCIL

A common source of annoyance, particularly during the summer months, is the noise from swimming pool and spa equipment.

Respect your neighbours' right to peace and quiet. Consult your Local Council or your State Noise Control Authority about any relevant laws. If you don't, you may find the use of pumps, filters or blowers is restricted and this in turn may spoil your enjoyment.

Discuss your concern about noise with your pool salesman and include a statement in the contract which binds your installer to at least satisfy Local, State or Territory Government Laws about noise. This may save you significant costs at a later date.

If there are no laws, ask the installer to ensure that your pump noise is inaudible on nearby residential premises.

A lot of problems can be avoided by proper planning. Consider the following factors when planning your pool or spa.

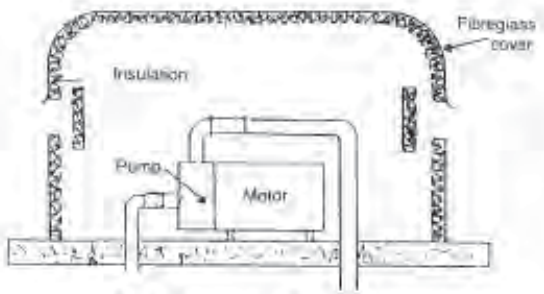
1 locate the noisy equipment as far as practicable from your neighbour.

2 if possible, place any pool or spa equipment behind a solid fence, wall or barrier to screen the equipment from the direct view of your neighbours.

However any nearby surface other than that between your pool equipment and your neighbours may reflect the noise back towards them – so be careful.

3 in some instances steps (1) and (2) will be insufficient to adequately reduce the noise. In these cases noise enclosures can be constructed relatively cheaply and may be effective in reducing the noise, while still allowing the equipment to function normally. Alternatively, you may be able to buy a ready-made enclosure. If you decide to build an enclosure yourself, refer to the enclosed sketch and remember these points.

(a) The enclosure cover needs to be strongly constructed and should not contain any holes or gaps other than those shown in the sketch for ventilation.



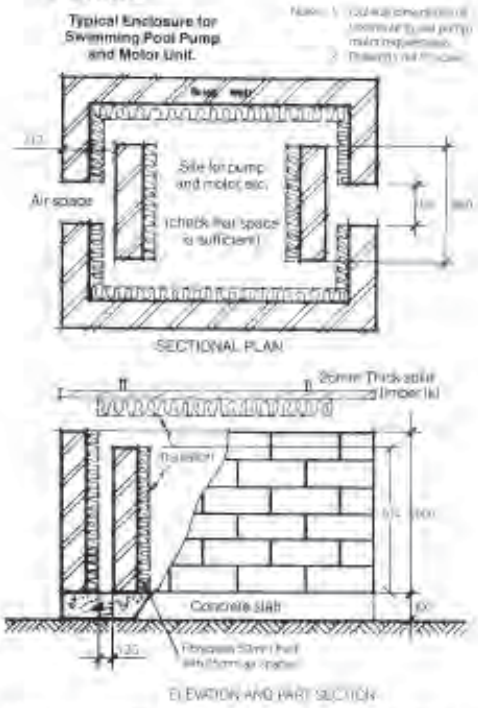
Typical Custom-built Enclosure

(b) The cover should fit firmly on the ground and should not come into contact with any equipment or pipework. It is preferable that pipework enter or exit the enclosed space from under the ground, rather than through the walls of the enclosure.

If it is necessary for pipework to pass through the enclosure, then make sure that the gap is as small as possible without touching the enclosure and fill the gap with a resilient sealant.

(c) Ventilation should be provided – enough to ensure that the motor does not overheat. Ventilation ducts or passages should be treated with sound absorbing materials.

Typical Enclosure for Swimming Pool Pump and Motor Unit.



NOTE: Enclosure lined with fibreglass 50 mm thick and of a density 70–100 kg/m³ faced with perforated aluminium foil.

B FLORA AND FAUNA REPORTS

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B1 BIOBANKING ASSESSMENT

BioBanking Credit Calculator

BioBanking credit report

This report identifies the number and type of credits required at a DEVELOPMENT SITE.

Date of report: 21/08/2012 Time: 1:43:49PM Tool version: 2.0

Development details

Proposal ID:	0064/2012/0318D
Proposal name:	Settlers Ridge
Proposal address:	Gregory Street and Kieth Andrews Avenue South West Rocks NSW 2431
Proponent name:	SJ Connelly CPP Pty Ltd
Proponent address:	PO Box 538 Lennox Head NSW 2478
Proponent phone:	0266877171
Assessor name:	Peter Parker
Assessor address:	Broken Head Road BROKEN HEAD NSW 2481
Assessor phone:	6685 3148
Assessor accreditation:	0064

Improving or maintaining biodiversity

An application for a red flag determination is required for the following red flag areas

Red flag	Reason

The application for a red flag determination should address the criteria set out in the BioBanking Assessment Methodology. Please note that a biobanking statement cannot be issued unless the determination is approved.

Additional information required for approval:

- ☐ Change to percent cleared for a vegetation type/s
- ☐ Use of local benchmark
- ☐ Change negligible loss
- ☐ Expert report
- ☐ Predicted threatened species not on site
- ☐ Change threatened species response to gain (Tg value)

Ecosystem credits summary

Vegetation type	Area (ha)	Credits required	Red flag
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	13.97	883	No
Total	13.97	883	

Credit profiles

1. Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast, (NR228)

Number of ecosystem credits required	883
CMA sub-region	Macleay Hastings - Northern Rivers
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	Offset options - CMA sub-regions
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast, (NR228) Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast, (NR114) Blackbutt - bloodwood dry heathy open forest on sandstones of the northern North Coast, (NR115) Blackbutt - Needlebark Stringybark shrubby open forest on coastal sands of the North Coast, (NR116) Blackbutt - Spotted Gum shrubby open forest on sandstones of the lower Clarence Valley of the North Coast, (NR118) Pink Bloodwood - Red Mahogany - Smudgy Apple shrubby open forest on sandstone of northern North Coast, (NR218) Pink Bloodwood open forest of the coastal lowlands of the North Coast, (NR220) Scribbly Gum - Needlebark Stringybark heathy open forest of coastal lowlands of the northern North Coast, (NR227)	Macleay Hastings - Northern Rivers Clarence Lowlands Coffs Coast & Escarpment Clarence Sandstones

Species credits

Common name	Scientific name	Extent of impact	Number of species credits required
Brush-tailed Phascogale	Phascogale tapoatafa	13.97	279

BioBanking Credit Calculator

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE.

Date of report: 21/08/2012 Time: 1:38:06PM Tool version: 2.0

Biobank details

Proposal ID:	0064/2012/0319B
Proposal name:	Settlers Ridge
Proposal address:	Gregory Street and Kieth Andrews Drive South West Rocks NSW 2431
Proponent name:	SJ Connelly CPP Pty Ltd
Proponent address:	PO Box 538 Lennox Head NSW 2478
Proponent phone:	02877171
Assessor name:	Peter Parker
Assessor address:	Broken Head Road BROKEN HEAD NSW 2481
Assessor phone:	6685 3148
Assessor accreditation:	0064

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report
- ☐ Change threatened species response to gain (Tg value)

Ecosystem credits summary

Vegetation type	Area (ha)	Credits required	Red flag
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	19.20	152	No
Total	19.20	152	

Credit profiles

1. Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast, (NR228)

Number of ecosystem credits required	152
CMA sub-region	Macleay Hastings - Northern Rivers
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

Species credits

Common name	Scientific name	Extent of impact	Number of species credits required
Masked Owl	Tyto novaehollandiae	20.00	31
Squirrel Glider	Petaurus norfolcensis	20.00	31
Brush-tailed Phascogale	Phascogale tapoatafa	20.00	31

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Cat and/or Fox control
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Exclude miscellaneous feral species
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Maintain or reintroduce flow regimes (aquatic flora)

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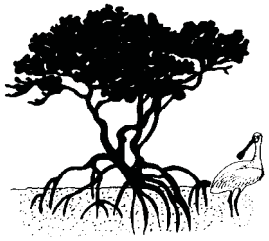
B2 BIODIVERSITY ASSESSMENT REPORT

Peter Parker

Environmental Consultants Pty Ltd

Broken Head Road, Broken Head, NSW, 2481

☎ Phone/fax 0266 853 148



ACN 076 885 704

SETTLERS RIDGE, RESIDENTIAL SUBDIVISION AND BIOBANKING PROPOSAL

BIODIVERSITY ASSESSMENT REPORT

PREPARED FOR SJ Connelly CPP Pty Ltd

23 October 2012

CONTENTS

FIGURES

TABLES

PLATES

GLOSSARY

Abundance: means a quantification of the population of the species or community

Affected species: means subject species likely to be affected by the proposal

Conservation status: is regarded as the degree of representation of a species or community in formal conservation reserves

Critical habitat: the area declared to be critical habitat under Part 3 of the *Threatened Species Conservation Act 1995*

Development: the erection of a building on that land, the carrying out of work in, on, over or under that land, the use of that land or of a building or work on that land, and the subdivision of that land

Ecological community: an assemblage of species occupying a particular area

Endangered ecological community ("EEC"): an ecological community specified in Part 1 of Schedule 1 of the *Threatened Species Conservation Act 1995*

Endangered population: a population specified under Part 1 of Schedule 1 of the *Threatened Species Conservation Act 1995*

Endangered species: a species listed under Schedule 1 of the *Threatened Species Conservation Act 1995*

EPA Act: *Environmental Planning and Assessment Act, 1979*

Habitat: an area or areas occupied, or periodically or occasionally occupied by a species, population or ecological community and includes any abiotic component

OEH: Office of Environment and Heritage (Previously DECCW)

Recovery and threat abatement plan: a plan to promote the recovery of threatened species, population or an ecological community with the aim of returning the species, population, or ecological community to a position of viability in nature. The purpose of the threat abatement plan is to manage key threatening processes with a view to their abatement, amelioration or elimination

GLOSSARY

SEPP: State Environmental and Planning Policy

Significant species: means species not listed under the *Threatened Species Conservation Act 1995* but considered to be of regional or local significance

Study area: is the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly

Subject site: the area which is proposed for development or activity

Subject species: those threatened species which are considered known or likely to occur in the study area

Threatened species: a species listed in Part 1 or 4 of Schedule 1 or in Schedule 2 of the *Threatened Species Conservation Act 1995*

Threatening process: means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities

TSC Act: *Threatened Species Conservation Act 1995*

Vulnerable species: a species listed under Schedule 2 of the *Threatened Species Conservation Act 1995* or, when a fish, listed under the *Fisheries Management Act 1994*

SUMMARY

- This biodiversity assessment report has been prepared for SJ Connelly CPP Pty Ltd with respect to a subdivision comprising of 154 residential lots, two rural lots and residual open space located at Steve Eagleton Drive, South West Rocks.
- This assessment has been undertaken in accordance with the draft guidelines for 3A projects. It has also addressed the more recent ("OEH") interim policy on assessing and offsetting biodiversity impacts of Part 3A projects.
- A fauna trapping survey was undertaken over six nights. A systematic four-night survey was undertaken from September to October 2009 and a two night survey was undertaken in August 2012. Additional surveys included site inspections undertaken on 5 August 2009, on 8 October 2009 and on 4 December 2009.
- This proposal has identified 19.2 ha of land which is potentially available for a BioBank site.
- Calculations with respect to BioBanking have established that the BioBank site can generate 152 ecosystem credits and 31 species credits for the masked owl, the squirrel glider and the brush-tailed phascogale respectively. As the proposed development requires that 883 ecosystem credits and 279 brush-tailed phascogale species credits need to be retired, this leaves a short fall of some 731 ecosystem and 248 brush-tailed phascogale credits.
- Enquiries undertaken indicate that suitable ecosystem and species credits are available to offset development impacts to meet the "improve or maintain standard". While not necessarily required for Part 3A proposals, the "improve or maintain" standard is a high standard of biodiversity protection.
- With respect to this proposal, red flag assets are not proposed to be cleared and offsetting can be sourced from land adjacent to or in the vicinity of the site. This approach is consistent with that required by the BioBanking Assessment Methodology.

Fig. 1: The proposed subdivision (Source RPS 2012)

1.0 INTRODUCTION

This biodiversity assessment report has been prepared for SJ Connelly CPP Pty Ltd with respect to 154 residential lots, two rural lots, an extension of local roads and infrastructure to service the subdivision and the provision of open space. It is located at Steve Eagleton Drive, South West Rocks (Fig. 1 at page 8).

The site is known as "Settler's Ridge" and is a part-rural and part-residential zoned land located on Gregory Street and Steve Eagleton Drive. South West Rocks is a coastal village on the mid-north coat of NSW with a population of 4,300. The village is located 40km north-east of Kempsey near the mouth of the Macleay River.

This biodiversity assessment report is submitted pursuant to Part 3A of the *Environmental Planning and Assessment Act 1979* (the "*EPA Act*"). On 13 May 2011, the NSW Government announced transitional arrangements for projects already in the Part 3A system pending the repeal of that section of the Act. The subject project was retained by the Government as a Part 3A Application.

The Real Property description of the subject land is:

- Lot 31 DP 754396 (Lot 31);
- Lot 57 DP 1117398 (Lot 57); and
- Lot 223 DP 754396 (Lot 223).

These three properties have a total area of 40.011 ha, made up of the following areas:

- Lot 31 – 31.76 ha;
- Lot 57 – 5.261 ha; and
- Lot 223 – 2.99 ha.

1.1 Specific objectives

The specific purpose of this biodiversity assessment is:

- to document flora and fauna surveys undertaken at the site in accordance with the *draft guidelines for threatened species assessment* ("the guidelines") (Department of Environment and Conservation and Department of Primary Industries 2005);
- evaluation of impacts;
- identify mitigation measures and offset strategies, including those contained within the BioBanking Assessment Methodology ("the BBAM")(DECC 2009); and
- address the key strategies outlined in the guidelines;

1.2 Structure and content

This report follows the structural and content requirements detailed in the guidelines. It also adopts the draft *Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities* (DEC 2004) with respect to survey technique and effort (Table 1 at page 12). It adopts the BBAM with respect to survey pro-formas which include vegetation plot size and numbers.

1.3 Field personnel

This report has been documented by Peter Parker of Peter Parker Environmental Consultants Pty Ltd (BSc. MPhil, Dip. Ed.). Mr Parker was assisted on all field surveys by Mr Eli Dutton (B.Appl. Sci) and Mr Adam Gosling (B.Ec. B.Appl. Sci.). All individuals undertaking

surveys hold the relevant licenses issued by the NSW Office of Environment and Heritage and the Department of Primary Industry.

Mr Parker is accredited under s 142B(1)(a) of the *Threatened Species Conservation Act 1995* ("*TSC Act*") by the NSW Office of Environment and Heritage ("OEH") to undertake and prepare surveys and assessments for biodiversity certification pursuant to Part 7AA of the TSC Act.

Table 1: Survey methods (source: *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Draft* (Department of Environment and Conservation, November 2004).

Method	Effort per stratification unit up to 50 ha plus additional effort for every additional 100 ha
Small Elliott traps	100 trap nights over 3-4 consecutive nights
Large Elliott traps	100 trap nights over 3-4 consecutive nights
Arboreal Elliott traps	24 trap nights over 3-4 consecutive nights
Wire cage traps	24 trap nights over 3-4 consecutive nights
Pitfall traps with drift nets	24 trap nights over 3-4 consecutive nights
Hair tubes	10 large and 10 small tubes in pairs for at least 4 days and 4 nights
Arboreal hair tubes	3 tubes in each of 10 habitat trees up to 100 hectares of stratification unit, for at least 4 days and 4 nights
Spotlighting on foot	2 x 1 hour and 1 km up to 200 hectares of stratification unit, walking at approximately 1 km per hour on 2 separate nights
Spotlighting from vehicle	2 x 1 km of track at maximum speed of 5 km per hour, up to 200 hectares of stratification unit, on 2 separate nights
Sand plots	6 soil plots for 4 nights
Call playback	2 sites per stratification unit up to 200 hectares, plus an additional site per 100 hectare above 200 hectares. Each playback site must have the session conducted twice, on separate nights
Stag-watching	Observing potential roost hollows for 30 minutes prior to sunset and 60 minutes following sunset
Search for scats and signs	30 minutes searching each relevant habitat, including trees for scratch marks
Track search	1 km of track search with emphasis on where substrate is soft
Collection of predator scats	Opportunistic collection of predator scats for hair analysis

2.0 PREVIOUS PROPOSALS

Development Consent for the subdivision of Lot 223 into 35 lots was granted by Kempsey Shire Council ("Council") on 26 September 2003 (DA T6-02-042). That application was considered concurrently with two applications for a residential subdivision of Lot 57 into 46 lots (DA T6-03-186 & T6-03-191). These applications were granted consent on 30 October 2003.

The three applications were supported by a combined Species Impact Statement ("SIS") in accordance with Section 5A of the *EPA Act* 1979. Concurrence to the SIS was obtained from the then National Parks and Wildlife Service ("NPWS"), and a Fire Safety Authority was issued by the NSW Rural Fire Service ("RFS").

The approvals were subsequently challenged in the NSW Land & Environment Court ("LEC") in 2004; "*Friends of South West Rocks Inc v Machro Pty Ltd and Ors*" (Ref: NSWLEC 721) and the consents were voided by the Court on matters relating to the then State Environmental Planning Policy ("SEPP") 71.

The subdivision of Lot 223 was considered by the LEC to constitute a State Significant Development under the provisions of SEPP 71, and therefore a Master Plan needed to be prepared and approved by the Minister in accordance with the provisions of SEPP 71.

A Preliminary Environmental Assessment for this project was lodged with the Department of Planning on 24 June 2010. Advice from the Minister of Planning was received on 8 August 2010, which formed the opinion that *"… this proposal is development of a kind that is described in Schedule 2 of the Major Development SEPP".*

In June 2011, a draft Environmental Assessment was submitted to the Department for Adequacy Assessment. The subdivision contemplated in the Adequacy Assessment was for 220 lots and included a BioBanking proposal to mitigate impacts. Since the lodgement of the draft, the proponents have reconsidered the scheme to further mitigate impacts on conservation assets by reducing the development footprint.

3.0 FIELD SURVEYS

A preliminary one day vegetation survey was undertaken on 5 August 2009. This involved walking along tracks and trails throughout the site and the adjoining land to the west noting vegetation structure and floristics.

A systematic vegetation and fauna trapping survey was undertaken over four days and nights from 28 September to 1 October 2009 (inclusive) over the study area. The study area is defined as the site and the land to the west as illustrated in Fig. 2[1].

A further vegetation inspection was undertaken on 8 October 2009 when hair-tube traps were collected and on 4 December 2009.

In 2012, additional surveys were undertaken. These included a two night trapping survey using “B” Elliott traps, spotlighting, Anabat and Songwriter (to detect bat ultra sound), infrared cameras, play-back calls for nocturnal birds and vegetation plots and transects.

The fauna trapping survey targeted reptiles, frogs, birds and mammals and included vegetation mapping and floristic descriptions

1 For the purpose of this report the *Threatened species assessment guidelines, the assessment of significance,* Publ. DECC 2007 have been adopted

(see Fig. 2: Survey methods at page 16 and Table 2: Fauna survey methods and effort at page 17).

3.1 Vegetation

3.1.1 Air photo interpretation and field surveys

Vegetation was mapped over a coloured aerial photograph provided by the Land and Information Service. This was geo-referenced and imported into ArcGis software (Ver. 10). Vegetation patterns were ground truthed during the various vegetation surveys but the species differences noted were considered insufficient to split the vegetation into different plant communities.

3.1.2 Vegetation classification, structure and floristics

The vegetation classification system adopted for this survey is based on Keith (2006). Keith (2006, page 22) adopts the term Vegetation Formation as the top level of a hierarchy which is a broad vegetation group distinguished by structural and physiognomic features. Typical Vegetation Formations include rainforest, wet sclerophyll forest, dry sclerophyll forest and heathland.

The next level of classification is the Vegetation Class. Classes are groups of vegetation defined mainly by floristic similarities. Vegetation classes may have a considerable degree of floristic variation, i.e., they are broad groupings of related communities.

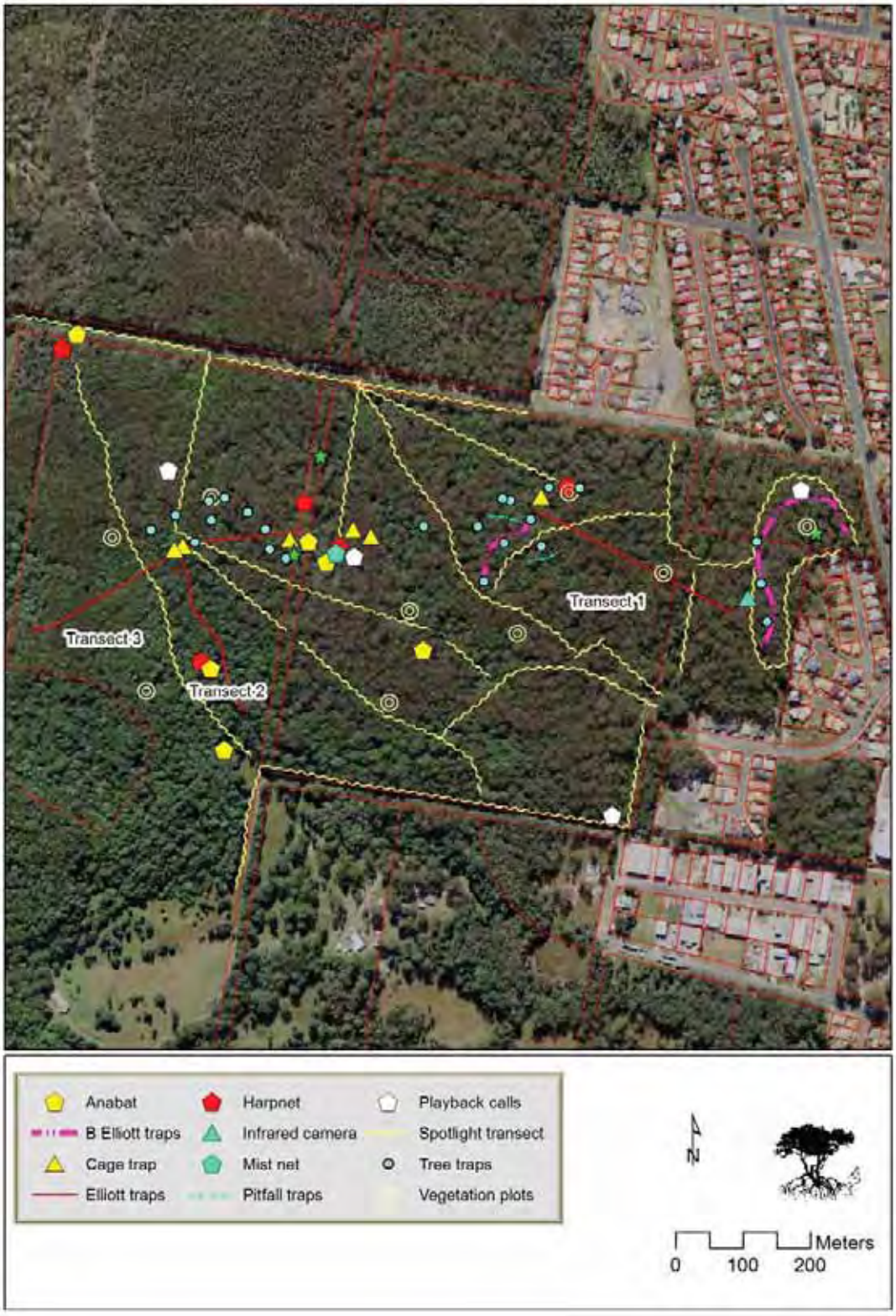


Fig. 2: Survey location and methods

Table 2: Survey methods and effort

Date	Survey method	Trapping Effort
September to October 2009 and August 2012	Bat acoustical sampling	2009: 3x4 Anabat devices = 12 nights, 2012: 2 x 2 detection devices = 4 nights. Total: 16 acoustical nights
2009	Bat harpnets	2009: 3 nets x 4 nights = 12 harpnet-nights
2009	Bat mist-nets	2009: 2 nets for 2 hours over 3 nights Total: 12 net-hours
2009 and 2012	Bird play-back calls	One station per survey night for approximately 45 minutes Total: 6 nights
2009 and 2012	Bird transects	Morning and evening, see Fig. 2 for transects which follow spotlight surveys
2009	Cage traps	5 traps for 4 nights Total: 20 trap-nights
2009	Elliott “A” traps	50 traps for 4 night Total: 200 trap-nights
2009 and 2012	Elliott “B” traps (ground and tree)	20 traps per night over 6 nights Total: 120 trap-nights
2009	Elliott “E” traps	25 traps over 4 nights Total: 100 trap-nights
2009 and 2012	Frog call detection	Opportunistic, 2 hours/night Total: 12 hours
2009 and 2012	Hair-tube traps	75 traps over 10 nights Total: 750 trap-nights
2009 and 2012	Infrared photography	1 camera x 4 nights 2009 2 cameras x 2 nights 2012 Total: 8 camera-nights
2009 and 2012	Litter searches	Opportunistic during survey, approximately 6 hours
2009	Pit-fall traps	12 x 4 nights with drift fences Total: 48 trap-nights
2009 and 2012	Scat, skeleton searches	Opportunistic, approximately 2 hours day
2009 and 2012	Spotlighting	2 hours each night over 6 nights Total: 12 spot-light hours
2009 and 2012	Vegetation plots	9 plots following the BBAM

Plant Communities comprise of assemblages of plant species which co-occur together. They are the most homogeneous units in the hierarchy described by Keith (2006) and are similar to plant groupings described in many regional and local studies (e.g., see Walker and Hopkins 1990).

3.1.3 Vegetation transects

Vegetation associations were surveyed and mapped by walking in meandering transects throughout the site. Transects spaced at approximately 20 m intervals were generally adopted, although these were spaced more widely (up to 50 m) when surveying the adjoining land located to the west.

The following features of the vegetation were noted:

- dominant trees, shrubs and ground covers in each strata;
- major plant species in the association;
- tree heights and foliage cover; and
- any threatened species.

3.1.4 Vegetation plots

The BBAM was adopted for vegetation plots. Assessment methodology is fully described in the BBAM (particularly in Appendix 2, Field Methodology). It uses 20 m x 20 m vegetation plots to measure floristics. Structural parameters such as tree hollows, fallen logs, canopy and mid-storey cover, ground cover and regeneration are also measured but the plot size is increased to 20 m x 50 m. Data was entered into the Calculator which is retained and managed by the OEH. Shape files have been forwarded on disc.

Table 3: Threatened vertebrate species known from the locality and typical habitat requirements

Common name	Scientific name	Typical habitat and recorded locations (nth. NSW)	Possibility of occurrence
Frogs			
Wallum froglet	*Crinia tinnula*	Occurs in the acid, paperbark swamps of the Wallum heaths of south-eastern Qld and north-eastern NSW to about Sydney	No suitable habitat
Birds			
Barred cuckoo-shrike	*Coracina lineata*	Rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses, although near the southern extreme of its range	Potential habitat
Black-necked stork	*Ephippiorhynchus asiaticus*	Riverine swamps, permanent pools and coastal wetlands and estuaries	No suitable habitat
Glossy black cockatoo	*Calyptorhynchus lathami*	Woodland dominated by forest she-oak	Potential habitat
Masked owl	*Tyto novaehollandiae*	Forest and woodland	Recorded at the site
Osprey	*Pandion haliaetus*	Nests in tall trees adjacent to estuaries and forages for fish over water	Tall trees occur and the site is near a major estuary
Powerful owl	*Ninox strenua*	Old growth forest with large hollow-bearing trees	Potential habitat
Rose-crowned fruit-dove	*Ptilinopus regina*	Rainforests, monsoon and paperbark forests, eucalypt woodlands, vine groves, fruit orchids camphor laurel and broad-leaved privet regrowth	Potential habitat
Square-tailed kite	*Lophoictinia isura*	Woodland and ecotones, widespread but uncommon	Potential habitat
Swift parrot	*Lathamus discolor*	Breeds in hollow-bearing eucalypts in Tasmania during summer. Migratory to northern areas	Potential non-breeding habitat
Mammals			
Brush-tailed phascogale	*Phascogale tapoatafa*	Dry sclerophyll forest, coastal swamp forest and heaths	Recorded at the site
Common planigale	*Planigale maculatus*	Forests, swamp forests and woodlands	Potential habitat occurs but species uncommon in area
Koala	*Phascolarctos cinereus*	Forest and woodlands	Potential habitat but no local records
Spotted-tail quoll	*Dasyurus maculatus*	Rainforest, forest and woodlands	Potential habitat
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*	Thick sedges and grasses in moist and dry heathland	No suitable habitat
Squirrel glider	*Petaurus norfolcensis*	Dry sclerophyll forest and woodland which contain mixed age stands of greater than one eucalypt species	Recorded at the site
Yellow-bellied Glider	*Petaurus norfolcensis*	Dry sclerophyll forest and woodland which contain mixed age stands of greater than one eucalypt species	Potential habitat
Eastern false pipistrelle	*Falsistrellus tasmaniensis*	Occurs on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania	Potential habitat
Common bent-wing bat	*Miniopteris schreibersii*	Forests, woodlands and coastal heaths	Potential habitat
Eastern free-tail bat	*Mormopterus norfolkensis*	Sparsely distributed in coastal eastern Australia from approximately Sydney to Fraser Island	Potential habitat
Greater broad-nosed bat	*Scoteanax rueppellii*	Forests, woodlands and coastal heathland	Potential habitat

Table 3 (continued): Threatened vertebrate species known from the locality and typical habitat requirements

Mammals			
Fishing bat (Large-footed myotis)	*Myotis mollucanus*	Riparian habitats, including rivers, estuaries and reservoirs	No suitable habitat
Little bent-wing bat	*Miniopterus australis*	Forests, woodlands and coastal heaths	Recorded at the site
Common blossom bat	*Syconycteris australis*	Roost in littoral rainforest and feeds on nectar and pollen from heathland, paperbark swamps, wet sclerophyll and eucalypt forest	Potential habitat
Grey-headed flying-fox	*Pteropus poliocephalus*	Littoral and subtropical rainforest, mangrove swamps, flood plain rainforests and swamp forests	Recorded at the site

3.2 Fauna

A fauna trapping survey was undertaken over six nights. A systematic four-night survey was undertaken from September to October 2009 and a two night survey in August 2012 (refer to Table 2: Survey Methods and Effort at page 17). Additional surveys included a site inspection undertaken on 5 August 2009, on 8 October 2009 when collecting hair-tube traps and on 4 December 2009. In order to maximise results, survey methods included the following:

- Harp-nets, mist nets and acoustical detection devices set in flyways for megachiropteran and microchiropteran bats (Plates 7 and 8);
- "A", "B" and "E" Elliott traps, cage traps and pitfall traps targeted different body weight small vertebrates. "B" Elliott traps were attached to trees using tree-brackets (Plate 12);
- Hair-tube traps and spotlighting identified the presence of larger vertebrates; and
- Cameras photographed trap-shy species.

Plate 1: Old growth scribbly gum (Photo August 2009)

Plate 2: Scribbly gum and bloodwood (Photo August 2009)

Plate 3: Golden glory pea (*Gompholobium latifolium*)

Plate 4: Senescent old growth trees (Photo August 2009)

Plate 5: Squirrel glider recorded with spotlight (Photo 13 August 2012)

Plate 6: Gould's long-eared bat (*Nyctophilus gouldi*) (Photo 1 October 2009)

Plate 7: Anabat digital recording device for detecting microbats (Photo 1 October 2009)

Plate 8: Harp-net along forested trail (Photo 1 October 2009)

Plate 9: Infrared camera over bait station (Photo 1 October 2009)

Plate 10: "B" Elliott trap near hollow log with brush-tailed possum (Photo 1 October 2009)

Plate 11: Brush-tail possum after release from cage trap (Photo 1 October 2009)

Plate 12: "B" Elliott tree trap on bracket (Photo 28 September 2009)

Plate 13: Hair-tube trap (Photo 28 September 2009)

Plate 14: Cage trap (Photo 28 September 2009)

Plate 15: Microbat captured in mist net (Photo 28 September 2009)

Plate 16: “A” Elliott trap (Photo 28 September 2009)

Plate 17: Brush-tail possum in cage trap (Photo 28 September 2009)

Plate 18: Little forest bat (*Vespadelus vulturnus*) captured in harp net (Photo 28 September 2009)

Plate 19: Eastern bearded dragon (*Pogona barbata*) (Photo 28 September 2009)

Plate 20: Vegetation plot (Photo 28 September 2009)

Plate 21: Ring-tailed possum captured in cage trap (Photo 1 October 2009)

Plate 22: Tawny frogmouth (Photo 13 August 2012)

Plate 23: Vegetation plot (Photo 13 August 2012)

Plate 24: Local signage identifying the presence of threatened fauna (Photo 13 August 2012)

3.2.1 Reptiles and amphibians

Reptiles were searched for opportunistically in suitable habitats (e.g., among leaf litter and under logs). Frogs were mainly identified by call. Survey locations included dry creek-lines and roadside drains. Pitfall traps targeted small skinks and frogs.

3.2.2 Birds

Birds were identified visually and aurally during post-dawn and evening transects. Transects of approximately 40 minutes duration were undertaken during the mornings and evenings of 28, 29 and 30 September and 1 October 2009 and 12 and 13 August 2012.

Birds were also recorded during the 2009 vegetation and fauna survey and follow up surveys in 2012. Play-back calls were used to identify the presence of cryptic or nocturnal species. Calls of the masked owl, powerful owl and barking owl were broadcast shortly after dusk on each survey night. Calls were broadcast over a 15 minute period in sequences of approximately three minutes on and two minutes off.

3.2.3 Mammals

The mammal survey used a spotlight, Elliott “A”, “B” and “E” traps, hair-tube traps, cage traps, harp-nets, pitfall traps, mist nets, ultrasonic detection devices (Anabat II combined with digital flash cards and Songwriter), play-back calls (for birds) and collections of scats and/or skeletons.

Elliott traps

Elliot “A” traps were set along transect one and transect 2 as depicted in Fig. 2 at page 16. Elliot “E” traps were set along transect three (Fig. 2). Twenty five traps were set out along each transect line over four nights in the 2009 survey. Traps were baited with a blend of peanut butter and oats mixed with vanilla essence and the traps were inspected daily. Elliott “B” traps were attached to trees using tree brackets as depicted in Plate 12 or placed on logs hollows as depicted in Plate 10.

Twenty Elliott B traps were set out for two nights in the 2012 survey. These targeted the brush-tail phascogale and were placed on logs or piles of fallen timber. No other Elliott trapping was conducted in 2012. Traps were baited alternatively with vegetable and meat baits and were attended to daily.

Hair-tube traps

In the 2009 survey, a total of 75 hair-tube traps was set out for 10 nights along the same three transects (Fig. 2 at page 16). No hair-tube trapping was conducted in 2012. Traps were baited with peanut butter and oats treated with vanilla essence and pistachio oil.

Cage traps

Five treadle-type cage traps were set over four nights in the 2009 survey (Fig. 2). No cage trapping was conducted in 2012. Traps were baited alternatively with sardines and/or peanut butter and oats and were inspected daily. Trapped animals were released in the vicinity of the transect line.

Pitfall traps

Twelve 20 litre buckets joined by a 30 cm high drift fence were set out in two rows (6 traps in each row) in the 2009 survey (Fig. 2 at page 16). These were inspected each morning and evening.

Infrared photography

A *Faunatec* infrared camera (Plate 9) was set up at a bait station as in the 2009 survey (Fig. 2). The same camera and a "Little Acorn" trail camera were used for two nights in the 2012 survey. These cameras detect cryptic, shy or large species which are hesitant to enter traps. Camera stations were baited with sardines and vegetable baits.

Spotlighting

Nocturnal sampling was undertaken using hand-held 55 watt halogen spotlights and a car-mounted spotlight. Spotlighting using the hand-held light was undertaken along the trap-line transects and along tracks within and around the site over four nights in 2009 and two nights in 2012 (refer to Fig. 2: Survey location and methods). Spotlighting was undertaken by three persons in the 2009 survey and two persons in 2012 for approximately two hours per night.

Day-time searching

Day-time litter searching for scats, skeletons, reptiles, frogs and skinks was undertaken opportunistically. Survey sites included roadside drains, under logs and litter and along tracks. These surveys also included specific searches for koala scats under recognised koala food trees. Over 100 tallowwood and scribbly gums (potential koala food trees) were inspected.

Bat survey

Sampling for megachiropteran and microchiropteran bats utilised harp-nets, mist nets, ultrasonic detection devices (Anabat II and Songwriter) and a spotlight (refer to Fig. 2: Survey location at page 16 and Table 2: Survey methods at page 17). Three Austbat harp-nets were set along flyways over four nights in the 2009 survey in locations where bats were considered likely to be captured (Fig. 2 at page 16). Shade cloth was suspended from each side and along the bottom of the net to direct bats into the net (Plate 8).

Two 10 m mist nets were set for two hours over three nights in the 2009 survey. Nets were set on sunset and attended during use. They were then furled for the night and relocated the following day.

Three Anabat II detection devices were used to record bat ultrasound in a variety of habitats which included potential flyways adjacent to potential roosting sites and in association with harp-nets. These were set for four nights in the 2009 survey. One Anabat detector and a Songwriter were used in the 2012 survey for two nights.

A hand-held Anabat was used during the spotlight transect and then set in a stationery location for the remainder of the night in both the 2009 and 2012 surveys. Bat calls were recorded onto a digital flash card and subsequently analysed by this consultant (Figs. 6-10).

Spotlighting and audible calls

Spotlighting for microchiropteran bats and flying-foxes was undertaken in potential food trees and by call identification over four nights in 2009 and two nights in 2012 for approximately two hours per night.

4.0 RESULTS

4.1 Weather

The rainfall and temperatures recorded during 2009 and 2012 are listed in Tables 4 and 5 (rainfall) and Tables 6 and 7 (temperature).

Table 4: Rainfall 2009

Daily Rainfall (millimetres)

SOUTH WEST ROCKS (SMOKY CAPE LIGHTHOUSE)

Station Number: 059030 · State: NSW · Opened: 1939 · Status: Open · Latitude: 30.89°S · Longitude: 153.09°E · Elevation: 117 m

2009	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	0	0	0	12.2	2.6	3.2	0	0	0	0	0	3.2
2nd	0	0.4	0	1.8	0	12.0	0	0	0	0	0	0
3rd	3.8	0	0	6.0	1.4	18.2	0	0	0	0	0	0
4th	0.2	0	0	32.4	1.0	0.8	0	0	0	33.4	0	0
5th	0	0	20.0	24.6	10.0	0	0	0	0	23.6	1.0	0.6
6th	0	0	0	0.6	39.6	0	0	0	0	5.4	11.2	1.0
7th	0	0	0	29.0	1.2	0	0	0	0	0	55.4	0
8th	0	0	0	14.4	0	0	4.2	0	1	0	25.6	0
9th	4.6	0	10.6	11.0	0	0	10.2	0	11.4	0	8.8	1.2
10th	2.4	0	33.4	0.8	0	0	34.8	0	0	0	0	0
11th	0	1.4	8.2	0	20.2	0	14.8	0	0	0	0	8.0
12th	0	1.6	4.0	1.2	0	0	0	0	0	0	0	0
13th	0	31.4	0	1.0	0	0	0	0	0	0	0.6	0
14th	0	30.8	0	54.0	0	0	0	0	0	0	0	0
15th	0	64.0	1.8	0.2	0	0	0	0	0	0	0	76.0
16th	0	155.6	0.4	0	0	1.2	0	0	0	0	0	0.2
17th	6.8	107.0	0	0	0	0.2	0	0	0	0	0	0
18th	12.4	31.4	0	0	1.0	34.2	0	0	0	0	0	0
19th	0	0.8	0	0.6	4.0	29.6	0	0	0	0	0	1.0
20th	0	0	0	30.8	8.4	86.2	0	0	0	0	0	0
21st	0	0	15.4	81.2	12.6	4.0	0	0	0	0	0	0
22nd	0.2	2.8	0.6	8.2	47.0	35.8	0	0	0	0	0	0
23rd	0	0	1.0	4.0	42.0	31.4	0	0	0.6	0	0	0
24th	0	0	0	0	5.6	0	0	0	0	0	1.0	0
25th	0.4	0	0	0	0.2	0	0	0	0	0	0	0
26th	1.8	12.0	0	0	2.8	6	0	0	0	11.4	0	0
27th	0.2	0	0	0	0	0	0	0	0	69.2	0	1.0
28th	0	0	31.0	0	0	2.4	0	0	0	0.2	0	0
29th	0		0.2	0	1.4	0.4	0	0	0	0.8	0	63.0
30th	0		6.8	0.2	0.2	0	0	0.6	0	0	0	4.0
31st	0		43.8		18.0		0	0		0		9.0
Highest daily	12.4	155.6	51.8	81.2	47.0	86.2	34.8	0.6	0.6	69.2	55.4	76.0
Monthly Total	32.8	509.2	198.0	342.2	219.8	339.6	84.0	0.6	12.0	146.6	136.6	168.8

Annual total for 2009 = 2070.2mm

↓ This day is part of an accumulated total

Quality control: 123 Done & acceptable, 123 Not completed or unknown

Table 4 (continued): Rainfall 2009

Daily Rainfall (millimetres)

SOUTH WEST ROCKS (SMOKY CAPE LIGHTHOUSE)

Station Number: 059030 · State: NSW · Opened: 1939 · Status: Open · Latitude: 30.92°S · Longitude: 153.09°E · Elevation: 117 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	146.9	168.6	183.0	172.0	132.5	141.2	78.8	79.7	56.0	94.2	114.8	119.4
Median	109.2	161.0	167.1	151.6	104.4	107.1	60.4	51.1	53.3	76.7	99.2	93.0
Highest daily	178.6	158.6	217.7	343.7	227.6	209.3	163.6	215.9	88.8	142.6	147.1	193.8
Date of highest daily	3rd 1959	15th 1988	7th 1963	28th 1963	8th 1963	17th 1986	14th 1999	27th 1949	12th 1998	31st 1984	17th 1950	9th 1947

Table 5: Rainfall 2012

Daily Rainfall (millimetres)

SOUTH WEST ROCKS (SMOKY CAPE LIGHTHOUSE)

Station Number: 059030 · State: NSW · Opened: 1939 · Status: Open · Latitude: 30.92°S · Longitude: 153.09°E · Elevation: 117 m

2012	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	0	38.0	0	0	5.0	15.8	0	0	0	0		
2nd	0	62.4	0	0	0.6	9.8	0	0	0	9.0		
3rd	0	0	4.6	1.8	0	7.0	0	0	0	0		
4th	0	0	2.2	0	13.8	27.6	0	0	0	0		
5th	1.8	0	0.8	0	0	9.0	0	0	0	0		
6th	0	0	9.8	0	0	2.6	11.4	0	0	0		
7th	0	0	2.8	0	0	2.6	6.2	0	0	0		
8th	0	21.6	0	0.8	0	0	0	0	0	0		
9th	1.0	0.6	0	0	0	0	0.6	0	0	0		
10th	0	0	0	0	0	0	2.0	0	0	0		
11th	0	1.2	40.4	0	0	35.4	4.8	23.0	0	3.0		
12th	0	0.6	3.0	0	0	57.6	1.6	4.6	0	9.2		
13th	0	0	12.8	0.8	0	0.2	15.8	1.4	0	0		
14th	0	24.0	0.6	1.0	0	12.6	5.2	0	3.8	0		
15th	0	2.4	2.2	1.4	0	0	0	0	0	0.4		
16th	2.6	0	18.2	4.2	0	0	0	0	0	0		
17th	0	3.0	0	49.0	0	0	0	0	0	0		
18th	15.6	0	4.0	53.0	0	0	0.4	0	0	0		
19th	6.2	0	3.0	50.8	0	0	0.4	0	0			
20th	3.2	0	13.4	48.0	0	0	4.0	0	0			
21st	9.2	27.0	4.0	24.0	0	0	0.8	0	0.6			
22nd	0.8	0	0.2	0.2	0	0	1.6	0	0.2			
23rd	19.6	4.0	0	0	0	0	8.0	0	0			
24th	5.6	0	0	12.0	0	0	16.0	0	0			
25th	8.8	0	0	0.2	3.8	0	2.6	0	3.2			
26th	19.0	0	2.8	0	2.2	0	0	0	0			
27th	14.6	0	0.2	0	1.4	33.0	0	0	0			
28th	1.0	0	1.2	3.0	0	21.0	0	0	0			
29th	2.8	0	8.0	5.0	1.8	22.0	0	0	0			
30th	8.0		0	4.2	19.0	0	0	0	0			
31st	0.2		0		5.2		0	0				
Highest daily	19.0	62.4	40.4	53.0	19.0	57.6	16.0	23.0	3.8	9.0		
Monthly Total	146.0	179.4	127.2	263.0	51.6	269.4	85.8	29.0	7.8			

↓ This day is part of an accumulated total
Quality control: 12.3 Done & acceptable. *12.3* Not completed or unknown

Table 5 (continued): Rainfall 2012

Daily Rainfall (millimetres)

SOUTH WEST ROCKS (SMOKY CAPE LIGHTHOUSE)

Station Number: 059030 · State: NSW · Opened: 1939 · Status: Open · Latitude: 30.92°S · Longitude: 153.09°E · Elevation: 117 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	146.9	168.6	183.0	172.0	132.5	141.2	78.8	79.7	56.0	94.2	114.8	119.4
Median	109.2	161.0	167.1	151.6	104.4	107.1	60.4	51.1	53.3	76.7	99.2	93.0
Highest daily	178.6	158.6	217.7	343.7	227.6	209.3	163.6	215.9	88.8	142.6	147.1	193.8
Date of highest daily	3rd 1959	15th 1988	7th 1963	28th 1963	8th 1963	17th 1986	14th 1999	27th 1949	12th 1998	31st 1984	17th 1950	9th 1947

Table 6: Temperature 2009

Daily Maximum Temperature (degrees Celsius)

SOUTH WEST ROCKS (SMOKY CAPE LIGHTHOUSE)

Station Number: 059030 State: NSW Opened: 1939 Status: Open Latitude: 30.92°S Longitude: 153.09°E Elevation: 117 m

2009	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	28.8	30.8	29.9	24.0	23.1	16.0	23.0	20.0	22.3	26.0	26.1	28.0
2nd	26.1	32.3	25.3	27.2	24.1	17.7	17.0	20.5	24.0	26.8	25.0	27.5
3rd	23.2	30.2	28.5	26.1	22.2	20.1	18.2	21.3		28.1	27.7	26.3
4th	27.0	31.6	27.2	23.0	23.2	21.0	18.0	20.6		20.2	25.7	26.5
5th	28.1	31.8	26.1	23.0	20.0	23.5	18.4	20.0		20.1	21.3	26.0
6th	29.0	31.5	27.0	25.6	21.1	20.5	18.6	20.8		23.2	20.0	30.0
7th	27.2	31.0	28.2	24.8	23.6	21.0	15.5	20.9		25.4	21.7	28.0
8th	28.4	31.0	28.6	24.0	21.0	20.0	17.6	19.2		26.0	25.1	
9th	21.6	31.5	22.4	23.8	25.9	19.5	16.0	20.2		21.6	25.6	
10th	26.2	28.0	27.2	24.0	22.1	17.5	16.8	19.8		22.3	25.8	28.0
11th	27.6	26.0	27.0	24.0	21.1	16.5	18.7	20.2		22.0	26.3	28.5
12th	29.6	27.0	26.9	23.5	21.4	19.5	18.8	22.2		23.7	23.2	28.0
13th	29.9	21.6	28.0	21.5	22.5	20.1	22.0	23.4		27.0	25.8	29.9
14th	28.3	20.9	27.7	25.6	22.7	20.5	19.5	21.0		28.0	26.9	29.9
15th	27.3	22.0	27.2	27.5	23.0	22.2	18.4	22.6		26.5	27.5	27.3
16th	28.7	24.5	25.5		24.0	20.7	17.5	23.2		25.0	28.0	28.7
17th	21.6	23.6	26.2	27.0	22.5	16.0	18.2	24.5		24.1	25.2	25.3
18th	23.6	23.0	26.8	24.0	19.6	17.7	19.6	21.3	27.0	23.8	23.8	29.1
19th	26.0	27.3	28.0	23.0	19.0	17.4	20.4	21.7	26.0	25.7	26.0	27.2
20th	27.0	29.0	28.8	19.0	20.0	19.1	20.6	22.1		24.2	25.7	27.2
21st	26.2	29.5	28.0	23.0	20.2	19.0	20.8	23.4		24.2	26.0	27.3
22nd	25.4	29.0	29.0	20.7	18.9	19.2	20.2	23.1		26.8	25.0	26.5
23rd	27.5	30.0	28.0	23.1	20.3	20.3	21.5	25.0		27.2	25.2	30.7
24th	27.5	29.0	27.5	23.3	22.0	21.1	18.8	21.5		27.7	28.2	29.6
25th	25.5	28.5	28.1	26.8	19.6	16.8	20.6	28.1	28.0	28.1	27.5	26.8
26th	28.6	26.0	26.8	26.0	22.0	17.4	18.3	24.0	30.5	20.5	25.1	27.6
27th	30.0	26.0	26.7	21.6	22.1	19.8	19.1	24.1	21.1	20.0	25.0	28.7
28th	30.5	28.4	25.3	23.6	23.5	20.0	19.2	24.5	23.4	23.0	31.5	29.0
29th	31.2		25.8	29.8	19.6	20.0	19.7	25.7	24.0	24.7	36.0	24.7
30th	30.8		22.4	22.0	21.2	20.1	20.8	25.8	24.5	22.4		22.6
31st	30.7		22.6		18.7		21.0	26.2		24.8		23.1
Highest daily	31.2	32.3	29.5	27.5	24.1	23.5	23.0	31.5	30.5	28.1	36.0	30.7
Lowest daily	21.6	20.9	22.4	19.0	18.7	16.0	15.5	19.2	21.1	20.0	20.0	23.6
Monthly mean	27.4	27.7	26.8	23.9	21.5	19.3	19.1	22.6	25.1	24.4	26.1	27.6

Quality control: 12.3 Done & acceptable, 12.3 Not quality controlled or uncertain, or precise date unknown

Table 6 (continued): Temperature 2009

Daily Maximum Temperature (degrees Celsius)

SOUTH WEST ROCKS (SMOKY CAPE LIGHTHOUSE)

Station Number: 059030 State: NSW Opened: 1939 Status: Open Latitude: 30.92°S Longitude: 153.09°E Elevation: 117 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	26.8	26.9	26.3	24.0	21.4	19.7	18.7	19.8	21.8	23.2	24.5	25.9
Highest monthly mean	30.1	29.2	28.0	25.8	23.7	21.3	20.5	22.6	25.1	26.4	27.8	28.8
Lowest monthly mean	24.2	24.3	24.6	22.0	19.1	17.0	16.8	16.3	19.6	20.9	21.7	24.3
Highest daily	39.5	39.2	34.3	32.8	29.5	26.3	28.3	31.5	35.6	39.2	41.7	39.5
Date of highest daily	2nd 2002	21st 2004	1st 2011	8th 1969	4th 2007	26th 1991	29th 1958	24th 2009	27th 1965	22nd 1988	19th 1968	2nd 1979
Lowest daily	10.3	10.4	10.9	10.0	14.4	11.7	11.1	12.2	14.9	14.6	15.6	16.9
Date of lowest daily	3rd 1939	14th 1938	15th 1990	22nd 2009	30th 2011	22nd 1960	23rd 1968	6th 1960	14th 1990	2nd 2011	11th 1939	1st 1994

Table 7: Temperature 2012

Daily Maximum Temperature (degrees Celsius)

SOUTH WEST ROCKS (SMOKY CAPE LIGHTHOUSE)

Station Number: 059030 · State: NSW · Opened: 1939 · Status: Open · Latitude: 30.92°S · Longitude: 153.09°E · Elevation: 117 m

2012	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	27.5	21.5	29.1	26.1	22.2	19.2	20.0	18.5	*16.8*	*17.0*		
2nd	27.9	26.6	26.9	26.4	22.5	19.1	18.9	18.9	*21.2*	*22.0*		
3rd	27.2	24.8	25.0	27.0	25.0	18.2	17.3	20.0	*21.2*	*24.2*		
4th	26.7	28.5	26.7	27.1	22.0	22.0	17.3	21.6	*22.8*	*26.0*		
5th	29.0	29.0	28.3	26.8	23.8	17.1	17.7	22.5	*21.0*	*22.2*		
6th	28.0	29.5	25.2	27.2	23.5	17.7	17.3	22.2	*20.6*	*25.2*		
7th	27.8	30.0	24.8	27.4	21.8	18.5	18.4	18.0	*20.0*	*27.0*		
8th	27.7	27.5	26.0	28.1	22.8	19.2	19.2	20.3	*24.0*	*25.0*		
9th	30.2	27.5	29.0	27.1	25.0	19.3	20.2	20.0	*22.3*	*24.6*		
10th	30.0	27.1	28.5	20.4	25.2	16.3	19.2	17.0	*22.3*	*25.3*		
11th	30.7	26.8	27.0	22.0	24.0	15.6	21.5	16.5	*22.3*	*19.0*		
12th	25.2	28.3	25.5	22.0	24.1	19.5	19.0	17.0	*24.3*	*19.6*		
13th	28.0	28.7	27.0	23.2	23.6	18.3	20.5	19.0		*23.2*		
14th	28.4	27.2	27.2	25.8	18.9	21.0	17.0	21.5	*20.0*	*22.8*		
15th	27.2	27.7	27.1	26.9	21.3	20.0	20.0	22.0	*22.2*	*24.8*		
16th	27.5	27.6	27.0	23.7	21.6	21.5	18.2	24.0	*22.0*	*23.6*		
17th	24.2	28.3	24.7	19.0	22.0	21.0	20.9	22.0	*22.3*	*27.3*		
18th	28.7	28.8	24.5	22.2	23.1	19.9	20.0	20.7	*21.6*			
19th	28.0	29.0	24.7	22.8	23.7		18.4	20.3	*24.1*			
20th	28.1	29.4	27.2	25.2	23.7	*19.6*	17.5	20.7	*24.7*			
21st	29.1	27.4	24.2	25.7	23.2	20.3	19.0	20.8	*23.3*			
22nd	24.0	27.5	27.0	26.0	23.6	20.4	16.7	22.2	*24.7*			
23rd	25.8	28.0	28.3	26.6	23.6	18.0	16.2	21.9	*24.7*			
24th	25.6	28.0	23.0	22.6	23.0	19.5	19.3	24.2	*22.0*			
25th	24.8	30.0	26.1	21.2	18.9	19.8	20.3	23.0	*23.3*			
26th	22.8	28.0	26.4	23.4	21.0	19.2	19.5	20.2	*24.6*			
27th	27.7	27.5	26.9	21.6	19.6	16.2	20.3	20.6	*24.7*			
28th	26.6	28.0	23.1	17.9	19.2	18.5	18.5	21.8	*25.1*			
29th	25.7	30.3	26.6	23.2	19.0	20.6	19.6	20.8	*25.0*			
30th	25.4		27.6	21.5	19.9	21.6	17.8	22.0	*22.8*			
31st	27.2		26.1		16.5		18.0	19.1				
Highest daily	30.7	30.3	29.1	28.1	25.2	22.0	21.2	24.2	*30.0*	*27.3*		
Lowest daily	22.8	21.5	23.1	17.9	16.5	15.6	16.2	16.5	*18.8*	*19.0*		
Monthly mean	27.2	27.9	26.4	24.2	22.2	19.2	18.8	20.6				

Quality control: 12.1 Done & acceptable, */2.1* Not quality controlled or uncertain, or precise date unknown

Table 7 (continued): Temperature 2012

Daily Maximum Temperature (degrees Celsius)

SOUTH WEST ROCKS (SMOKY CAPE LIGHTHOUSE)

Station Number: 059030 · State: NSW · Opened: 1939 · Status: Open · Latitude: 30.92°S · Longitude: 153.09°E · Elevation: 117 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	26.8	26.9	26.1	24.0	21.4	19.2	18.7	19.8	21.8	23.2	24.5	25.9
Highest monthly mean	30.1	29.2	28.0	25.8	23.7	21.3	20.5	22.6	25.1	26.4	27.5	28.8
Lowest monthly mean	24.2	24.3	24.6	22.0	19.1	17.0	16.8	16.3	19.6	20.9	21.7	24.3
Highest daily	39.5	39.2	34.3	32.8	29.5	26.3	28.3	31.5	35.6	39.2	41.7	39.5
Date of highest daily	2nd 2002	21st 2004	1st 2011	8th 1966	4th 2007	26th 1991	29th 1958	24th 2009	27th 1965	22nd 1988	19th 1968	2nd 1979
Lowest daily	18.3	19.4	18.9	16.0	14.4	11.7	11.1	12.2	14.9	14.6	15.6	16.8
Date of lowest daily	3rd 1959	14th 1988	13th 1990	22nd 2008	30th 2011	22nd 1960	23rd 1968	6th 1960	14th 1990	2nd 2011	11th 1959	1st 1994

These data illustrate the extremely dry conditions experienced in 2009 compared to more normal weather in 2012. The temperature range recorded during field surveys was between approximately 19-25 degrees Celsius in 2009 and 16 – 23 degrees Celsius in 2012.

4.2 Soils

Soils at the site fall within the mapping category of loam, silty loam, or sandy clay loam (20-30%) (Australian Soil Resource Information System mapping (http://www.asris.csiro.au/mapping/viewer.htm), Fig. 3).

Fig. 3: Soil map (Source ASRIS http://www.asris.csiro.au/mapping/viewer.htm)

4.3 Vegetation

In accordance with the classification of Keith (2004), the following vegetation was recorded:

- Formation: dry sclerophyll forest;

- Class: Hunter-Macleay Dry Sclerophyll Forest;
- Type: Tall to extremely tall dry open forest; and
- Community: Scribbly gum, tallowwood, pink bloodwood, red bloodwood, needle bark stringybark and large-fruited blackbutt.

The BBAM adopts the use of vegetation benchmark data where each vegetation type is assigned to a broader Vegetation Class and a Vegetation Formation (Keith 2004). This has been lodged on the OEH web page through the Calculator. Shape files with respect to how calculations were derived have been lodged by the Applicant.

(http://www.environment.nsw.gov.au/projects/VegetationTypingAndCondition.htm). Scribbly gum, *Eucalyptus saligna,* was the dominant species throughout the site. It was recorded from the lower flats to the slopes and ridges. However, tallowwood, *Eucalyptus microcorys*, was subdominant and patchily distributed, particularly on the lower slopes, whereas large-fruited blackbutt, *Eucalyptus pyrocarpa*, was more common on the ridges. Given the dominance of scribbly gum and the similarity of other species across the landscape, the vegetation mapping comprised of only Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast (ID NR228) (Fig. 4). This community lists scribbly gum as dominating the canopy with the associated species: red bloodwood (*Corymbia gummifera*), pink bloodwood (*Corymbia intermedia*), needlebark stringybark (*Eucalyptus planchoniana*), turpentine (*Syncarpia glomulifera*), bastard white mahogany (*Eucalyptus umbra*), smudgy apple (*Angophora woodsiana*), Bailey's stringybark (*Eucalyptus baileyana*).

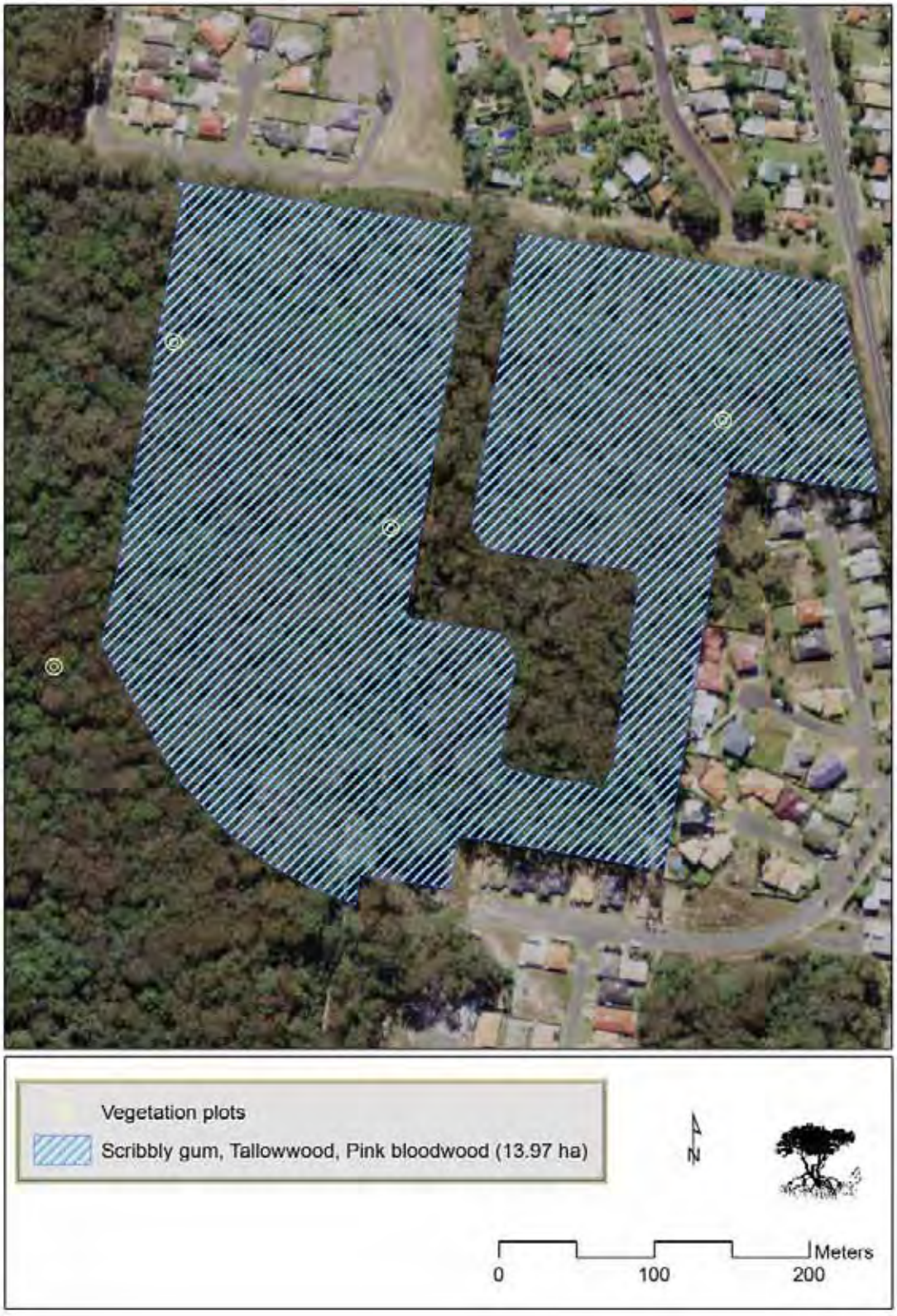


Fig. 4: Vegetation within proposed development site

4.4 Fauna

4.4.1 Reptiles and frogs

A number of lizards, skinks and small reptiles were recorded during the fauna survey.

The bearded dragon, *Pogona barbata,* and the eastern grass skink, *Lampropholis delicata*, were the most common lizards observed. The bearded dragon was recorded in open areas and along tracks (Plate 19, page 24) whereas the eastern grass skink was common in leaf litter and was the only species trapped in pit-fall traps.

The green tree snake, *Dendrelaphis punctulata*, was the only snake observed during the fauna survey. However, other species such as the yellow-faced whip snake, *Demansia psammophis,* the carpet python, *Morelia spilota,* the red-bellied black snake, *Pseudechis porphyriacus,* have been recorded in the vicinity of the site (pers. recs.).

Few frog species were recorded in the 2009 survey due to the particularly dry conditions. However, the red-backed toadlet, *Pseudophryne coriacea*, was detected calling on a number of occasions and the rocket frog, *Litoria nasuta*, was observed. Heavy rain in early August 2012 resulted in localised pools of water which persisted throughout the 2012 survey. The striped marsh frog, *Limnodynastes peronii,* the common froglet, *Crinia signifera*, the dusky toadlet, *Uperoleia fusca*, the rocket frog and the eastern sign-bearing frog, *Crinia parinsignifera*, were detected calling.

Vulnerable species such as the Wallum froglet, *Crinia tinnula,* are not expected to occur at the site due to the absence of suitable habitat.

4.4.2 Birds

A variety of forest birds were recorded (refer to Appendix 2: Fauna). The white-throated tree creeper, *Cormobates leucophaea,* was ubiquitous in the forest and woodlands. Lewin's honeyeater*, Meliphaga lewinii*, the grey fantail, *Rhipidura fuliginosa,* and the white-throated gerygone, *Gerygone olivacea,* were also relatively common. Conspicuous calling species included the rufous whistler, *Pachycephala rufiventris*, the cicada bird, *Coracina tenuirostris*, and the white-throated treecreeper, *Cormobates leucophaea*.

Species such as the laughing kookaburra, *Dacelo novaeguineae,* the welcome swallow, *Hirundo neoxena,* the grey butcherbird, *Hirundo neoxena*, the Australian magpie, *Gymnorhina tibicen*, the torresian crow, *Corvus orru,* and the masked lapwing, *Vanellus miles*, were also common.

Bird assemblages vary throughout the year and correspond to the flowering periods of the trees and shrubs or to the migration patterns of the particular species. For example, the rainbow lorikeet, *Trichoglossus haematodus,* and the scaly-breasted lorikeet, *Trichoglossus chlorolepiotus*, are opportunistic blossom feeders which were noted foraging throughout the site. Other species which foraged opportunistically at the site included the yellow-tailed black cockatoo, *Calyptorhynchus funereus.* The tawny frogmouth, *Podargus strigoides* (Plate 22), and southern boobook, *Ninox*

boobook, were both observed and were detected calling on numerous occasions.

Play-back calls enticed a response from the masked owl, *Tyto novaehollandiae*, during the 2012 survey (Fig. 5 at page 41). Consistent responses were obtained on both survey nights in 2012. No other species responded to play-back calls.

A search under forest oak, the characteristic food species of the glossy black-cockatoo, *Calyptorhynchus lathami,* for chewed seeds was unproductive.

4.2.3 Mammals

The swamp wallaby, *Wallabia bicolour,* the eastern grey kangaroo, *Macropus giganteus,* the brush tail possum, *Trichosurus vulpecular,* and the common ring-tail possum, *Pseudocheirus peregrinus,* were either observed during vegetation transects or plots, or trapped in cage traps (Plates 11 and 17). The brush-tail possum and the squirrel glider, *Petaurus norfolcensis,* were observed by spotlight (Plate 5, Fig. 5).

The sugar glider was observed during both the 2009 and 2012 surveys suggesting that they are resident at the site. The population could be quite high if one takes into account an expected home range of around 7 ha (Goldingay *et. al.,* 2010).

Four small mammal species, the brown antechinus, *Antechinus stuartii,* the swamp rat, *Rattus lutreolus,* the black rat, *Rattus rattus* and the brush-tail phascogale, *Phascogale tapoatafa*, were recorded at the site. These results are listed in Tables 8-12.

The poor trapping results in 2009 were attributed to the particularly dry survey conditions experienced (see rainfall data in Table 4 at page 29), rather than the paucity of these species at the site.

In the case of the phascogale, this species experiences difficulty successfully breeding and rearing young under drought conditions (Rhind 2002) although it is also possible that it is uncommon at the site. It was only recorded on one night in hair-tube traps despite 320 Elliott "A" and "B" trap-nights being undertaken.

Table 8: Elliott trap results for transect 1
(numbers in column refer to trap # along transect, eg., "8" = 1 specimen captured in trap 8)

September-October 2009	*Antechinus stuartii* (brown antechinus)
September 29	8
September 30	
October 1	
October 2	

Table 9: Elliott trap results for transect 2

September-October 2009	*Antechinus stuartii*
September 29	
September 30	10
October 1	10
October 2	12

Table 10: Elliott trap results for transect 3

September-October 2009	*Rattus rattus* (black rat)	Common ring-tail possum
September 29		
September 30		"B" Elliott
October 1		
October 2	13	

Table 11: Results for the "B" Elliott 2012 survey

August 2012	Black rat
August 12	
August 13	7

Table 12: Cage trap results

September-October 2009	*Trichosurus vulpecula* (common brushtail possum)
September 29	Capture at transect 1
September 30	
October 1	Capture at transect 1
October 2	Captures at transects 1 and 2

Table 13: Hair-tube trap results (September to October 2009) (Identified by B. Triggs)

No.	Transect	Tube	Mammal ID - definite
1	1	#2	*Trichosurus sp.*
			Wallabia bicolor
2	1	#4	*Trichosurus sp.*
3	1	#6	*Phascogale tapoatafa*
			W. bicolor
4	1	#7	*W. bicolor*
5	1	#8	*W. bicolor*
6	1	#9	*W. bicolor*
7	1	#11	*W. bicolor*
8	1	#12	*W. bicolor*
9	2	#7	*Trichosurus sp.*
10	2	#11	*Trichosurus sp.*
11	3	#9	*Rattus lutreolus*

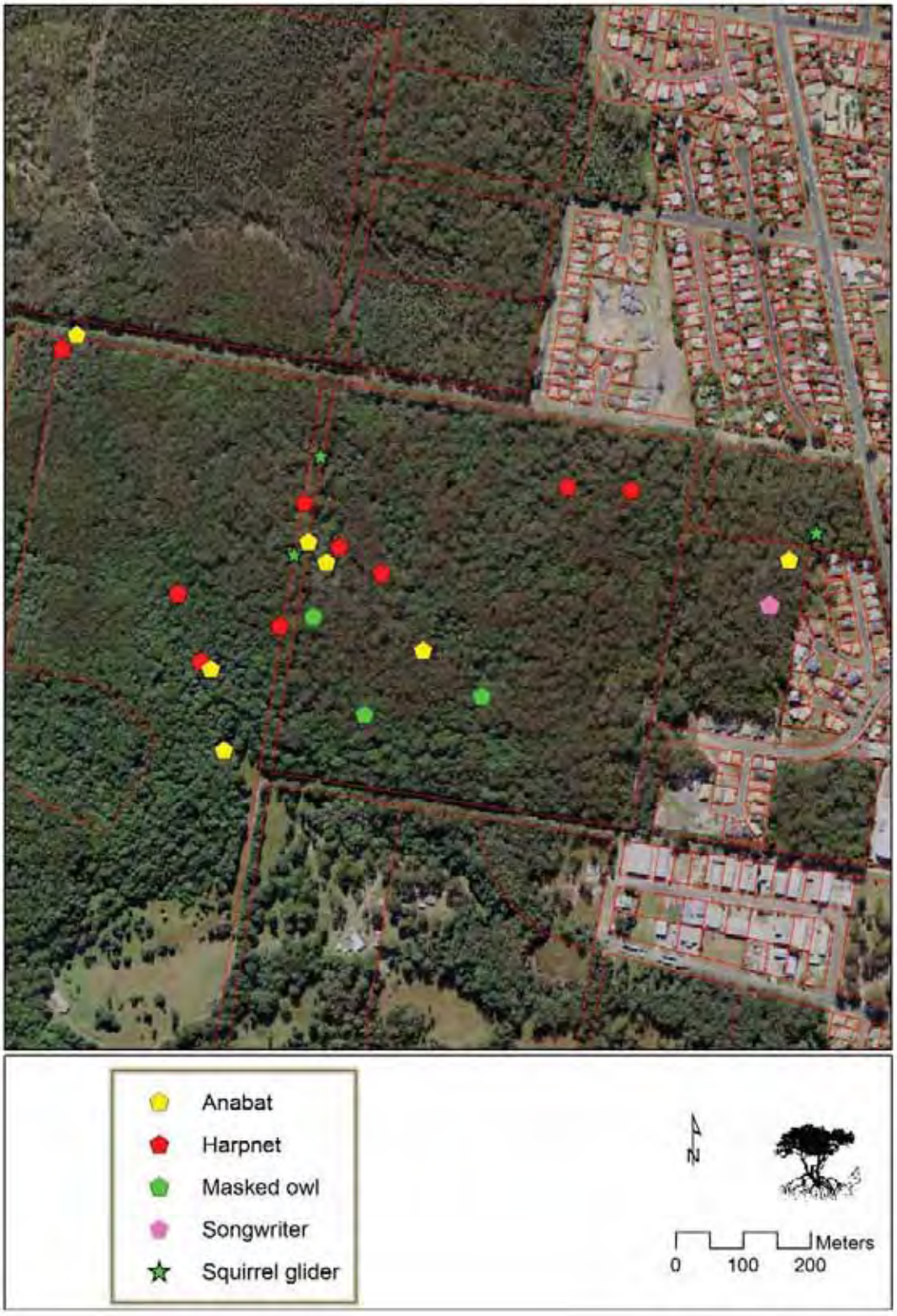


Fig. 5: Threatened species records
(note: little bent-wing bats recorded at Anabat and Songwriter locations)

The use of the site by microbats was particularly high (Table 14 at page 43). In the case of the forest bats, this was attributed to the abundance of high quality roosting sites. The other species listed in Table 14 are more likely to rely on the site to supply foraging resources. It was interesting to note that bat species recorded did not differ significantly between the 2009 and 2012 surveys, with the exception that long-eared bats were not recorded in the 2012 survey.

Three microbats, comprising of two eastern forest bats, *Vespadelus pumilus,* and one little forest bat, *V. vulternus*, were captured in mist-nets on 28 September 2009.

Harp-net captures were as follows: four eastern forest bats on 28 September; one eastern forest bat and one little forest bat on 29 September; 17 bats on 30 September comprising of 13 eastern forest bats, one Gould's long-eared bat and three little bent wing bats and five captures on 1 October comprising of three eastern forest bats, two little forest bats and one little bent wing bat. The variation between bat numbers captured over the respective nights was attributed to harp-net location rather than variation of bat abundance across the site. Harp-nets were set along a dry creekline on the night of 30 September 2009 and surrounding vegetation was well placed to direct bats into the net, thus contributing to the high capture rate.

The Anabat bat and Songwriter survey recorded over 760 recognisable calls which were attributable to the six microbat species listed in Table 14 (see also Figs. 6 - 10). Two bat species, the little bent-wing bat, and the grey-headed flying fox, were recorded and are listed as vulnerable pursuant to the TSC Act.

Table 14: Bat species recorded at the site ("#" indicates threatened species)

Scientific name	Common name	Number of identifiable calls
Chalinolobus gouldii	Gould's wattled bat	2
Nyctophylus sp.	A long-eared bat	14
Miniopteris australis#	Little bent-wing bat	170
Pteropus poliocephalus#	Grey-headed flying-fox	>20 sightings
Vespadelus pumilus	Eastern forest bat	522
Vespadelus vulternus	Little forest bat	54
Rhinolophus megaphyllus	Eastern horse-shoe bat	4
Total		766 calls

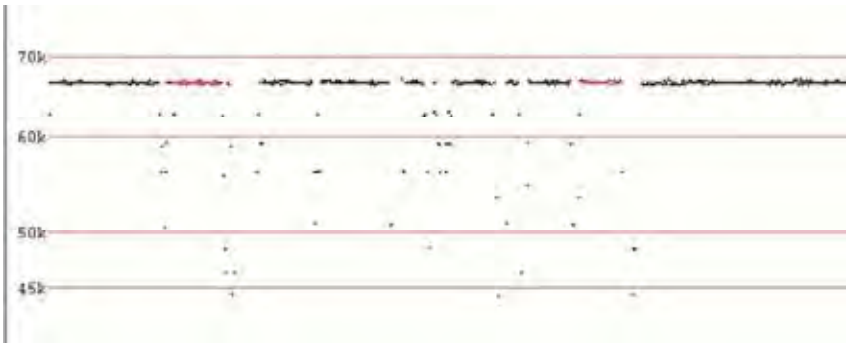


Fig. 6: Sonogram of eastern horse-shoe bat

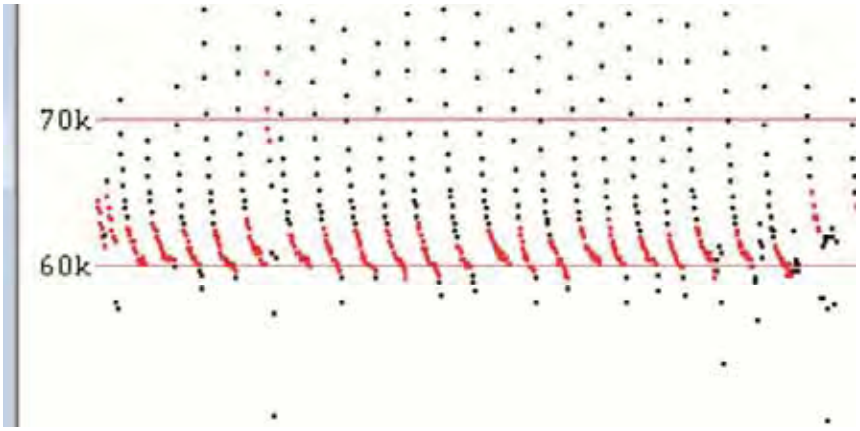


Fig. 7: Sonogram of little bent-wing bat

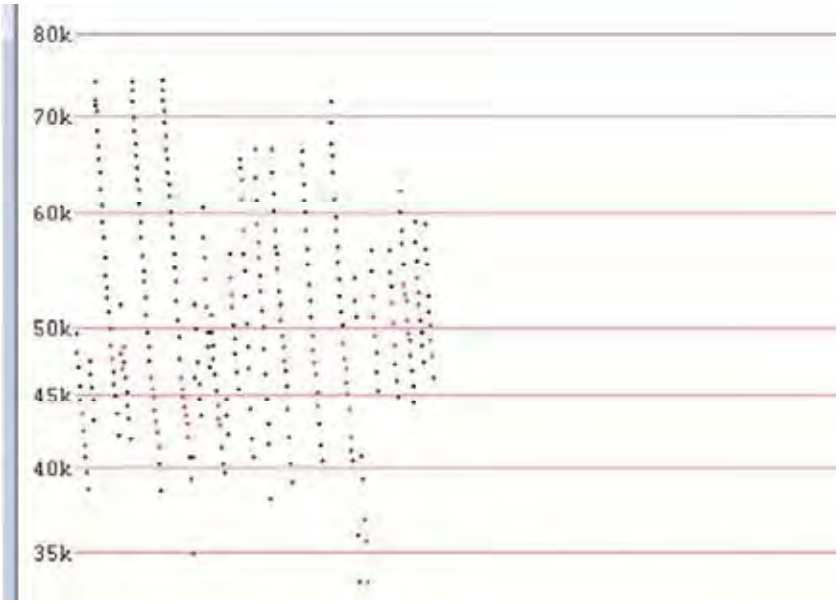


Fig. 8: Sonogram of long-ear bat

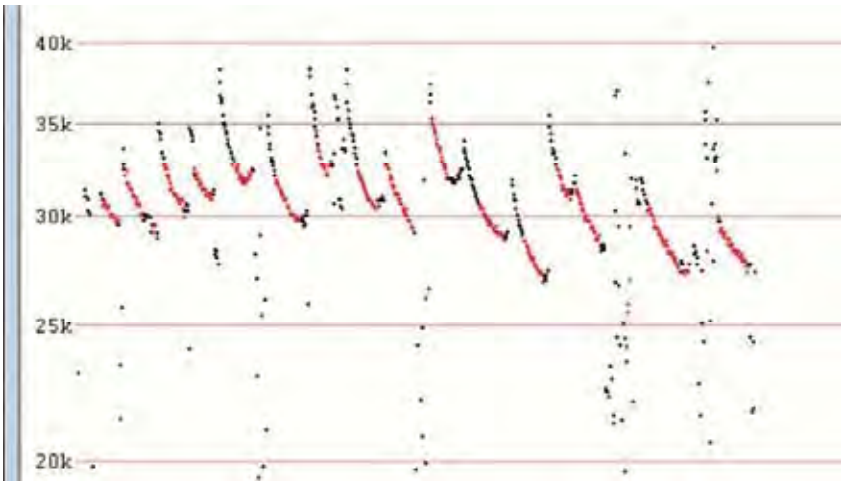


Fig. 9: Sonogram of Gould's wattled bat

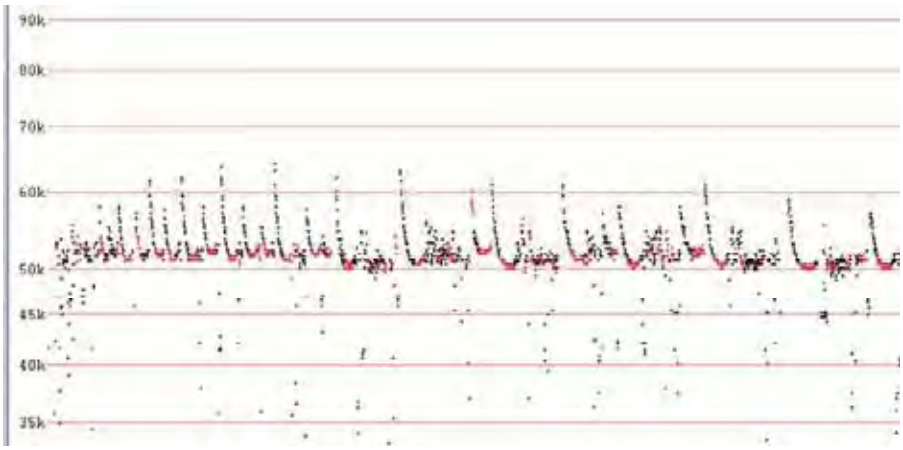


Fig. 10: Sonogram of little forest bat

5.0 THREATENED SPECIES ASSESSMENT

This assessment has been undertaken in accordance with the draft guidelines. It has also addressed the more recent OEH interim policy on assessing and offsetting biodiversity impacts of Part 3A, State significant development and State significant infrastructure projects (2011) (Appendix 3).

5.1 Draft guidelines for threatened species assessment

5.1.1 Development site

Steps 1 and 2 of the draft guidelines refer to the need to undertake a preliminary assessment and a field survey. These matters are reported herein at pages 13-44.

Step 3 of the guidelines refers to the evaluation of impacts. This is undertaken by using the BBAM and the BioBanking Calculator.

The BBAM provides rules for the number and type of credits that a development site will require in order to offset impacts and thus "improve or maintain" biodiversity values. The BBAM also provides rules for the number and type of credits that can be created at a BioBank site.

The proposed development is illustrated in Fig. 1 at page 8. The BBAM and Credit Calculator has established that 883 credits will need to be retired in order to meet the "improve or maintain" standard. In addition, 279 brush-tailed phascogale species credits will need to be retired. These are detailed in the credit report at pp. 49-51 of this report.

5.1.2 Mitigation

A development proposal for 220 lots and a BioBanking proposal to mitigate impacts was lodged with the Department for an Adequacy Assessment on 24 June 2010. This is described in section 2 of this report and is illustrated in Fig. 11. This proposal now been reduced to 156 allotments and open space as illustrated in Fig. 12.

Fig. 11: 2010 proposal (220 allotments)

Fig. 12: Current proposal (156 allotments, not including extension of road to west)

5.1.3 Offsets

This proposal has also identified 19.2 ha of land which is potentially available for a BioBank site (Fig. 13 at page 52). Calculations with respect to BioBanking have established that this site can generate 152 ecosystem credits and 31 species credits for the masked owl, the squirrel glider and the brush-tailed phascogale respectively (see BioBanking credit report at pp. 53-55 of this report. This leaves a short fall of some 731 ecosystem and 248 brush-tailed phascogale credits.

Preliminary enquiries undertaken, with respect to sourcing these credits with GHD, Port Macquarie indicate that suitable ecosystem and species credits are available to offset development impacts and therefore meet the "improve or maintain test" (Figure 14 at page 56).

5.2 OEH interim policy on assessing and offsetting biodiversity impacts under Part 3A

This policy (Appendix 3) seeks to provide a consistent and transparent approach to impact assessment and offsetting for projects assessed under Part 3A. This policy relates to proposals that are assessed by the Department of Planning and Infrastructure under the Part 3A of the EP&A Act and are therefore not part of the Biobanking Scheme.

This policy acknowledges that proposals assessed as Part 3A projects do not have to meet the "improve or maintain" standard, which is required under Biobanking. Nevertheless, it adopts the use of the BBAM for the purpose of quantifying and categorising the biodiversity values and impacts of Part 3A proposals.

5.2.1 Tier 1: "Improve or Maintain"

The Biobank credits available at the site together with those which can be sourced offsite would allow this project to meet Tier 1 of the Policy guidelines which is the "improve or maintain" standard. While not necessarily required for Part 3A proposals, the "improve or maintain" standard is a high standard of biodiversity protection.

The Policy identifies that a proposal can fall short of the "improve or maintain" standard in two main ways. This occurs when red flag assets are to be cleared outside of the rules allowed by the BBAM or the amount and type of offsetting secured is inconsistent with the requirements of the BBAM.

With respect to this proposal, red flag assets are not proposed to be cleared and offsetting can be sourced from land adjacent to or in the vicinity of the site. This approach is consistent with that required by the BBAM.

BioBanking Credit Calculator

NSW GOVERNMENT | Office of Environment & Heritage

BioBanking credit report

This report identifies the number and type of credits required at a DEVELOPMENT SITE.

Date of report: 21/08/2012 Time: 1:43:49PM Tool version: 2.0

Development details

Proposal ID:	0064/2012/0318D
Proposal name:	Settlers Ridge
Proposal address:	Gregory Street and Kieth Andrews Avenue South West Rocks NSW 2431
Proponent name:	SJ Connelly CPP Pty Ltd
Proponent address:	PO Box 538 Lennox Head NSW 2478
Proponent phone:	0266877171
Assessor name:	Peter Parker
Assessor address:	Broken Head Road BROKEN HEAD NSW 2481
Assessor phone:	6685 3148
Assessor accreditation:	0064

Improving or maintaining biodiversity

An application for a red flag determination is required for the following red flag areas

Red flag	Reason

The application for a red flag determination should address the criteria set out in the BioBanking Assessment Methodology. Please note that a biobanking statement cannot be issued unless the determination is approved.

Additional information required for approval:

- ☐ Change to percent cleared for a vegetation type/s
- ☐ Use of local benchmark
- ☐ Change negligible loss
- ☐ Expert report
- ☐ Predicted threatened species not on site
- ☐ Change threatened species response to gain (Tg value)

Ecosystem credits summary

Vegetation type	Area (ha)	Credits required	Red flag
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	13.97	883	No
Total	13.97	883	

Credit profiles

1. Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast, (NR228)

Number of ecosystem credits required	883
CMA sub-region	Macleay Hastings - Northern Rivers
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	Offset options - CMA sub-regions
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast, (NR228)	Macleay Hastings - Northern Rivers
Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast, (NR114)	Clarence Lowlands
Blackbutt - bloodwood dry heathy open forest on sandstones of the northern North Coast, (NR115)	Coffs Coast & Escarpment
Blackbutt - Needlebark Stringybark shrubby open forest on coastal sands of the North Coast, (NR116)	Clarence Sandstones
Blackbutt - Spotted Gum shrubby open forest on sandstones of the lower Clarence Valley of the North Coast, (NR118)	
Pink Bloodwood - Red Mahogany - Smudgy Apple shrubby open forest on sandstone of northern North Coast, (NR218)	
Pink Bloodwood open forest of the coastal lowlands of the North Coast, (NR220)	
Scribbly Gum - Needlebark Stringybark heathy open forest of coastal lowlands of the northern North Coast, (NR227)	

Species credits

Common name	Scientific name	Extent of impact	Number of species credits required
Brush-tailed Phascogale	Phascogale tapoatafa	13.97	279

Fig. 13: Potential BioBank site

BioBanking Credit Calculator

NSW GOVERNMENT | Office of Environment & Heritage

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE.

Date of report: 21/08/2012 Time: 1:38:06PM Tool version: 2.0

Biobank details

Proposal ID:	0064/2012/0319B
Proposal name:	Settlers Ridge
Proposal address:	Gregory Street and Kieth Andrews Drive South West Rocks NSW 2431
Proponent name:	SJ Connelly CPP Pty Ltd
Proponent address:	PO Box 538 Lennox Head NSW 2478
Proponent phone:	02877171
Assessor name:	Peter Parker
Assessor address:	Broken Head Road BROKEN HEAD NSW 2481
Assessor phone:	6685 3148
Assessor accreditation:	0064

Additional information required for approval:

☐ Use of local benchmark

☐ Expert report

☐ Change threatened species response to gain (Tg value)

Ecosystem credits summary

Vegetation type	Area (ha)	Credits required	Red flag
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	19.20	152	No
Total	19.20	152	

Credit profiles

1. Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast, (NR228)

Number of ecosystem credits required	152
CMA sub-region	Macleay Hastings - Northern Rivers
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

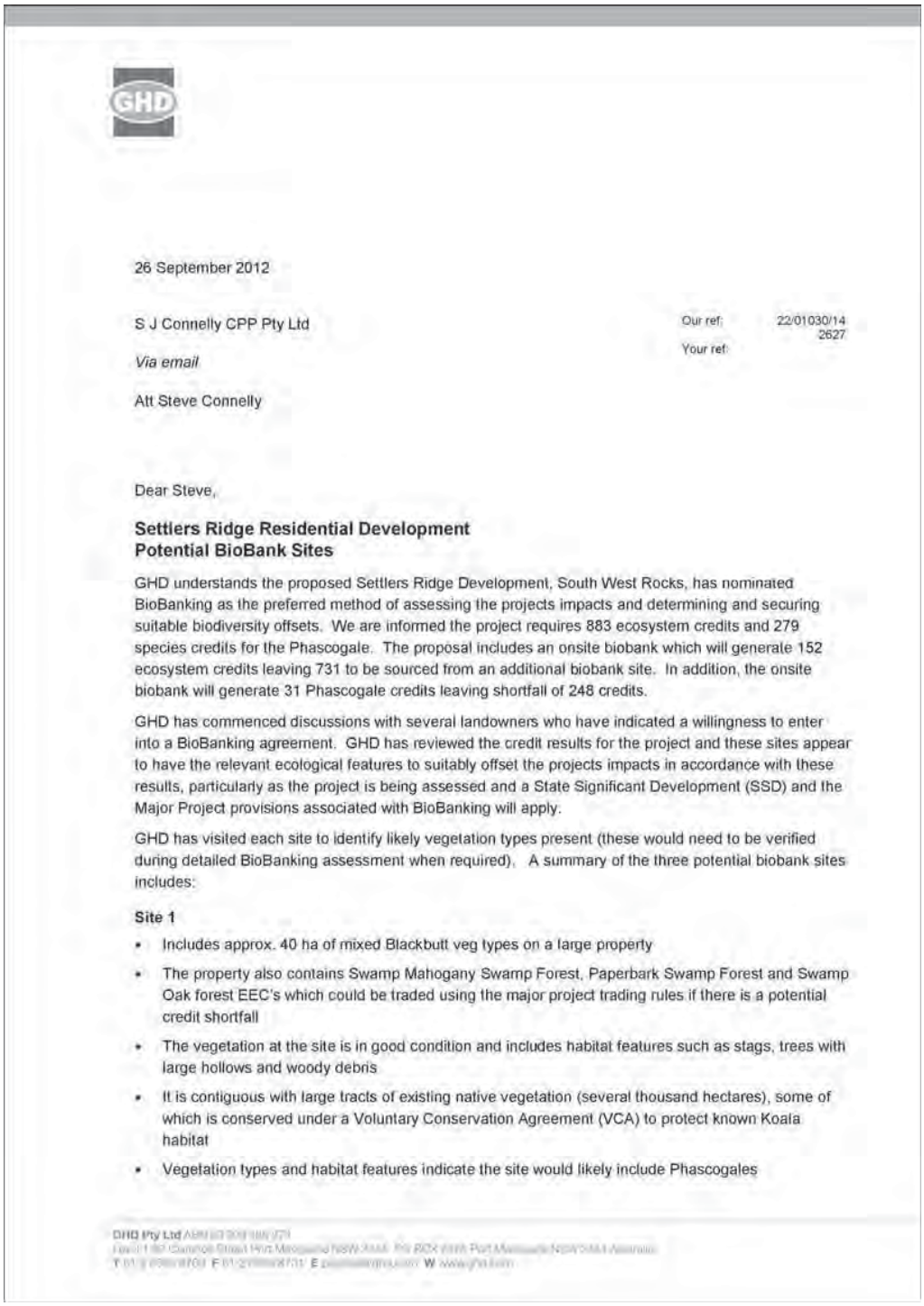
Species credits

Common name	Scientific name	Extent of impact	Number of species credits required
Masked Owl	Tyto novaehollandiae	20.00	31
Squirrel Glider	Petaurus norfolcensis	20.00	31
Brush-tailed Phascogale	Phascogale tapoatafa	20.00	31

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Cat and/or Fox control
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Exclude miscellaneous feral species
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Maintain or reintroduce flow regimes (aquatic flora)



26 September 2012

S J Connelly CPP Pty Ltd

Via email

Att Steve Connelly

Our ref: 22/01030/14
Your ref: 2627

Dear Steve,

Settlers Ridge Residential Development
Potential BioBank Sites

GHD understands the proposed Settlers Ridge Development, South West Rocks, has nominated BioBanking as the preferred method of assessing the projects impacts and determining and securing suitable biodiversity offsets. We are informed the project requires 883 ecosystem credits and 279 species credits for the Phascogale. The proposal includes an onsite biobank which will generate 152 ecosystem credits leaving 731 to be sourced from an additional biobank site. In addition, the onsite biobank will generate 31 Phascogale credits leaving shortfall of 248 credits.

GHD has commenced discussions with several landowners who have indicated a willingness to enter into a BioBanking agreement. GHD has reviewed the credit results for the project and these sites appear to have the relevant ecological features to suitably offset the projects impacts in accordance with these results, particularly as the project is being assessed and a State Significant Development (SSD) and the Major Project provisions associated with BioBanking will apply.

GHD has visited each site to identify likely vegetation types present (these would need to be verified during detailed BioBanking assessment when required). A summary of the three potential biobank sites includes:

Site 1

- Includes approx. 40 ha of mixed Blackbutt veg types on a large property
- The property also contains Swamp Mahogany Swamp Forest, Paperbark Swamp Forest and Swamp Oak forest EEC's which could be traded using the major project trading rules if there is a potential credit shortfall
- The vegetation at the site is in good condition and includes habitat features such as stags, trees with large hollows and woody debris
- It is contiguous with large tracts of existing native vegetation (several thousand hectares), some of which is conserved under a Voluntary Conservation Agreement (VCA) to protect known Koala habitat
- Vegetation types and habitat features indicate the site would likely include Phascogales

GHD Pty Ltd

Fig. 14: Potential BioBank or offset sites

- The land owner has indicated a willingness to proceed with a biobanking agreement over the Blackbutt veg types (as well as Swamp Mahogany, Paperbark and Swamp Oak if required)

Site 2

- Includes approx. 25 ha of Blackbutt Needlebark Stringy Bark vegetation
- The site is contiguous with the Hat Head National Park and is connected to several thousand hectares of native vegetation
- The vegetation at the site is in good condition and includes habitat features such as stags, trees with large hollows and woody debris
- The site has confirmed sightings of Phascogales
- The land owner has indicated a willingness to enter into further discussions regarding placing a biobanking agreement over the Blackbutt vegetation type

Site 3

- Includes approx. 25 ha of Scribbly Gum-Red Bloodwood vegetation on a larger property
- The site is contiguous with several thousand hectares of native vegetation
- The vegetation at the site is in good condition and includes habitat features such as stags, trees with large hollows and woody debris
- Vegetation types and habitat features indicate the site would likely include Phascogales
- The land owner has indicated a willingness to proceed with a biobanking agreement over the Scribbly Gum-Red Bloodwood vegetation type

Should you have any questions in relation to the above, please contact me accordingly. We look forward to further discussions to progress negotiations regarding these sites when appropriate.

Sincerely
GHD Pty Ltd

Daniel Williams
Principal Environmental Consultant
6586 8714

Fig. 14 (continued): Potential BioBank or offset sites

6.0 REFERENCES

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DEC 2005 *Part 3A Guidelines for threatened species assessment,* Department of Environment and Conservation and Department of Primary Industries July 2005.

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APPENDIX 1:

VEGETATION

Scientific name	Common name
** introduced or naturalised*	
FERNS	
ADIANTACEAE	
Adiantum hispidulum	rough maidenhair
BLECHNACEAE	
Blechnum cartilagineum	gristle fern
Blechnum camfieldii	swamp fern
Blechnum indicum	swamp water fern
DENNSTAEDTIACEAE	
Pteridium esculentum	bracken
DICKSONIACEAE	
Calochlaena dubia	common ground fern
GLEICHENIACEAE	
Gleichenia dicarpa	pouched coral fern
LINDSAECEAE	
Lindsaea microphylla	lacy wedge fern
NEPHROLEPIDACEAE	
Nephrolepis cordifolia	fishbone fern
POLYPODIACEAE	
Platycerium bifurcatum	elk-horn fern
GYMNOSPERMS (Conifers)	
CUPRESSACEAE	
Callitris columellaris	coast cypress
PINACEAE	
**Pinus elliotii*	slash pine
ANGIOSPERMS (Flowering plants)	
Monocotyledons	
(palms, palm-lilies and cycads)	
AGAVACEAE	
Cordyline stricta	narrow-leaf palm lily
ARECACEAE	
Archontophoenix cunninghamiana	bangalow palm
Livistona australis	cabbage palm
ASPARAGACEAE	
**Protasparagus aethiopicus*	ground asparagus
CYPERACEAE	
Baumea teretifolia	a sedge
Carex appressa	carex
Gahnia clarkei	tall sawsedge
Lepidosperma laterale	sword sedge
DIOSCOREACEAE	
Dioscorea transversa	native yam

Scientific name ** introduced or naturalised*	Common name
IRIDACEAE	
Patersonia glabrata	leafy purple-flag
**Watsonia bulbillifera*	wild watsonia
LUZURIAGACEAE	
Eustrephus latifolius var. latifolius	wombat berry
Geitonoplesium cymosum	scrambling lily
ORCHIDACEAE	
Acianthus fornicatus	pixie caps
Calanthe triplicata	Christmas orchid
Cryptostylis erecta	bonnet orchid
Dipodium variegatum	slender hyacinth orchid
PHORMIACEAE	
Dianella caerulea var *caerulea*	blue flax lily
POACEAE	
**Andropogon virginicus*	whiskey grass
Aristida sp.	a spear grass
** Briza maxima*	quaking grass
Cynodon dactylon	couch
Entolasia stricta	wiry panic grass
Eragrostis interrupta	love-grass
Imperata cylindrica var. *major*	blady grass
**Melinis minutiflora*	molasses grass
Oplismenus imbecillis	basket grass
Ottochloa gracillima	forest grass
**Paspalum urvillei*	vasey grass
**Paspalum mandiocanum*	broad-leaved paspalum (warrel grass)
**Setaria sphacelata*	canary seed grass
**Sporobolus indicus* var. *capensis*	Parramatta grass
Themeda australis	kangaroo grass
RESTIONACEAE	
Leptocarpus tenax	slender twine rush
SMILACACEAE	
Smilax australis	austral sarsparilla
Smilax glyciphera	sweet sarsaparilla
UVULARIAVEAE	
Tripladenia cunninghamii	kreysigea
XANTHORRHOEACEAE	
Lomandra longifolia	matrush
Lomandra multiflora	many-flowered matrush
Xanthorrhoea macronema	bottlebrush grass tree
Xanthorrhoea resinosa ssp. *fulva*	spear grass tree
ZINGIBERACEAE	
Alpinia caerulea	native ginger

Scientific name	Common name
** introduced or naturalised*	
Dicotyledons	
ANACARDIACEAE	
Euroschinus falcatas	ribbonwood
APIACEAE	
Centella asiatica	centella
Trachymene anisocarpa	a wild parsnip
APOCYNACEAE	
Parsonsia straminea	common silkpod
Tabernaemontana pandacqui	banana bush
ARALIACEAE	
Astrotricha latifolia	wooly stair-hair
Schefflera actinophylla	umbrella tree
ASCLEPIADACEAE	
**Gomphocarpus fruiticocus*	narrow-leaf cotton-bush
Marsdenia rostrata	common milk vine
ASTERACEAE	
**Ageratum houstonianum*	blue billygoat weed
**Ambrosia artemisiifolia*	annual ragweed
**Biddens pilosa*	cobbler's pegs
**Chrysanthemoides monilifera* spp. *rotundata*	bitou bush
**Conyza albida*	tall fleabane
** Hypochoeris radicata*	flatweed
Ozothamnus diosmifolium	white dogwood
**Senecio lautus*	fireweed
BIGNONIACEAE	
Pandorea jasminoides	native jasmine
CAESALPINIACEAE	
**Senna pendula* var. *glabrata*	winter senna
CAMPANULACEAE	
Wahlenbergia gracilis	Australian bluebell
CASUARINACEAE	
Allocasuarina torulosa	forest oak
CONVOLVULACEAE	
** Ipomea purpurea*	common morning glory
CRASSULACEAE	
**Bryophyllum delagoense*	mother-of-millions
DILLENIACEAE	
Hibbertia dentata	guinea flower
Hibbertia scandens	twining guinea flower
EBENACEAE	
**Diospyros kaki*	persimmon

Scientific name ** introduced or naturalised*	Common name
ELAEOCARPACEAE	
Elaeocarpus obovatus	hard quandong
EPACRIDACEAE	
Epacris pulchella	wallum heath
Monotoca elliptica	broom heath
Trochocarpa laurina	tree heath
EUPHORBIACEAE	
Alchornea ulicifolia	native holly
Breynia oblongifolia	breynia
Glochidion ferdinandii var. *ferdinandii*	cheese tree
EUPOMATIACEAE	
Eupomatia laurina	bolwarra
FABACEAE	
Subfamily FABOIDEAE	
Bossiaea heterophylla	variable bossisea
Derris involuta	native derris
Desmodium rhytidophyllum	
Gompholobium latifolium	golden glory pea
Hardenbergia violacea	hardenbergia
Hovea acutifolia	hovea
Jacksonia scoparia	dogwood
Kennedia rubicunda	dusky coral pea
Pultenaea villosa	hairy bush pea
GOODENIACEAE	
Dampiera stricta	blue dampiera
Goodenia heterophylla	variable goodenia
LAURACEAE	
Cassytha glabella forma glabella	devil's twine
**Cinnamomum camphora*	camphor laurel
Cryptocarya microneura	murrogun
Endiandra discolor	rose walnut
Endiandra sieberi	hard corkwood
Litsea australis	brown bollygum
LOBELIACEAE	
Pratia purpurascens	common white root
MALVACEAE	
**Sida rhombifolia*	Paddy's lucerne
MELIACEAE	
Synoum glandulosum	scentless rosewood
MIMOSOIDEAE	
Acacia longifolia	Sydney golden wattle
Acacia melanoxylon	blackwood
Acacia longifolia subsp. *sophorae*	beach sally wattle

Scientific name	Common name
** introduced or naturalised*	
Acacia ulicifolia	prickly Moses
MONIMIACEAE	
Wilkiea austroqueenslandia	smooth wilkiea
MYRSINACEAE	
Myrsine variabilis	muttonwood
MYRTACEAE	
Acmena smithii	lilly pilly
Austromyrtus dulcis	migenberry
Corymbia gummifera	red bloodwood
Corymbia intermedia	pink bloodwood
Eucalyptus umbra	bastard white mahogany
Eucalyptus globoidea	white stringybark
Eucalyptus microcorys	tallowwood
Eucalyptus pyrocarpa	large-fruited blackbutt
Eucalyptus planchoniana	bastard tallowwood
Eucalyptus propinqua	small-fruited grey gum
Eucalyptus saligna	scribbly gum
Eucalyptus robusta	swamp mahogany
Lopohostemon confertus	brushbox
Melaleuca linariifolia	flax-leaved paperbark
Melaleuca pachyphyllus	swamp bottlebrush
Melaleuca quinquenervia	broad-leaved paperbark
Syzygium oleosum	blue lilly pilly
PASSIFLORACEAE	
**Passiflora foetida*	foetid passionfruit
PITTOSPORACEAE	
Billardiera scandens	common apple berry
Pittosporum undulatum	sweet pittosporum
PLANTAGINACEAE	
**Plantago gaudichaudii*	narrow-leaf plantain
PROTEACEAE	
Banksia robor	swamp banksia
Banksia serrata	saw-tooth banksia
Lomatia silaifolia	crinkle bush
Persoonia stradbrokensis	geebung
RHAMNACEAE	
Alphitonia excelsa	red ash
RUBIACEAE	
Morinda jasminoides	morinda
Pomax umbellata	pomax
SAMBUCACEAE	
Sambucus australasica	native elderberry

Scientific name ** introduced or naturalised*	Common name
SAPINDACEAE	
Cupaniopsis anarcardioides	tuckeroo
Diploglottis australis	native tamarind
Dodonaea triquetra	hop-bush
SOLANACEAE	
**Solanum seaforthianum*	climbing nightshade
STERCULIACEAE	
Brachychiton acerifolius	flame tree
THYMELAEACEAE	
Pimelia linifolia subsp. *linifolia*	slender rice flower
TREMANDRACEAE	
Tetratheca thymifolia	black-eyed susan
ULMACEAE	
Trema tomentosa	native peach
VERBENACEAE	
** Lantana camara*	lantana
VIOLACEAE	
Viola hederaceae	native violet
VITIDACEAE	
Cayratia clematidea	slender grape
Cissus antarctica	watervine
Cissus hypoglauca	five-leaf water vine
Cissus sterculifolia	long-leaf watervine

APPENDIX 2:

FAUNA

Scientific name	Common name	Recorded	Expected
* : introduced species; # threatened species			
MAMMALS			
CANIDAE			
*Canis familaris**	dog	x	
*Vulpes vulpes**	fox	scats	
DASYURIDAE			
Antechinus stuartii	brown antechinus	x	
Dasyurus maculatus #	spotted-tail quoll		?
Phascogale tapoatafa#	brush-tail phascogale	x	
FELIDAE			
*Felis catus**	feral cat		x
MACROPODIDAE			
Macropus giganteus	eastern grey kangaroo	x	
Wallabia bicolor	swamp wallaby	x	
MOLOSSIDAE			
Mormopterus norfolkensis#	eastern free-tail bat		x
Mormopterus sp. 1			x
Tadarida australis	white-striped mastiff bat		x
MURIDAE			
*Mus musculus**	house mouse		x
Rattus fuscipes	bush rat		x
Rattus lutreolus	swamp rat	x	
*Rattus rattus**	black rat	x	
PERAMELIDAE			
Isoodon macrourus	northern brown bandicoot		x
Perameles nasuta	long-nosed bandicoot		x
PETAURIDAE			
Petaurus breviceps	sugar glider		x
Petaurus norfolcensis	squirrel glider	x	
Pseudocheirus peregrinus	common ringtail possum	x	
PHALANGERIDAE			
Trichosurus vulpecula	common brushtail possum	x	
PTEROPODIDAE			
Pteropus poliocephalus #	grey-headed flying-fox	x	
RHINOLOPHIDAE			
Rhinolophus megaphyllus	eastern horse-shoe bat	x	
TACHYGLOSSIDAE			
Tachyglossus aculeatus	short-beaked echidna		x
VESPERTILIONIDAE			
Chalinolobus gouldii	Gould's wattled bat	x	
Chalinolobus morio	chocolate wattled bat		x
Miniopteris australis#	little bent-wing bat	x	
Miniopteris schreibersii#	large bent-wing bat		x
Nyctophilus gouldi	Gould's long-eared bat	x	
Scoteanax rueppellii#	greater broad-nosed bat		x
Scotorepens orion	eastern broad-nosed bat		x
Scotorepens sp	broad-nosed bat		x
Vespadelus pumilus	the little forest bat	x	
Vespadelus vulturnus	little forest bat	x	
BIRDS			

Scientific name	Common name	Recorded	Expected
* : introduced species; # threatened species			
ACANTHIZIDAE			
Gerygone olivacea	white-throated gerygone	x	
Sericornis frontalis	white-browed scrubwren	x	
Sericornis magnirostris	large-billed scrubwren		x
ACCIPITRIDAE			
Accipiter cirrhocephalus	collared sparrowhawk		x
Accipiter novaehollandiae	grey goshawk		x
Aquila audax	wedge-tailed eagle		x
Aegotheles cristatus	Australian owlet-nightjar		x
ALCEDINIDAE			
Dacelo novaeguineae	laughing kookaburra	x	
Todiramphus sanctus	sacred kingfisher	x	
ANHINGIDAE			
Hirundapus caudacutus	white-throated needletail	x	
CAMPEPHAGIDAE			
Coracina novaehollindiae	black-faced cuckoo-shrike	x	
Coracina tenuirostris	cicadabird	x	
CHARADRIIDAE			
Vanellus miles	masked lapwing	x	
CLIMACTERIDAE			
Cormobates leucophaea	white-throated treecreeper	x	
COLUMBIDAE			
Columba leucomela	white-headed pigeon		x
Geopelia humeralis	bar-shouldered dove	x	
Geopelia placida	peaceful dove	x	
Macropygia amboinensis	brown cuckoo-dove		x
CORACIIDAE			
Eurystomus orientalis	dollarbird		x
CORVIDAE			
Corvus orru	torresian crow	x	
CRACTICIDAE			
Cracticus nigrogularis	pied butcherbird	x	
Cracticus torquatus	grey butcherbird	x	
Gymnorhina tibicen	Australian magpie	x	
Strepera graculina	pied currawong	x	
CUCULIDAE			
Cacomantis flabelliformis	fan-tailed cuckoo		x
Centropus phasianinus	pheasant coucal		x
Chrysococcyx basalis	horsfield's bronze-cuckoo		x
Eudynamys scolopacea	common koel		x
DICRURIDAE			
Dicrurus bracteatus	spangled drongo		x
FALCONIDAE			
Falco peregrinus	peregrine falcon		x
HIRUNDINIDAE			
Hirundo ariel	fairy martin		x
Hirundo neoxena	welcome swallow		x

Scientific name	Common name	Recorded	Expected
* : introduced species; # threatened species			
Hirundo nigricans	tree martin		x
MALURIDAE			
Malurus cyaneus	superb fairy-wren	x	
Malurus lamberti	variegated fairy-wren	x	
MELIPHAGIDAE			
Acanthorhynchus tenuirostris	eastern spinebill		
Anthochaera carunculata	red wattlebird		
Anthochaera chrysoptera	brush (little) wattlebird	x	
Manorina melanocephala	noisy miner		x
Myzomela sanguinolenta	scarlet honeyeater		x
Philemon corniculatus	noisy friarbird	x	
ORIOLIDAE			
Sphecotheres viridis	figbird		x
PACHYCEPHALIDAE			
Colluricincla harmonica	grey shrike-thrush	x	
Eopsaltria australis	eastern yellow robin	x	
Myiagra rubecula	leaden flycatcher		x
Pachycephala pectoralis	golden whistler		x
Pachycephala rufiventris	rufous whistler	x	
Rhipidura fuliginosa	grey fantail	x	
Rhipidura leucophrys	willie-wagtail	x	
Rhipidura rufifrons	rufous fantail		x
PANDIONIDAE			
Pandion cristatus #	eastern osprey		x
PARDALOTIDAE			
Pardalotus striatus	striated pardalote	x	
PLOCEIDAE			
Neochmia temporalis	red-browed finch	x	
PODARGIDAE			
Podargus strigoides	tawny frogmouth	x	
PSITTACIDAE			
Alisterus scapularis	Australian king parrot	x	
Cacatua galerita	sulphur-crested cockatoo	x	
Cacatua roseicapilla	galah		x
Calyptorhynchus funereus	yellow-tailed black cockatoo	x	
Platycercus elegans	crimson rosella		x
Platycercus eximius	eastern rosella	x	
Trichoglossus chlorolepiotus	scaly-breasted lorikeet	x	
Trichoglossus haematodus	rainbow lorikeet	x	
PTILONORHYNCHIDAE			
Ptilonorhynchus violaceus	satin bowerbird		x
Sericulus chrysocephalus	regent bowerbird		x
STRIGIDAE			
Ninox boobook	southern boobook	x	
Tyto alba	barn owl		x
Tyto novaehollandiae #	masked owl	x	
REPTILES			
AGAMIDAE			
Gemmatophora muricata	jacky lizard		x
Physignathus lesueurii	eastern water dragon		x

Scientific name	Common name	Recorded	Expected
* : introduced species; # threatened species			
Pogona barbata	eastern bearded dragon	x	
BOIDAE			
Morelia spilota	carpet python		x
COLUBRIDAE			
Dendrelaphis punctulata	green tree snake	x	
ELAPIDAE			
Demansia psammophis	yellow-faced whip snake		x
Pseudechis porphyriacus	red-bellied blacksnake		x
Pseudonaja textilis	eastern brown snake		x
Tropidechis carinatus	rough-scaled snake		x
Vermicella annulata	bandy-bandy		x
SCINCIDAE			
Lampropholis delicata	eastern grass skink	x	
Saiphos equalis	three-toed skink		x
Saproscincus challengeri	challenger skink		x
Tiliqua scincoides	eastern blue-toungued lizard		x
VARANIDAE			
Varanus varius	lace monitor		x
AMPHIBIANS			
HYLIDAE			
Litoria caerulea	green tree frog		x
L. fallax	eastern dwarf frog		x
L. nasuta	rocket frog	x	
MYOBATRACHIDAE			
Crinia parinsignifera	eastern sign-bearing frog	x	
Crinia signifera	common eastern froglet	x	
Limnodynastes peronii	brown-striped frog	x	
Pseudophryne coriacea	red-backed toadlet	x	
Uperoleia tyleri	Tyler's toadlet	x	

APPENDIX 3:

OEH INTERIM POLICY ON ASSESSING AND OFFSETTING BIODIVERSITY IMPACTS UNDER PART 3A

NSW OEH interim policy on assessing and offsetting biodiversity impacts of Part 3A, State significant development (SSD) and State significant infrastructure (SSI) projects

Approved by the Chief Executive Officer 25 June 2011

1 Introduction

Offsetting is one practical tool for decision makers who have to balance the relative environmental, social and economic merits of development proposals under the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The NSW Office of Environment and Heritage (OEH) has developed the Biobanking Scheme to provide a structured, market driven approach to offsetting. The Biobanking Scheme requires proposals to meet the 'improve or maintain' standard, and is based on sound science and robust, transparent rules.

The Biobanking Scheme is voluntary and many proposals in NSW are assessed outside the Scheme. The majority of these proposals have been assessed by the Department of Planning and Infrastructure (DP&I) as major projects under Part 3A of the EP&A Act. DP&I have now repealed Part 3A. Most developments that would previously have been assessed and determined under Part 3A will now fall into either:

- Part 4 – State Significant Development (SSD): these will be projects put forward by the private sector and determined by the Planning Assessment Commission.
- Part 5.1 – State Significant Infrastructure (SSI): infrastructure projects undertaken by or on behalf of public authorities and determined by the Minister for Planning and Infrastructure.

There are also transitional arrangements for existing projects that will continue to be assessed and processed as Part 3A projects. For the purposes of this policy these existing proposals will continue to be referred to as Part 3A; SSD and SSI are referred to collectively as 'State significant projects'.

A proportion of Part 3A and State significant projects also affect nationally listed threatened species and threatened ecological communities (TECs). These proposals are considered by the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The question of suitable offsetting often arises in the context of these decisions. This policy seeks to provide a consistent and transparent approach to impact assessment and offsetting for projects assessed under Part 3A or as SSD or SSI. This policy also provides the basis for aligning NSW and Commonwealth assessment and offsetting processes by providing an assessment pathway that is likely to satisfy both NSW and DSEWPC requirements provided that certain standards are met.

This policy will operate on a trial basis in partnership with DSEWPC and DP&I until 30 June 2012, and will be reviewed at the end of this period.

2 Scope and application

This interim policy relates to proposals that are assessed by DP&I under the Part 3A, SSD or SSI provisions of the EP&A Act, and are not being considered as part of the Biobanking Scheme.

This interim policy:

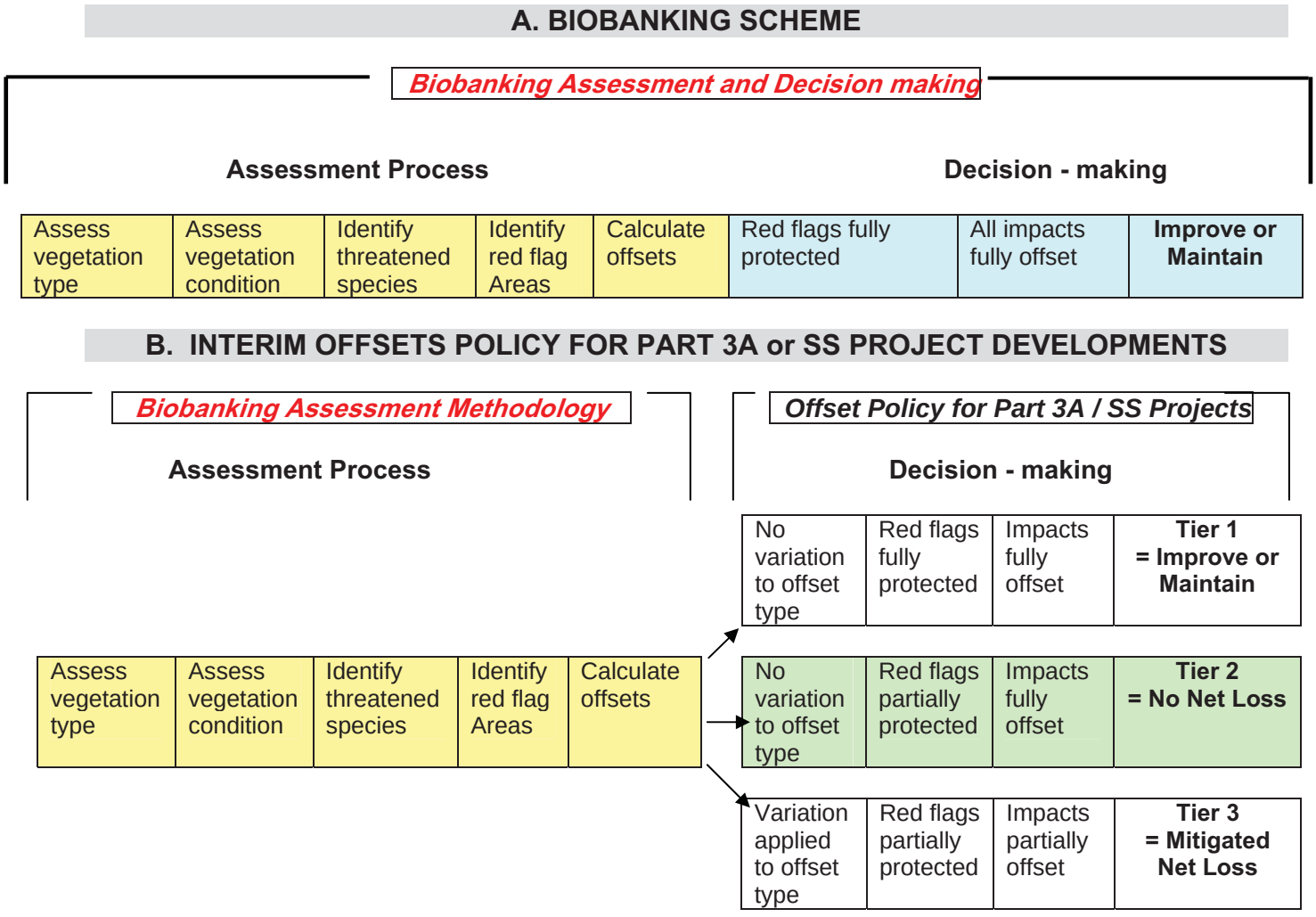
- acknowledges that proposals assessed as State significant projects or Part 3A do not have to meet the "improve or maintain" standard, which is required under the Biobanking scheme;
- nevertheless, adopts the use of the Biobanking Assessment Methodology (BBAM) for the purpose of:
  - quantifying and categorising the biodiversity values and impacts of State significant projects or Part 3A proposals;

- establishing, for benchmarking purposes, the offsets that would be required if the State significant project or Part 3A proposal had been expected to meet the improve or maintain standard;

- provides a structured approach to determining how proposals may, in lieu of meeting the improve or maintain standard, meet one of two alternative standards established under this policy.

Diagram 1 illustrates how the BBAM is applied under this policy, in contrast to its application under the BioBanking Scheme.

Diagram 1: Application of the Biobanking methodology to Part 3A and State significant (SS) project offsetting decisions



This interim policy does not apply to:

- decisions on developments under Part 4 or 5 of the EP&A Act (except SSD under Part 4 or SSI under 5.1 of the EP&A Act); or
- decisions on the making of environmental planning instruments (EPIs) under Part 3 of the EP&A Act.

3 Definitions

BBAM:	Biobanking Assessment Methodology
Biobanking Credit Calculator:	As defined under the BBAM
Biodiversity Credits:	Ecosystem or species credits required to offset the loss of biodiversity values on development sites or created on biobank sites from management actions that improve biodiversity values
DGRs:	Director-General's Requirements for either an EIS (issued by DP&I) or a SIS (issued by OEH)

EARs	Environmental Assessment Requirements
Ecosystem credit:	As defined by the *Threatened Species Conservation Act 1995* (TSC Act)
EPI:	Environmental Planning Instrument as defined by the EP&A Act
ESD:	Ecologically Sustainable Development
State significant project:	Collectively State significant development and State significant infrastructure projects
Planning authority:	A person or body exercising and consent or approval role under the EP& A Act – usually a Council or DP&I;
Proponent:	A person or body seeking consent or approval under the EP&A Act.
Red flag:	As defined by the BBAM – areas of particular conservation significance of sufficient scale to be viable over the medium to long term.
Relevant planning decisions	Decisions made by DP&I under Part 3A, 4 or 5.1 of the EP&A Act
Variation criteria:	Options outlined in this policy vary the offsetting requirement in certain circumstances
Species credit:	As defined by the TSC Act
SSD:	State significant development as defined by the EP&A Act
SSI:	State significant infrastructure as defined by the EP&A Act
Threatened Species concurrence and consultation decisions:	Decisions made under section 79(B), in the case of Part 4 EP&A Act matters, and sections 112B and 112C, in the case of Part 5 matters
Voluntary planning Agreement	A planning agreement as defined by the EP&A Act

4 OEH's policy on impact assessment and offsetting

Attachment A sets out the process for Part 3A proposals considered under this policy. It is expected to be similar for State significant projects (this will be confirmed after release of the new regulations outlining the State significant project process).

4.1 Determining offset requirements

Under this policy, the Biobanking Assessment Methodology (BBAM) is used for the following purposes:

- to describe, quantify and categorise the biodiversity values and impacts of a proposal;
- to identify, for benchmarking purposes, the offsetting that would be required to meet the improve or maintain standard; and
- to provide the information for calculating offsets under this policy.

The BBAM is an assessment tool that allows the impacts of a proposal and its offsetting requirements to be calculated in a consistent and transparent way. The BBAM can be applied on:

- a voluntary basis by the proponent, either on a formal basis as part of the Biobanking Scheme, or as part of the assessment of a State significant project or Part 3A proposal;
- by OEH to inform its submissions to the DP&I on State significant project or Part 3A proposals. In such cases OEH would be using the assessment information provided by the proponent to assess likely impacts and calculate offset requirements.

OEH will support both of these options being implemented by:

- Amending and then recommending standard Environmental Assessment Requirements for State significant projects or Part 3A to include the option for the proponent to use the BBAM in his or her environmental assessment; and
- Internally applying the BBAM to State significant projects or Part 3A proposals using the information provided by the proponents in their Environmental Assessment; and using that

assessment and this policy as the basis for OEH submissions on State significant projects or Part 3A proposals. (See Attachment A.)

Due to resourcing constraints it will not be possible for OEH to undertake this work for all State significant projects or Part 3A proposals but all efforts should be made to use the BBAM where the State significant project or Part 3A proposal is or is likely to be an EPBC Act controlled action.

Where it is not possible due to resourcing constraints to apply the BBAM, offsets are to be negotiated on a case by case basis and in accordance with OEH's offsetting principles (See http://www.environment.nsw.gov.au/biocertification/offsets.htm). The *NSW OEH interim policy on assessing and offsetting biodiversity impacts of Part 3A, State significant development (SSD) and State significant infrastructure (SSI) projects* is not relevant to offsets that have been calculated without applying the BBAM.

The Policy provides for a range of mechanisms to be used to implement offsets (ie. not only biobanking credits) in view of the currently limited supply of biodiversity credits on the market.
The Policy describes 3 possible outcomes that proposals should strive to meet depending on the circumstances. These outcomes are described in Table 1.

Table 1: Offsetting calculations using the BBAM*

Outcome achieved	Level of impact	Offsetting requirement
- Improve or maintain (Tier 1)	- red flag assets protected and clearing only occurs within the variation rules set by the BBAM	- calculated by the credit calculator**
- No net loss (Tier 2)	- some/all red flags not protected and clearing allowed outside the variations rules permitted by the BBAM	- calculated by the credit calculator**
- Mitigated net loss (Tier 3)	- as for 'no net loss'	- calculated by the credit calculator but then amended by the offset variation criteria contained in Attachment A of this policy to a minimum land offset to clearing ratio of 2:1

* These standards do not apply where the BBAM has not been used as it is not possible to identify red flags or credit requirements in the absence of the BBAM assessment.
** The difference between Tier 1 and 2 relates only to the clearing of red flags. The amount of offsetting required is the same for both Tiers

OEH's submissions will advocate that proposals deliver at least one of these outcomes, with "improve or maintain" (Tier 1) being preferred.

4.2 Determining an appropriate outcome

Tier 1: "Improve or Maintain"

While not required of State significant projects or former Part 3A proposals, the "Improve or Maintain" nevertheless represents a high standard of biodiversity protection. OEH should set out in its submissions to DP&I the requirements for meeting this standard. DSEWPC has advised that proposals that meet the "Improve or Maintain" standard are likely to satisfy its requirements for impact assessment and offsetting.

A proposal can fall short of the "Improve or Maintain" standard in two main ways: either red flag assets are to be cleared outside the rules allowed by the BBAM; and/or the amount and type of offsetting secured is inconsistent with the requirements of the BBAM credit calculator.

Tier 2: Negotiating a "No Net Loss" outcome

'No Net Loss' is attained when it is proposed to clear red flags outside the variation rules permitted by the BBAM, but all impacts are to be fully offset in accordance with the BBAM requirements.

In deciding whether this is appropriate, consideration should be given to:

a) whether any feasible alternatives exist that would avoid clearing;

b) the value of the resource (in the case of extractive industries) or other economic benefits and the likely contribution of the proposal to local and regional economies.

Most Part 3A proposals and State significant projects are of social and economic significance to State and regional economies. It is for DP&I to compare and balance the significance of economic or social benefits, and potential environmental (including biodiversity) impacts and gains.

DP&I has prepared draft social and economic impact assessment guidelines to assist decisions makers balance social, economic and environmental outcomes. OEH will work with DP&I on the preparation of these guidelines and their subsequent integration with future versions of this policy.

Proposals that meet the 'No Net Loss' outcome may satisfy DSEWPC requirements for impact assessment and offsetting provided that a sound economic and social justification for anticipated impacts is provided.

Tier 3: Negotiating a "Mitigated Net Loss" outcome

"Mitigated Net Loss" occurs when red flag assets are to be cleared and this clearing is considered acceptable under the requirements set out for no net loss; and the amount and type of offsetting proposed is inconsistent with the requirements of the BBAM credit calculator. In considering whether the mitigated net loss standard is appropriate, consideration should be given to:

a) whether the credits required by the calculator are available on the market;
b) whether alternative offset sites (other than credits) are available on the market;
c) the overall cost of the offsets and whether these costs are reasonable given the circumstances.

Should any of these circumstances apply, then it is reasonable to apply the variation criteria to the point that:

a) suitable offset sites can be found within a reasonable[2] timeframe;
b) the costs of offsetting is brought within a reasonable range; and
c) an offset to clearing ratio of at least 2:1 vegetated to cleared hectares is achieved.

The variation criteria are set out at Attachment B. In summary the variation criteria:

- Make provision for the conversion of ecosystem credits to another type of ecosystem credit;
- Make provision for conversion of one type of ecosystem credit to another type of ecosystem credit and for the waiving of species credits in some circumstances;
- Remove the need for offsets where clearing is minimal and confined to non-threatened vegetation; and
- Make provision for the conversion of ecosystem and species credits to hectares which, in turn, allows the land value of the offset to be estimated. In this way, approvals can be issued that specify either the hectares or the financial contribution that would need to be made to secure the land required for offsetting.

OEH should set out in its submissions to DP&I the requirements for meeting this standard.

Proposals that meet a mitigated net loss outcome will be considered on merit by DSEWPC.

5 Securing an offset site

5.1 Criteria for determining suitability of an offset site

OEH offset principles require offsets to be managed under effective and secure long term management arrangements. Dedication of land under the *National Parks and Wildlife Act 1974* (NPW Act), and the establishment of biobanking sites with Biobanking Agreements under the TSC Act, meet this requirement because:

a) The unambiguous principal objective of ongoing site management is biodiversity conservation;

[2] What is "reasonable" is contingent upon a range of factors and needs to be considered on a case by case basis.

b) Management is undertaken in accordance with a Plan of Management;

c) There is reasonable likelihood that sufficient resourcing will be available to implement the Plan of Management over-time;

d) The arrangements are in-perpetuity, and conservation obligations are transparently transferred and disclosed to any new owners of the land through appropriate administrative procedures; and

e) There are appropriate accountability mechanisms to secure the outcomes and these mechanisms cannot be altered without alternative and comparable offsetting arrangements being put in place.

f) An alternative to establishing biobanking sites is to retire biobanking credits, where appropriate credits are available. The Minister for Planning may approve a project under Part 3A subject to a condition that requires a proponent to acquire and retire biodiversity credits of a specified number and class (section 75JA, EP&A Act). S.89I and 115ZC allow approvals for all State significant projects to include conditions that require biodiversity credits to be obtained and retired by the proponent.

Other conservation mechanisms may also meet the criteria in certain circumstances. These include:

a) Conservation Agreements under the NPW Act;

b) Trust Agreements under the *Nature Conservation Trust Act 2001* (NCT Act);

c) A Property Vegetation Plan registered on title under the *Native Vegetation Act 2003* (NV Act); and

d) A Planning agreement under s93F of the EPA Act.

The suitability of these mechanisms (or any other mechanism) depends on whether the proposed arrangements are likely to result in the management of the land in accordance with the five criteria above.

5.2 Offsetting and reservation under the NPW Act

If an offset site is proposed that may involve the transfer of land to OEH for reservation under the NPW Act, then consultation must occur with the relevant PWG Branch Director at the earliest possible stage. No commitment should be made to accept an offset involving new reserves without the agreement of the Deputy Chief Executive, PWG. Similarly, no commitment should be made to accept offsets involving other forms of in-perpetuity protection without the agreement of the relevant sponsoring body.

6 Implementation and accountabilities

Staff may use the BBAM only if they have been trained. Some Catchment Management Authorities (CMAs) have indicated an interest in participating in offsetting discussions and may be available to assist OEH to undertake this work. OEH, however, will remain the lead Agency responsible for offsetting negotiations on behalf of the Environment portfolio. Positions with significant responsibilities under this interim policy are listed below**.**

Position	Responsibility
Director, LEC Manager, Conservation Policy and Strategy, LEC	Policy development and review
Manager, Biodiversity and Vegetation Programs	Issue biobanking statements and agreements State-wide co-ordination of biobanking program Overall program support including Biobanking helpline, Workshops and Training and accreditation programs.
Regional Director, EPRG	To approve the communication of BBAM outcomes to proponents and planning authorities To approve amendments to credit requirements in accordance with the requirements of this policy To liaise with PWG Branch Directors on offset proposals involve new reserves
Manager, Planning and Aboriginal Heritage,	To approve use of BBAM by OEH staff when dealing with

EPRG Manager, Metro Projects and Support (Metro only), EPRG Manager Environment and Conservation Programs (NW only), EPRG Manager, Regional Operations, EPRG	SSD, SSI or Part 3A matters
Regional Operations Officers, EPRG Catchment Management Officer, CMA	Must be trained in BBAM in order to apply to methodology

7 Policy review

This interim policy will be reviewed by 30 June 2012.

8 Contacts for further advice

For further advice on this policy please contact:
Ms Julie Ravallion, Manager, Conservation Policy and Strategy on 02 9995 6729

For advice offsetting and new reserve proposals please contact Mr Ray Fowke, Environment Planning Advisor on 02 9585 6607

For advice on the Biobanking Scheme please contact the Biobanking helpline.

9 Related policies and other documents

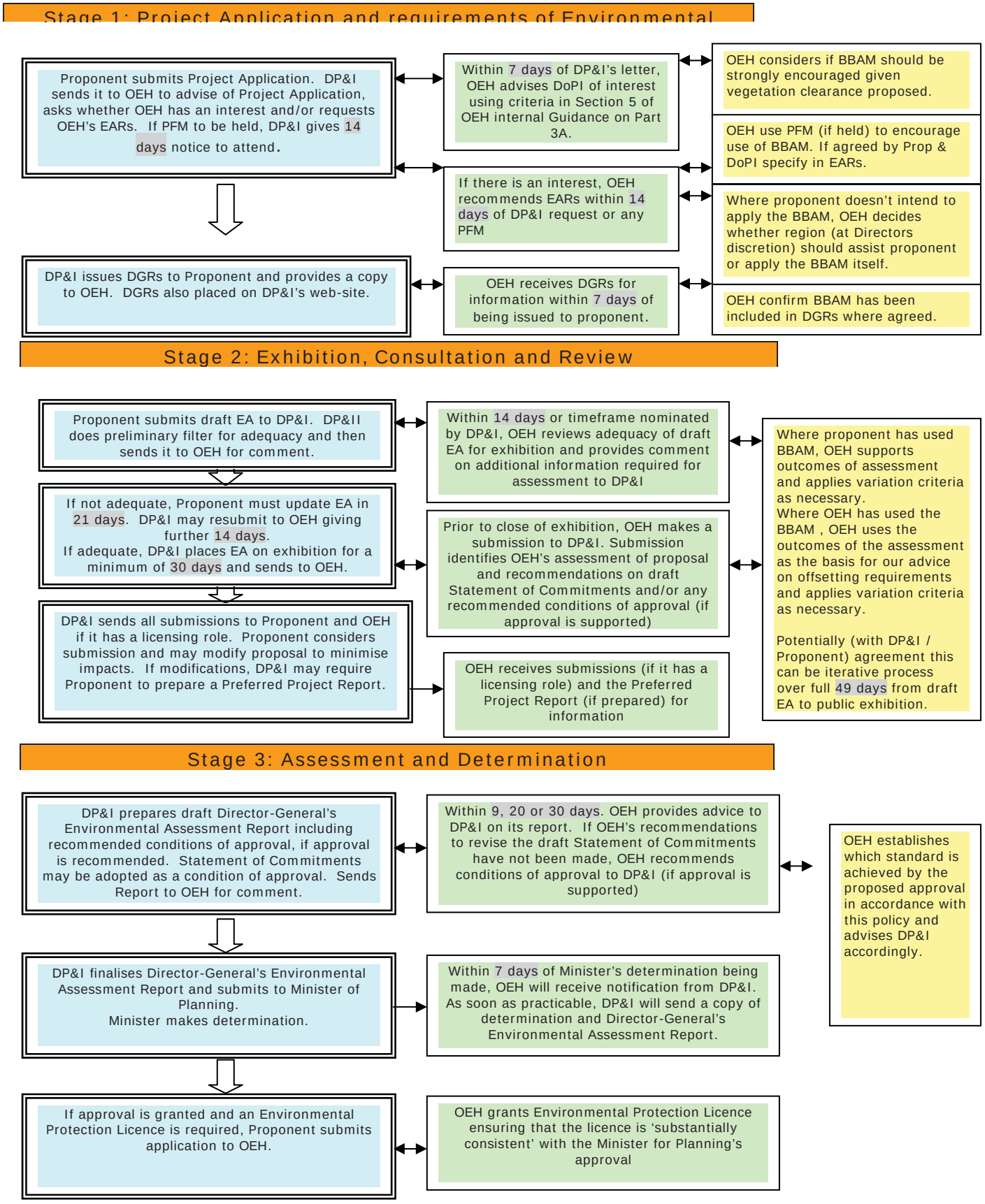
BioBanking Assessment Methodology and Credit Calculator Operational Manual, March 2009, http://www.environment.nsw.gov.au/resources/biobanking/09181bioopsman.pdf

OEH's offsetting principles can be found at:
http://www.environment.nsw.gov.au/biocertification/offsets.htm

The Department of Sustainability, Environment, Water, Population and Communities' draft offsetting policy can be found at:
(http://www.environment.gov.au/epbc/publications/draft-environmental-offsets.html)

Attachment A: Typical Project Application's Process under Former Part 3A

Note: The project application process for State significant projects is under development (as of July 2011)



Notes - All times are in calendar days.

DP&I	Department of Planning and Infrastructure	EARs	Environmental Assessment Requirements
DGRs	Director-General's Requirements	PFM	Planning Focus Meeting
EA	Environmental Assessment		

DP&I /Proponent Statutory Requirements | OEH Statutory Requirements | Offset Policy Requirements

Attachment B: Variation criteria for mitigated net loss (Tier 3)

To achieve Tier 3 - mitigated net loss standard, the following variation criteria may be applied to the offsetting requirements of the BBAM. The minimum area standard is an offset to clearing ratio of 2:1.

Variation criteria	When is this option appropriate	How
a) Convert ecosystem credits for one vegetation type to any vegetation type within the same vegetation formation in the same IBRA bioregion	When no matching ecosystem credits are available	Review to biometric vegetation database to identify vegetation types in the same formation in the same IBRA bioregion. Number of credits should be the same.
b) Convert one type of species credit to another type of species credit with the same or more endangered conservation status	When species credit is not available and the matching species credit is considered a greater conservation priority.	Review conservation status of species Number of credits should be the same
c) Remove/reduce the need for offsetting	Where clearing is minimal (less 4 ha) and where the vegetation is not a highly cleared vegetation type or a Commonwealth or State listed TEC.	Identify and remove credits required for offsetting vegetation under 4ha and for vegetation types that aren't greater than 70% cleared or a Commonwealth or State listed TEC
d) Convert ecosystem credits required to hectares and, if necessary, convert hectare figure to an estimate of land value	Where suitable offset sites are known to exist but: • there is insufficient time to secure the offset sites at the time the decision is made; or • the proposal is to use the services of a third party provider such as the Nature Conservation Trust to secure offset sites and an estimate of cost is required.	Convert credits required to hectares using the credit to ha converter[1] and ensure that the approval: • specifies the type, location and condition of offsets; and • secured offset sites in accordance with the requirements of section 5 of this Policy. An estimate of the cost of the offset can be made by using a Valuer Generals estimate of land value.
e) Waive the requirement for species credits NB: This criteria should not be used for EPBC Act listed species where the proposal is a controlled action	Where no matching credits are available and all ecosystem credits have been obtained in accordance with this policy	Remove the requirement
f) Convert ecosystem credits to a regional conservation priority as identified in a regional conservation plan or similar	When no matching credits are available and variation 1 is not feasible	Identify areas of high conservation priority in existing regional conservation plans or similar. Convert credits required to hectares[1]. Identify eligible offset sites and ensure areas are of sufficient size, condition and landscape context.

OEH is currently finalising an excel spreadsheet which converts credits to hectares. This spreadsheet will be lodged on the OEH intranet site.

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B3 KOALA ASSESSMENT

Peter Parker

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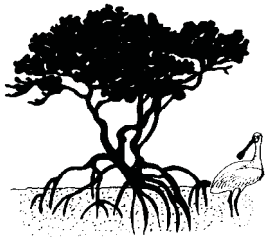

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SETTLERS RIDGE

SEPP 44, KOALA HABITAT PROTECTION ASSESSMENT

PREPARED FOR SJ CONNELLY CPP PTY LTD

27 August 2012

1.0 INTRODUCTION

This Koala habitat assessment has been prepared pursuant to State Environmental and Planning Policy No. 44 ("SEPP 44") for the Settlers Ridge development proposal at South West Rocks.

2.0 VEGETATION

2.1 Air photo interpretation and field survey

The primary tree species with respect to koala habitat assessment was scribbly gum, *Eucalyptus signata*, although tallowwood, *Eucalyptus microcorys*, was also common. Both of these species are listed under Schedule 2 of SEPP 44.

These species were mapped to determine whether the canopy cover was in excess of 15%; the definition under SEPP 44 for potential koala habitat.

Field surveys were undertaken from October to November 2009 and in August 2012 to ground truth vegetation and to search for evidence of the kola e.g., resident individuals, scratches and scats.

Fig. 1: Scribbly gum / tallowwood

2.0 KOALA HABITAT

SEPP 44 commenced on 13 February 1995 with the aim to:

"Encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline;"

(a) "by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat;

(b) by encouraging the identification of areas of core koala habitat; and

(c) by encouraging the inclusion of areas of core koala habitat in environment protection zones."

Definitions in SEPP 44

Various definitions are provided in SEPP 44. These are as follows:

"Core koala habitat'' means an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population;

"Potential koala habitat'' means areas of native vegetation where the trees of the types listed in Schedule 2 of the Policy constitute at least 15% of the total number of trees in the upper or lower strata of the tree component;

"Land to which the Policy applies" SEPP 44 applies to land for which a development application has been lodged for each local

government area listed in Schedule 1 of the Policy. It does not apply to land dedicated or reserved under the *National Parks and Wildlife Act 1974* or to land dedicated under the *Forestry Act 1916* as a State forest or flora reserve.

SEPP 44 applies to land that:

- Has an area of more than 1 ha; or
- Has, together with any adjoining land in the same ownership, an area of more than 1 ha;
- Whether or not the development application applies to the whole, or only part, of the land.

Circular B35 dated 22 March 1995 assists in the interpretation of SEPP 44. Clause 5.1 of circular B35 provides clarification with respect to the application of SEPP 44. The clause includes the following:

> *"It is the intention of the policy that investigations for potential and core koala habitats be limited to those areas in which it is proposed to disturb habitat"*

3.0 KOALA HABITAT ASSESSMENT

The subject site is greater than 1 ha, thus SEPP 44 applies with respect to site area. For potential koala habitat to occur, core koala food trees listed under Schedule 2 need to comprise 15% or more of the total number of trees in the upper or lower strata of the tree component.

Three koala food trees listed under Schedule 2 of SEPP 44 were recorded at the site. These were scribbly gum, tallowwood and swamp mahogany, *Eucalyptus robusta*.

Scribby gum was more widespread than the other species. Tallowwood was localised and patchy in its distribution, although it occurred over much of the site and swamp mahogany occurred as scattered trees associated with watercourses.

For the purpose of this assessment scribbly gum occurred over the whole of the site and tallowwood was present in numerous locations. Thus, the site contains potential koala habitat pursuant to SEPP 44.

For core koala habitat to occur there needs to be a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.

A systematic fauna survey was undertaken over four nights in October 2009 and over two nights in August 2012. These surveys included fauna trapping, spotlighting, play-back calls and searches for tracks and scats. There was no evidence that the koala occurred at the site and no anecdotal records were obtained from local residents when interviewed with respect to this matter.

It is concluded that core koala habitat does not occur at the site and a koala plan of management is not therefore required.

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B4 BIOBANKING DATA FILES

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C TRAFFIC IMPACT ASSESSMENT

RoadNet

Traffic Impact Assessment

For

Proposed 'Settlers Ridge'
Residential Development

Gregory Street
SOUTH WEST ROCKS

for

S J CONNELLY CPP PTY LTD

AUGUST 2012

Document Control Sheet

Document Status	FINAL
Prepared By	Craig Nethery (3 September 2012)
Reviewed By	Andy Davis (3 September 2012)

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CONTENTS

APPENDICES

1. INTRODUCTION

In December 2010 RoadNet were engaged by town planner, S J CONNELLY CPP Pty Ltd, to prepare a traffic impact assessment for a proposed 220 lot residential development at South West Rocks. The proposed estate is located on a vacant, 40.51 ha parcel of land immediately north of 'The Rocks' shopping village, on the western side of Gregory Street. Access to the future development is proposed via an extension of the existing Steve Eagleton Drive.

RoadNet has now been engaged to provide an amended traffic impact assessment for a 154 lot residential subdivision on the same parcel of land.

2. SCOPE

The majority of future traffic will access the proposed 'Settlers Ridge' residential development via Steve Eagleton Drive and the existing roundabout at Gregory Street. While a minimal amount of additional traffic while use Keith Andrews Avenue, this report will focus on the existing function of the roundabout, and it's capacity to cater for the additional traffic to be generated by the fully developed 'Settlers Ridge' estate.

3. EXISTING TRAFFIC CONDITIONS

As this amended proposal is a decrease in the lot yield of 66 lots from 220 to 154 it is assumed the traffic impacts will be less than the previous assessment. Therefore the previous report will form the basis of an amended report with the following to be completed.

Calculate traffic generation for the proposed subdivision, and consider traffic generation from adjacent areas if applicable.

Assess alternative accesses to the site via Frank Cooper Street and Keith Andrews Avenue.

Prepare an amended report and submit to the Client for comment, before finalising the report in accordance with the RMS Guide to Traffic Engineering Practice (with reference to Australian Standards, Council's Codes and Austroads Guidelines).

4. THE PROPOSAL

4.1 Site Location

The proposed development is located on the western side of Gregory Street, South West Rocks, immediately north of 'The Rocks' shopping complex. The site is approximately 2km south of Horseshoe bay, and the existing South West Rocks CBD.

Access to the site is proposed off an extension of the existing Steve Eagleton Drive.

Figure 4.1- Site Locality

5. PROPOSED DEVELOPMENT

The 'Settlers Ridge' estate is a proposed 154 lot residential development on the 40.5ha subject site, which currently comprises 3 parcels of vacant land. The proposed development includes:

- 154 residential lots (ranging from 450 to 970m^2, average size 650m^2)
- a number of reserves and open land
- an extension of the existing Steve Eagleton Drive and Trevor Judd Avenue
- connection with existing Keith Andrews Avenue
- construction of a number of internal local roads

5.1 Site Access

The major access to the future 'Settlers Ridge' development is proposed from Steve Eagleton Drive, an existing road intersecting with Gregory Street. The 370m existing section of Steve Eagleton Drive is generally 15m metres wide, comprising a 5m wide lane in either direction, separated by a landscaped median. The existing roadway includes kerb & gutter both sides and is consistent with a 'collector' standard road, as per Council's Auspec – DO1 Geometric Road Design.

Gregory Street is the primary link between South West Rocks and Kempsey and the Pacific Highway. The intersection of Steve Eagleton Drive and Gregory Street is controlled by a roundabout.

The future 'Settlers Ridge' development will include 4 intersections with local roads off Steve Eagleton Drive. Two existing local roads, Mertens Place and Trevor Judd Avenue currently feed onto Steve Eagleton Drive, close to the intersection with Gregory Street.

The proposed development includes extension of the existing Trevor Judd Avenue to provide access to approximately 28 future lots, while approximately 4 future lots will have driveway access to Keith Andrews Avenue at the northern boundary of the development.

Keith Andrews Avenue will also provide an alternative access to Gregory Street, through the adjacent existing residential area (to the north), via Bruce Field Street and Frank Cooper Street.

5.2 Internal Traffic Circulation

The proposed development will include a network of short internal roads which will connect with the existing Steve Eagleton Drive, which is to be extended westwards from the current formation, and serve as a collector road for the proposed 'Settlers Ridge' estate. The local roads will be generally 9 metres wide (and likely to include traffic calming devices to keep internal vehicle speeds low.

The proposed road network will include 2 future intersections with the extension of Steve Eagleton Drive, a connection with the existing Keith Andrews Avenue to the north of the proposed development and a continuation of the existing Trevor Judd Avenue.

5.3 Proposed Access Routes

5.3.1 Steve Eagleton Drive (Route 1)

The main access to the future Settlers Ridge residential development is proposed via Steve Eagleton Drive, an existing collector standard road, which currently extends 370m west from an existing roundabout at Gregory Street. The existing Steve Eagleton Drive formation is generally 15 metres wide, with full-length, upright kerb & gutter on the northern side, and approximately 100m of kerb & gutter on the southern side. The existing roadway, in the vicinity of Gregory Street, generally comprises a 5m wide lane in each direction, separated by a landscaped median island.

The proposed design plans indicate Steve Eagleton Drive will be extended from the existing formation, approximately 200 metres to the north-west.

5.3.2 Keith Andrews Street (Route 2)

Alternative access to the future Settlers Ridge residential development will be available through the existing residential estate to the north of the subject site. Two future roads will intersect, and 4 lots will have frontage

to Keith Andrews Avenue, an existing local road which links to Gregory Street via Bruce Field Street and Frank Cooper Street.

The intersection of Frank Cooper and Gregory Streets is currently controlled by 'Give Way' signs, with priority given to through traffic on the major road (Gregory Street).

Figure 5.1- Existing roundabout at Steve Eagleton Drive & Gregory Street

6. PROPOSED TRAFFIC MOVEMENTS

The majority of traffic exiting the future 'Settlers Ridge' residential development will either head east to destinations including the beach, South West Rocks CBD, primary school, golf club, cinema etc, or west towards the South West Rocks shopping centre, Kempsey, high schools, etc. or destinations further afield via the Pacific Highway.

The majority of vehicle movements in and out of the future 'Settlers Ridge' residential estate will be via Steve Eagleton Drive, due to the route being more direct to most destinations, and the relative ease of accessing the major thoroughfare (Gregory Street) via the existing roundabout.

It is assumed only a small number of future vehicle movements will enter and exit the estate via Keith Andrews Avenue, due to the in-direct route, and the current 'Give Way' signs at the intersection of Frank Cooper Street and Gregory Street, which give priority to through traffic on the major road.

7. TRAFFIC VOLUMES

7.1 Current Traffic Volumes

RoadNet undertook a manual traffic count at the intersection of Gregory Street and Steve Eagleton Drive on Thursday, 16 December 2010. The count included both the morning and afternoon peak periods, and the results included:

- The morning peak hour was between 8 and 9am
- The afternoon peak hour was between 3.15 and 4.15pm
- The maximum volume in Gregory Street was 679 vph during the afternoon peak
- Volumes in the side streets were low, with a maximum 89vph in Belle O'Conner St and 21vph in Steve Eagleton Drive.

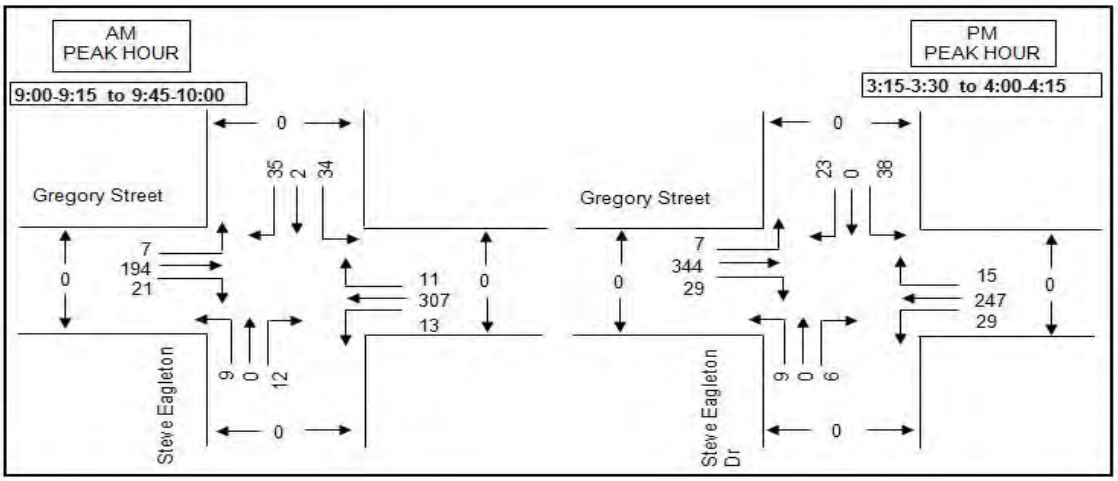


Figure 7.1- Summary of existing peak hour traffic counts

7.2 Future Traffic Generation

The amended proposed 'Settlers Ridge' residential development includes 154 lots, which will generate approximately 1386 vehicle movements daily (and 131 peak hour trips), when fully developed. To model the future traffic movements, the following assumptions have been adopted:

- 90% of future traffic movements in and out of the estate will be via Steve Eagleton Drive, with 10% using the alternative route through the adjoining development via Keith Andrews Avenue and Frank Cooper Street.
- Approximately 4 future lots which will front Keith Andrews Avenue are likely to use the alternative access to drive to destinations north of the proposed development, but are likely to utilise Steve Eagleton Drive to drive to destinations south and east
- The morning peak hour will generally experience a 60/40 split with 77 vehicles exiting via Steve Eagleton Drive and 50 vehicles entering the proposed development. The figures will be reversed during the afternoon peak hour.
- The fully developed 'Settlers Ridge' estate will generate approximately 127 additional vehicle movements through the existing Gregory Street/Steve Eagleton Drive roundabout. It is assumed that vehicle destinations will be:
  - 40% Gregory Street (north)
  - 5% east (Belle O'Connor Street)
  - 55% Gregory Street (south)
- Settlers Ridge estate to be fully developed by 2027 i.e. within 15 years, based upon a take up of approximately 10 lots per year.
- An annual population growth of approximately 1.8%, as provided by Kempsey Shire Council.

Using the above assumptions, the traffic generated by the fully developed 'Settlers Ridge' estate will increase traffic volumes through the existing Gregory Street/Steve Eagleton Drive roundabout by the following amounts:

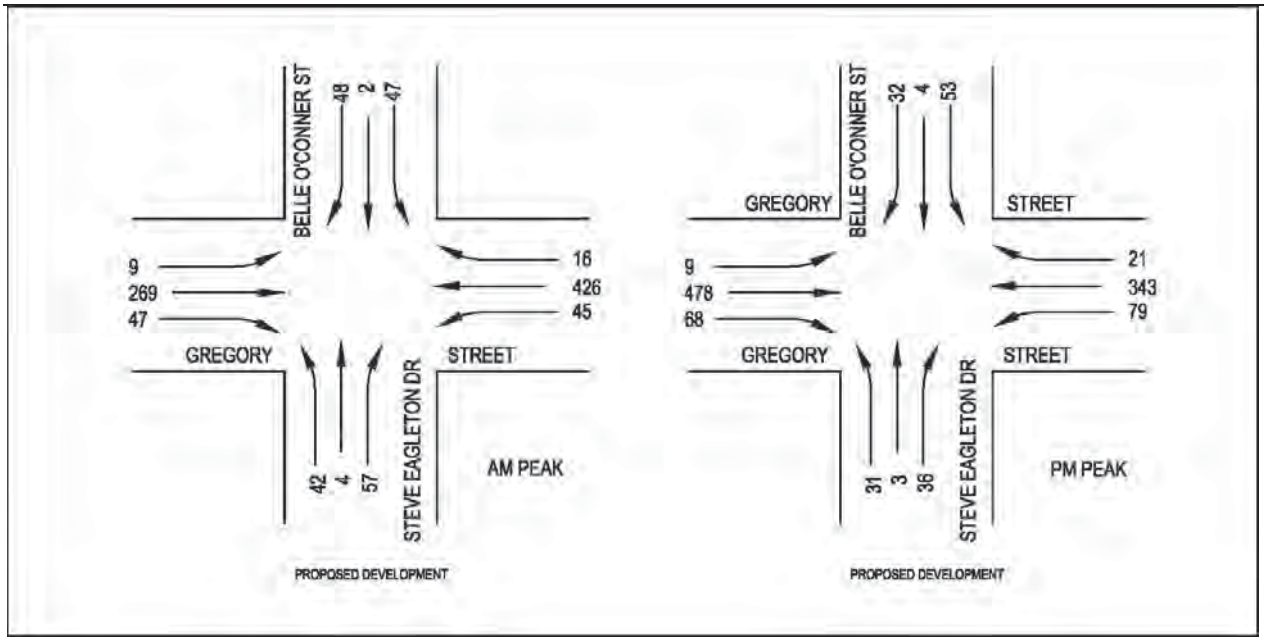


Figure 7.2- Estimated peak hr traffic generation from fully developed 'Settlers Ridge' Estate

7.3 Intersection Analysis

7.3.1 Gregory Street and Steve Eagleton Drive

The roundabout intersection of Gregory Street and Steve Eagleton Drive has been modelled using SIDRA 5.1 to determine the performance of the intersection now and into the future, with and without traffic from the proposed development.

The SIDRA modelling estimates flows through the intersection, queuing times and delays, based upon current and estimated future traffic volumes. The efficiency and performance of the roundabout is based on 'Level of Service' (LOS) as detailed below:

A	Free Flows.
B	Stable flow with slight delays.
C	Stable flows with acceptable delays.
D	Approaching unstable flows, with tolerable delays.
E	Unstable flows, congestion, with intolerable delays.
F	Forced flows.

Generally, a LOS of A – C is acceptable, while an LOS of D or greater may require further analysis, and consideration of an upgrade of the intersection.

Full development of the proposal is expected to occur within 15 years based on a take up rate of approximately 10 lots per year. For the purposes of analysis the roundabout intersection of Gregory Street and Steve Eagleton Drive has been modelled at full development 15 years into the future. 154 lots at the year 2027.

The following scenarios have been assessed for the roundabout intersection in both the AM and PM peaks:

- Existing volumes (2010 volumes)
- 15 years into the future without the proposed development (2027)
- 15 years into the future + the proposed development (2027)

Traffic growth has been based on future population predictions from Kempsey Shire Council and is calculated as 2.0% per year. This growth rate has been applied to Gregory Street and Belle O'Connor Street. All traffic growth on Steve Eagleton Drive will be associated with the proposed development and therefore no growth has been applied to this leg.

The Movement Summary for each scenario modelled is shown in Appendix B and is summarised in Table 7.1 below. The modelling shows the existing roundabout intersection will operate adequately with all legs operating at a 'LOS A' at full development of the proposal. The additional traffic from the proposal will have minor impacts on delay and queuing on all legs of the roundabout.

Scenario	LOS	Average Delay (sec)	95% Back of Queue (m)
2010 AM Existing	A	6.7	14.8
2010 PM Existing	A	6.5	15.2
2027 AM No Development	A	6.9	17.1
2027 PM No Development	A	6.7	17.6
2027 AM Full Development	A	7.5	20.7
2027 PM Full Development	A	7.2	23.6

Note: Values shown are for All Vehicles. For details of each movement see Appendix B

Table 7.1: Intersection Movement Summary

7.3.2 Gregory Street and Frank Cooper Street

A small number of the traffic to be generated by the proposed development is likely to head north, to access Gregory Street through the adjacent existing residential area, via Keith Andrews Avenue, Bruce Field Street and Frank Cooper Street. The existing residential area includes approximately 90 lots, which will generate approximately 810 vehicle trips per day, or 81 peak hour trips. The proposed 'Settlers Ridge' development may generate an additional 140 trips a day via Frank Cooper Street (or 13 peak hour trips).

Figure 7.3 Intersection of Frank Cooper St and Gregory St

Section 6.1.1 of Austroads Guide to Traffic Management (Part 3: Traffic Study and Analysis, 2009) relates to capacities of unsignalised intersections. In accordance with Table 7.2 (below) the current traffic volumes (623 vph in Gregory St – pm peak & 81 vph in Frank Cooper Street) are not significant, and the guidelines indicate adequate capacity in the intersection to cater for future growth on Gregory Street and additional traffic from 'Settlers Ridge' on Frank Cooper Street.

Table 6.1: Intersection volumes below which capacity analysis is unnecessary

Type of road	Light cross and turning volumes maximum design hour volumes vehicles per hour (two way)		
Two-lane major road	400	500	650
Cross road	250	200	100
Four-lane major road	1000	1500	2000
Cross road	100	50	25

Table 7.2: Capacity Analysis of Unsignalised Intersections

7.4 Road Capacity

7.4.1 Gregory Street

Gregory Street is a collector road connecting South West Rocks with Kempsey. To the south of the proposed development, Gregory Street is fully constructed with kerb & gutter both sides, a 3.5m wide traffic lane in both directions, separated by a concrete median island, and a parking/cycling lane both sides. The existing capacity of Gregory Street is a minimum of 1500 vph per lane (Austroads: Pt 3: Traffic Studies and Analysis). North of the proposed development, the Gregory Street formation includes a 3.5m lane in either direction, separated by a painted centreline, with wide shoulders either side. The wide roadway allows free traffic flow, with a capacity of at least 1500 vph per lane.

Recent traffic counts show a current peak hour of 388 vehicles (pm southbound) on Gregory Street, indicating a Level of Service of 'A'. Future traffic volumes on Gregory St, including predicted population growth and traffic to be generated by the Settlers Ridge development will result in a LOS of 'B', (stable flow with slight delays) which is still acceptable.

7.4.2 Steve Eagleton Drive

Steve Eagleton Drive is a collector road, which is to be extended to provide access to the proposed development. The existing roadway is generally 9 metres wide (2 x 4.5m lanes), and separated by a concrete median island at the eastern end. The capacity of the existing roadway is approximately 1500 vehicles per hour per lane, and therefore has adequate capacity to cater for current and future traffic volumes.

Figure 7.4 Steve Eagleton Drive, looking east towards Gregory Street

8. CONCLUSIONS

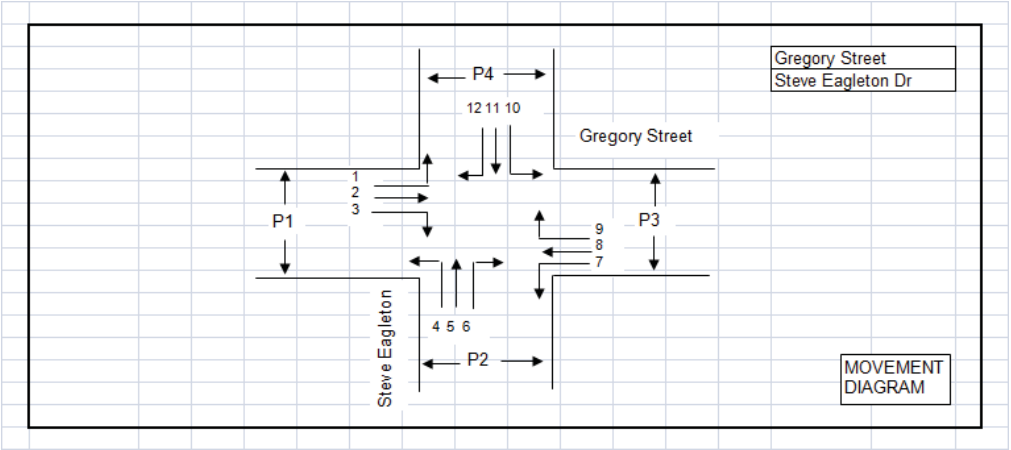
RoadNet's assessment of the proposed access to the future 'Settlers Ridge' residential development, and the capability of the roundabout at the intersection of Steve Eagleton Drive and Gregory Street, has resulted in the following:

1. A current volume of 747 vehicles through the existing roundabout during the afternoon peak hour (and 645 during the morning peak), resulting in a Level of Service (LOS) of A for all movements.
2. A maximum of 812 vehicles per hour during the morning peak hour and 998 vehicles per hour during the afternoon peak hour on Gregory Street.
3. The predicted traffic to be generated by the fully developed 'Settlers Ridge' estate will be 1386 vehicle movements per day, adding approximately 390 additional vehicles through the existing Steve Eagleton Drive and Gregory Street roundabout during morning and afternoon peak hours, resulting in a total of approximately 1157 vehicles through the roundabout.
4. SIDRA modelling indicates the roundabout has adequate capacity to cater for the predicted 2027 traffic volumes with a LOS of A. The existing roundabout at the intersection of Steve Eagleton Drive and Gregory Street has adequate capacity to cater for current and future traffic volumes, including the traffic to be generated by the proposed Settlers Ridge residential development, with no widening or other construction required.
5. The existing intersection of Frank Cooper Street and Gregory Street has adequate capacity to cater for the additional traffic to be generated by the proposed 'Settlers Ridge' development, without any widening or other construction.
6. No widening or other construction is required within the Gregory Street and Steve Eagleton Drive roadways to cater for the additional traffic to be generated by the proposed 'Settlers Ridge' development.

The modelled roundabout at the intersection of Steve Eagleton Drive and Gregory Street has a similar layout to the existing roundabout at the intersection of Ocean Drive and Crestwood Drive, Port Macquarie. Ocean Drive is a single lane in either direction, and serves as the primary connection between Port Macquarie and the Camden Haven area. Traffic volumes on Ocean Drive are in the order of 14,000 vehicles per day. The 'Crestwood' roundabout serves approximately 300 lots within the Crestwood Estate to the south and approximately 200 lots within the 'Dahlsford Estate' to the north.

While there may be minor delays during peak times through the Crestwood roundabout, the intersection generally flows freely, despite catering for almost twice the volume of traffic as the estimated future volumes through the Gregory St /Steve Eagleton Dr roundabout.

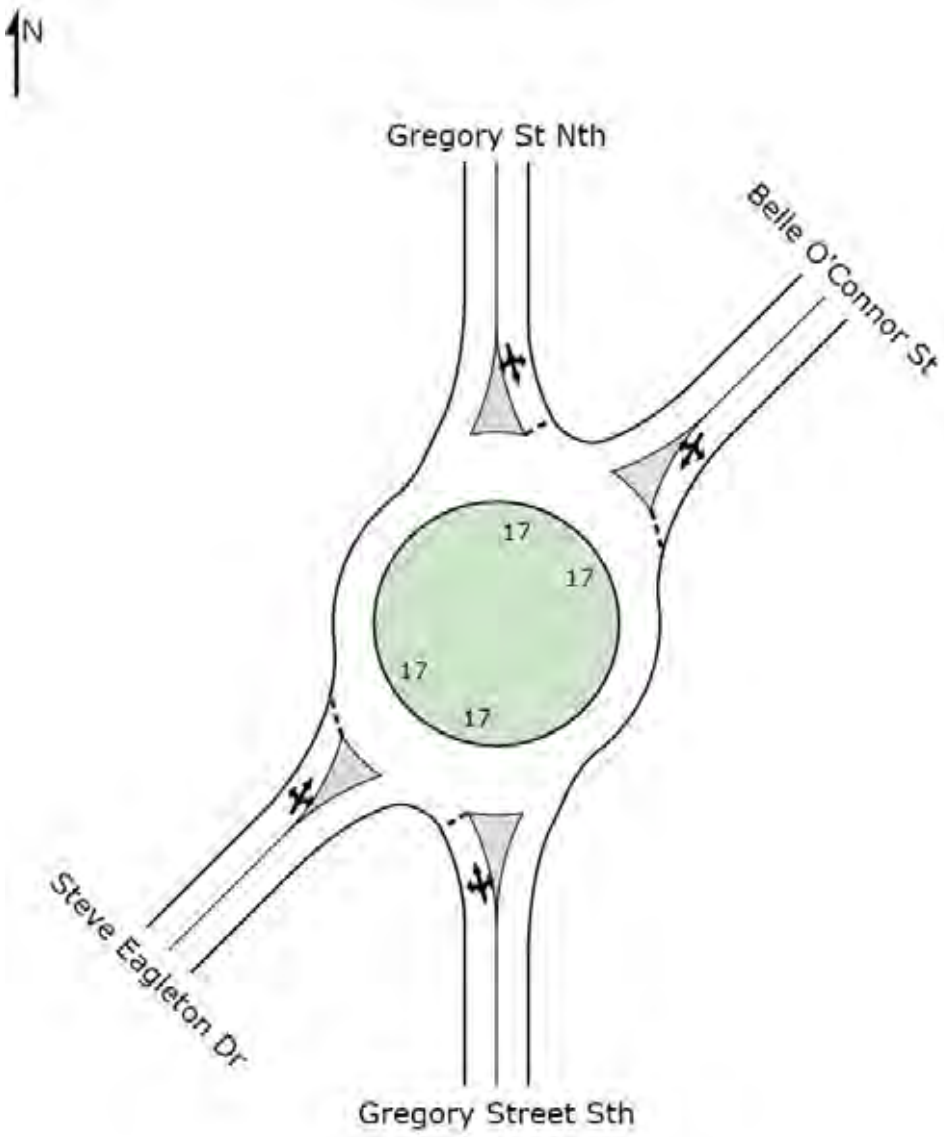
APPENDIX A
TRAFFIC COUNTS



Time	1	2	3	4	5	6	7	8	9	10	11	12	1/4h totals	Hourly	P1	P2	P3	P4	1/4h totals
8:00-8:15	0	12	0	0	0	0	4	44	0	6	0	5	71	Totals	0	0	0	0	0
8:15-8:30	0	31	0	3	0	2	6	60	1	7	0	7	117		0	0	0	0	0
8:30-8:45	1	21	3	1	0	3	2	46	3	5	0	6	91		0	0	0	0	0
8:45-9:00	1	34	3	5	1	3	4	62	4	6	0	5	128	407	0	0	0	0	0
9:00-9:15	0	45	3	4	0	3	4	80	4	10	0	6	159	495	0	0	0	0	0
9:15-9:30	2	42	6	0	0	3	2	64	3	7	0	8	137	515	0	0	0	0	0
9:30-9:45	4	59	6	3	0	2	3	90	2	7	0	7	183	607	0	0	0	0	0
9:45-10:00	1	48	6	2	0	4	4	73	2	10	2	14	166	645	0	0	0	0	0
#REF!	0	0	0	0	0	0	0	0	0	0	0	0	0	486	0	0	0	0	0
#REF!	0	0	0	0	0	0	0	0	0	0	0	0	0	349	0	0	0	0	0
#REF!	0	0	0	0	0	0	0	0	0	0	0	0	0	166	0	0	0	0	0
#REF!	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	9	292	27	18	1	20	29	519	19	58	2	58	Max Hr	645	0	0	0	0	0
	Peak hour: 9:00-9:15 to 9:45-10:00								Peak Hr begins in quarter hour No:					5					
Peak total	7	194	21	9	0	12	13	307	11	34	2	35	645		0	0	0	0	0

Time	1	2	3	4	5	6	7	8	9	10	11	12	1/4h totals	Hourly	P1	P2	P3	P4	1/4h totals
3:00-3:15	1	79	6	3	0	1	8	79	2	3	0	6	188	Totals	0	0	0	0	0
3:15-3:30	2	72	7	0	0	1	6	76	3	6	0	8	181		0	0	0	0	0
3:30-3:45	0	85	3	3	0	0	11	63	7	6	0	3	181		0	0	0	0	0
3:45-4:00	2	77	10	4	0	3	7	52	3	15	0	7	180	730	0	0	0	0	0
4:00-4:15	3	110	9	2	0	2	5	56	2	11	0	5	205	747	0	0	0	0	0
4:15-4:30	3	81	4	3	0	2	4	70	3	4	0	5	179	745	0	0	0	0	0
4:30-4:45	6	96	9	3	0	2	4	50	1	4	0	6	181	745	0	0	0	0	0
4:45-5:00	4	82	6	1	0	3	2	41	2	6	0	7	154	719	0	0	0	0	0
5:00-5:15	2	80	14	4	0	2	5	51	3	3	1	9	174	688	0	0	0	0	0
5:15-5:30	1	80	9	1	0	0	4	48	3	5	0	8	159	668	0	0	0	0	0
5:30-5:45	0	0	0	0	0	0	0	0	0	0	0	0	0	487	0	0	0	0	0
5:45-6:00	0	0	0	0	0	0	0	0	0	0	0	0	0	333	0	0	0	0	0
Total	24	842	77	24	0	16	56	586	29	63	1	64	Max Hr	747	0	0	0	0	0
	Peak hour: 3:15-3:30 to 4:00-4:15								Peak Hr begins in quarter hour No:					2					
Peak total	7	344	29	9	0	6	29	247	15	38	0	23	747		0	0	0	0	0

APPENDIX B
SUMMARY OF SIDRA MODELLING


N
Gregory St Nth
Belle O'Connor St
17
17
17
17
Steve Eagleton Dr
Gregory Street Sth

MOVEMENT SUMMARY

2010 AM Existing

Gregory Street and Steve Eagleton Drive Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Gregory Street Sth											
7	L	14	0.0	0.253	7.1	LOS A	2.1	14.8	0.24	0.63	48.7
8	T	323	3.0	0.252	6.2	LOS A	2.1	14.8	0.24	0.47	50.1
9	R	12	0.0	0.252	9.5	LOS A	2.1	14.8	0.24	0.77	46.6
Approach		348	2.8	0.252	6.3	LOS A	2.1	14.8	0.24	0.49	50.0
North East: Belle O'Connor St											
10	L	36	0.0	0.070	5.2	LOS A	0.5	3.3	0.42	0.45	44.1
11	T	2	0.0	0.070	5.2	LOS A	0.5	3.3	0.42	0.47	43.2
12	R	37	0.0	0.070	12.3	LOS A	0.5	3.3	0.42	0.77	40.8
Approach		75	0.0	0.070	8.7	LOS A	0.5	3.3	0.42	0.61	42.3
North: Gregory St Nth											
1	L	7	0.0	0.157	6.9	LOS A	1.2	8.6	0.13	0.65	48.9
2	T	204	3.0	0.158	5.9	LOS A	1.2	8.6	0.13	0.46	50.9
3	R	22	0.0	0.158	9.2	LOS A	1.2	8.6	0.13	0.79	46.7
Approach		234	2.6	0.158	6.3	LOS A	1.2	8.6	0.13	0.50	50.4
South West: Steve Eagleton Dr											
4	L	9	0.0	0.024	5.9	LOS A	0.2	1.1	0.51	0.47	43.4
5	T	1	0.0	0.024	5.9	LOS A	0.2	1.1	0.51	0.49	42.7
6	R	13	0.0	0.024	13.0	LOS A	0.2	1.1	0.51	0.74	40.4
Approach		23	0.0	0.024	9.8	LOS A	0.2	1.1	0.51	0.62	41.6
All Vehicles		680	2.3	0.252	6.7	LOS A	2.1	14.8	0.23	0.51	48.8

MOVEMENT SUMMARY

2010 PM Existing

Gregory Street and Steve Eagleton Drive Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Gregory Street Sth											
7	L	31	0.0	0.221	7.0	LOS A	1.7	12.5	0.22	0.62	48.7
8	T	260	3.0	0.221	6.1	LOS A	1.7	12.5	0.22	0.47	50.2
9	R	16	0.0	0.222	9.4	LOS A	1.7	12.5	0.22	0.76	46.6
Approach		306	2.5	0.221	6.4	LOS A	1.7	12.5	0.22	0.50	49.9
North East: Belle O'Connor St											
10	L	40	0.0	0.070	6.2	LOS A	0.5	3.3	0.54	0.53	43.5
11	T	1	0.0	0.070	6.2	LOS A	0.5	3.3	0.54	0.55	42.8
12	R	24	0.0	0.070	13.3	LOS A	0.5	3.3	0.54	0.81	40.3
Approach		65	0.0	0.070	8.8	LOS A	0.5	3.3	0.54	0.63	42.2
North: Gregory St Nth											
1	L	7	0.0	0.263	6.9	LOS A	2.1	15.2	0.13	0.66	48.9
2	T	362	3.0	0.261	5.9	LOS A	2.1	15.2	0.13	0.46	50.9
3	R	31	0.0	0.261	9.2	LOS A	2.1	15.2	0.13	0.80	46.7
Approach		400	2.7	0.261	6.2	LOS A	2.1	15.2	0.13	0.49	50.5
South West: Steve Eagleton Dr											
4	L	9	0.0	0.017	5.4	LOS A	0.1	0.8	0.46	0.44	43.9
5	T	1	0.0	0.017	5.4	LOS A	0.1	0.8	0.46	0.46	43.1
6	R	6	0.0	0.017	12.6	LOS A	0.1	0.8	0.46	0.76	40.8
Approach		17	0.0	0.017	8.1	LOS A	0.1	0.8	0.46	0.56	42.6
All Vehicles		788	2.4	0.261	6.5	LOS A	2.1	15.2	0.21	0.51	49.3

MOVEMENT SUMMARY

Gregory Street and Steve Eagleton Drive Roundabout
Year 2027 AM Peak WITHOUT THE DEVELOPMENT Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Gregory Street Sth											
7	L	18	0.0	0.331	7.2	LOS A	2.4	17.1	0.31	0.63	48.5
8	T	422	3.0	0.331	6.3	LOS A	2.4	17.1	0.31	0.48	49.7
9	R	15	0.0	0.331	9.6	LOS A	2.4	17.1	0.31	0.76	46.5
Approach		455	2.8	0.331	6.5	LOS A	2.4	17.1	0.31	0.50	49.6
North East: Belle O'Connor St											
10	L	46	0.0	0.095	5.6	LOS A	0.5	3.7	0.49	0.49	43.7
11	T	3	0.0	0.095	5.6	LOS A	0.5	3.7	0.49	0.51	42.9
12	R	48	0.0	0.095	12.8	LOS A	0.5	3.7	0.49	0.78	40.6
Approach		98	0.0	0.095	9.1	LOS A	0.5	3.7	0.49	0.64	42.0
North: Gregory St Nth											
1	L	9	0.0	0.205	7.0	LOS A	1.3	9.4	0.16	0.65	48.8
2	T	266	3.0	0.205	6.0	LOS A	1.3	9.4	0.16	0.46	50.7
3	R	28	0.0	0.205	9.3	LOS A	1.3	9.4	0.16	0.78	46.6
Approach		304	2.6	0.205	6.3	LOS A	1.3	9.4	0.16	0.50	50.2
South West: Steve Eagleton Dr											
4	L	13	0.0	0.035	6.5	LOS A	0.2	1.4	0.59	0.53	42.9
5	T	1	0.0	0.035	6.6	LOS A	0.2	1.4	0.59	0.55	42.2
6	R	17	0.0	0.035	13.7	LOS A	0.2	1.4	0.59	0.76	39.9
Approach		31	0.0	0.035	10.5	LOS A	0.2	1.4	0.59	0.66	41.2
All Vehicles		887	2.3	0.331	6.9	LOS A	2.4	17.1	0.29	0.52	48.4

MOVEMENT SUMMARY

Site: No Dev 2027 PM

Gregory Street and Steve Eagleton Drive Roundabout
Year 2027 PM Peak WITHOUT THE DEVELOPMENT Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Gregory Street Sth											
7	L	40	0.0	0.290	7.1	LOS A	2.0	14.2	0.28	0.62	48.5
8	T	340	3.0	0.290	6.3	LOS A	2.0	14.2	0.28	0.48	49.9
9	R	21	0.0	0.290	9.5	LOS A	2.0	14.2	0.28	0.75	46.5
Approach		401	2.5	0.290	6.5	LOS A	2.0	14.2	0.28	0.50	49.6
North East: Belle O'Connor St											
10	L	53	0.0	0.099	7.0	LOS A	0.6	3.9	0.61	0.60	43.0
11	T	1	0.0	0.099	7.0	LOS A	0.6	3.9	0.61	0.62	42.4
12	R	32	0.0	0.099	14.2	LOS A	0.6	3.9	0.61	0.83	39.8
Approach		85	0.0	0.099	9.7	LOS A	0.6	3.9	0.61	0.69	41.7
North: Gregory St Nth											
1	L	9	0.0	0.339	7.0	LOS A	2.5	17.6	0.17	0.65	48.8
2	T	473	3.0	0.339	6.0	LOS A	2.5	17.6	0.17	0.46	50.6
3	R	40	0.0	0.339	9.3	LOS A	2.5	17.6	0.17	0.78	46.7
Approach		522	2.7	0.339	6.3	LOS A	2.5	17.6	0.17	0.49	50.3
South West: Steve Eagleton Dr											
4	L	13	0.0	0.023	5.9	LOS A	0.1	0.9	0.53	0.49	43.5
5	T	1	0.0	0.023	5.9	LOS A	0.1	0.9	0.53	0.51	42.8
6	R	8	0.0	0.023	13.1	LOS A	0.1	0.9	0.53	0.77	40.5
Approach		22	0.0	0.023	8.6	LOS A	0.1	0.9	0.53	0.59	42.2
All Vehicles		1031	2.4	0.339	6.7	LOS A	2.5	17.6	0.26	0.51	48.9

Site: Full Dev 2027 AM

MOVEMENT SUMMARY

Gregory Street and Steve Eagleton Drive Roundabout
Year 2027 AM Peak WITH FULL DEVELOPMENT Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Gregory Street Sth											
7	L	47	0.0	0.384	7.4	LOS A	2.9	20.7	0.37	0.63	48.2
8	T	448	3.0	0.384	6.5	LOS A	2.9	20.7	0.37	0.50	49.3
9	R	17	0.0	0.384	9.8	LOS A	2.9	20.7	0.37	0.74	46.4
Approach		513	2.6	0.384	6.7	LOS A	2.9	20.7	0.37	0.52	49.1
North East: Belle O'Connor St											
10	L	49	0.0	0.107	6.1	LOS A	0.6	4.3	0.55	0.54	43.2
11	T	2	0.0	0.107	6.1	LOS A	0.6	4.3	0.55	0.56	42.5
12	R	51	0.0	0.107	13.3	LOS A	0.6	4.3	0.55	0.80	40.2
Approach		102	0.0	0.107	9.7	LOS A	0.6	4.3	0.55	0.67	41.6
North: Gregory St Nth											
1	L	9	0.0	0.254	7.3	LOS A	1.8	12.6	0.30	0.63	48.3
2	T	283	3.0	0.254	6.3	LOS A	1.8	12.6	0.30	0.48	49.7
3	R	49	0.0	0.254	9.6	LOS A	1.8	12.6	0.30	0.74	46.4
Approach		342	2.5	0.254	6.8	LOS A	1.8	12.6	0.30	0.52	49.2
South West: Steve Eagleton Dr											
4	L	44	0.0	0.128	7.0	LOS A	0.8	5.3	0.64	0.62	42.6
5	T	4	0.0	0.128	7.0	LOS A	0.8	5.3	0.64	0.63	41.9
6	R	60	0.0	0.128	14.2	LOS A	0.8	5.3	0.64	0.81	39.6
Approach		108	0.0	0.128	11.0	LOS A	0.8	5.3	0.64	0.73	40.8
All Vehicles		1065	2.1	0.384	7.5	LOS A	2.9	20.7	0.39	0.55	47.3

MOVEMENT SUMMARY

Site: Full Dev 2027 PM

Gregory Street and Steve Eagleton Drive Roundabout
Year 2027 PM Peak WITH FULL DEVELOPMENT Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Gregory Street Sth											
7	L	83	0.0	0.354	7.4	LOS A	2.5	18.2	0.36	0.62	48.2
8	T	361	3.0	0.354	6.6	LOS A	2.5	18.2	0.36	0.50	49.2
9	R	22	0.0	0.354	9.9	LOS A	2.5	18.2	0.36	0.73	46.3
Approach		466	2.3	0.354	6.9	LOS A	2.5	18.2	0.36	0.53	48.9
North East: Belle O'Connor St											
10	L	56	0.0	0.120	7.8	LOS A	0.7	5.0	0.68	0.66	42.6
11	T	4	0.0	0.120	7.8	LOS A	0.7	5.0	0.68	0.67	41.9
12	R	34	0.0	0.120	15.0	LOS B	0.7	5.0	0.68	0.85	39.4
Approach		94	0.0	0.120	10.4	LOS A	0.7	5.0	0.68	0.73	41.3
North: Gregory St Nth											
1	L	9	0.0	0.407	7.2	LOS A	3.3	23.6	0.30	0.63	48.4
2	T	503	3.0	0.407	6.3	LOS A	3.3	23.6	0.30	0.47	49.8
3	R	72	0.0	0.407	9.5	LOS A	3.3	23.6	0.30	0.74	46.5
Approach		584	2.6	0.407	6.7	LOS A	3.3	23.6	0.30	0.51	49.3
South West: Steve Eagleton Dr											
4	L	33	0.0	0.080	6.2	LOS A	0.5	3.2	0.57	0.54	43.1
5	T	3	0.0	0.080	6.2	LOS A	0.5	3.2	0.57	0.56	42.4
6	R	38	0.0	0.080	13.4	LOS A	0.5	3.2	0.57	0.78	40.2
Approach		74	0.0	0.080	9.9	LOS A	0.5	3.2	0.57	0.67	41.5
All Vehicles		1218	2.1	0.407	7.2	LOS A	3.3	23.6	0.37	0.54	47.9

D CIVIL ENGINEERING REPORT

CIVIL ENGINEERING REPORT

Concept Plan for a Proposed Residential Subdivision and BioBanking Proposal Steve Eagleton Drive, South West Rocks

August 2012

HOPKINS CONSULTANTS
DEVELOPMENT MANAGERS • SURVEYORS • ENGINEERS • PLANNERS

Table of Contents

Appendices

1 Introduction

Hopkins Consultants have been engaged to prepare civil engineering plans to support the intended residential subdivision of land known as “Settler’s Ridge” located at Steve Eagleton Drive, South West Rocks.

The development proposal has been determined by the Department of Planning to be a Major Project under the provisions of the Environmental Planning and Assessment Act 1979. Accordingly, the subdivision proposal requires the lodgement of an Environmental Assessment pursuant to State Environmental Planning Policy (Major Development) 2005.

This Civil Engineering Report has been prepared to support the Environmental Assessment and respond to the Director General’s Requirements. This report should be referenced against the Environmental Assessment, and associated reports and plans lodged with that Part 3A application.

2 Subject Site

2.1 Locality

South West Rocks is a Coastal Village with a population of 6500 on the mid north coast of NSW. The village is located 40km north-east of Kempsey near the mouth of the Macleay river, and is about 5 ½ hours drive north of Sydney.

The site has frontage to, and is bound by Gregory Street to the east, Steve Eagleton Drive to the south and the partly formed Keith Andrews Avenue to the north. The land is located between the "old' town of South West Rocks, and more recent residential development that has occurred along Steve Eagleton Drive adjacent 'The Rocks' local shopping centre. The South West Rocks industrial area lies to the south.

The land is undulating and is mostly vegetated. There are no permanent or semi-permanent water-bodies within the study area.

The Real Property description of the subject land is:

- Lot 31 DP 754396 (Lot 31);
- Lot 57 DP 1117398 (Lot 57); &
- Lot 223 DP 754396 (Lot 223).

2.1.1 Locality Map

3 Proposal

The Concept Plan for which approval is sought consists of a number of elements for the purpose of creating a residential subdivision over the site. The proposed civil works associated with the subdivision include:

- Extension of Trevor Judd Avenue providing vehicular access to the land;
- Landscaping/Street tree planting within all road reserves;
- Footpath and Cycleway connections;
- Extension of Steve Eagleton Drive, and providing for a future connection to Keith Andrews Avenue;
- Partial extension of Keith Andrews Avenue to provide private access to some residential lots;
- Creation of a bio-retention basin in the site's south abutting the Steve Eagleton Drive extension;
- Extension and augmentation of all associated public infrastructure to provide essential services to the residential neighbourhood.

The concept plan incorporates a variety of allotment sizes, road alignments and widths. The overall plan of subdivision is illustrated in the concept plan contained at **Appendix A**, and the mix of residential lot sizes is summarised in **Table 3.1** below.

Table 3.1 Proposed Residential Lot Sizes

Total No. of residential allotments	**156**
Courtyard allotments 445 – 499m^2	8
Premium courtyard allotments 500 – 599m^2	48
Traditional allotments 600 - 699 m^2	54
Premium traditional allotments 700 m^2 +	44
Balance allotments	2

All lots can be serviced by existing infrastructure with augmentation as necessary. All local infrastructure has been designed to the standards necessary to accommodate this anticipated development which is identified in Council's local DCPs and DSPs, and are commented on in more detail in **Section 4** of this report.

4 Essential Services

4.1 Roads

Trevor Judd Avenue connects to the site's eastern boundary and is a fully constructed residential street. Steve Eagleton Drive serves as a future local collector road, and also connects to the site boundary.

The half-width constructed Keith Andrews Avenue between Bruce Field Street and to 50m east of Rippon Place adjoins part of the north boundary of the site. Road extensions and widening can be easily and economically provided within the site.

The road and street network is to be constructed as part of the proposed subdivision in accordance with AUSPEC and Kempsey Shire council requirements for public roads. The recommended road reserve widths of Council's DCP 36 are:

- Collector 22m
- Internal Streets 16m

Road longitudinal grades have been kept within normal standards where practicable. Internal streets will have typical cross-falls with kerb and gutter connection to stormwater drainage system via kerb inlet pits and reinforced concrete pipes.

The Perimeter Collector Road (extension of Steve Eagleton Drive) is proposed to have a one way cross-fall with similar drainage infrastructure provided. Typical road cross-sections are illustrated in the plans contained in **Appendix A** to this report.

The existing sub-grade conditions will need to be fully investigated by a Geo-technician specifically in relation to California Bearing Ratio prior to a detailed pavement design during the design & documentation phase. Preliminary investigations indicate standard pavement design will be applicable.

Traffic & Access from surrounding streets has been addressed in a separate Traffic Assessment report prepared by Roadnet (also contained with the Technical Papers in support of the EA). This traffic report deems the traffic environment to be capable of accommodating the proposed increase in local traffic volumes.

4.2 Stormwater

An assessment of the drainage characteristics has been carried out & a catchment plan prepared. In addition, a drainage and water quality strategy has been completed for lodgement with the Environmental Assessment.

The development site is not subject to flooding nor has it any permanent or semi permanent watercourses. The site comprises 4 main sub-catchments being:

- Northern Catchment 1 – draining to existing drainage network in Keith Andrews Avenue;
- Western Catchment 2 – draining to a proposed new bioretention basin located at the southern perimeter of Steve Eagleton Drive;
- North-East Catchment 3 – draining to the existing drainage network in Gregory St; and
- Southern Catchment 4 – draining to the existing drainage network in Trevor Judd Avenue.

It is proposed that the one new bio-retention basin described above will be designed and constructed as “dry sand filter” type basin to capture and treat the 3 month storm event. The basin has been sized to treat and reduce Total Suspended Solids (TSS), Total Phosphorous (TP) and Total Nitrogen (TN). It is proposed that the treatment will reduce these parameters by the current industry standard being:

- TSS = 80%
- TP = 45%
- TN = 45%

The preliminary bio-retention basin size is calculated at 2.5% of the catchment area covered (western catchment 2). Detailed design and analysis of the basin using the modelling software MUSIC will be required to fine tune the filter media size, filter area, basin size & construction details.

It is not proposed that the stormwater strategy will include detention. Both the North & North-east catchments are very small and will connect to existing systems with potential for surcharge and overland flow. Moreover, there is very limited area for detention basins and it is assessed that the effectiveness of such structures would be limited when weighed against the ongoing council maintenance liability.

The Western sub-catchment will drain to the new bio-retention basins located adjacent natural watercourse located off-site. It is proposed that the structure will have a bypass facility to allow flow from major storm events to be diverted directly into the down-stream watercourses.

A plan detailing the proposed drainage strategy, and which illustrates the catchments and proposed bio-retention basin is contained in **Appendix B** to this report.

4.3 Town Water

Town water mains exist in Trevor Judd Avenue, Steve Eagleton Drive and along the full extent of Keith Andrews Avenue (trunk main and local supply mains).

Water mains surrounding the site have been previously designed in anticipation of the future site development and will be augmented once the site development proceeds.

The highest sections of the parent Lots 223 & 57 may require some pressure boosting to achieve satisfactory pressures. This will be subject to further negotiations with Kempsey Shire Council at the detailed engineering design stage.

Concept plans for the water reticulation of the residential project have been prepared and are contained in **Appendix C**.

4.4 Town Sewer

The North-east corner comprising the majority of parent Lot 223's development can gravity drain east to existing designed sewer infrastructure. The balance of development on Lots 223, all of Lot 57 and some of Lot 31 will drain south to an earlier designed and installed sewer pump station in Spencer's Creek Road. The northern section of Lot 31 can gravity drain to existing sewer infrastructure in Rippon Place and Bruce Field Street.

Only one additional sewer pump station will be required to service the Western & Southern catchments. The northern section of Lot 31 can gravity drain to existing sewer infrastructure in Rippon Place and Bruce Field Street.

It is anticipated that the new sewer pump station will be designed and constructed to Kempsey Shire Council standards and handed over to council as public assets.

A sewer reticulation concept plan, illustrating the abovementioned catchments, existing and proposed pump station and anticipated gravity feed is contained in **Appendix D** to this report.

4.5 Electricity

Underground electricity with pad-mount transformers exist adjoining the site in Trevor Judd Avenue and Steve Eagleton Drive. High voltage overhead and low voltage underground supply exists along the Keith Andrews Avenue frontage (northern boundary of the site).

It is proposed to have Country Energy or an Accredited Electrical designer prepare an electrical services plan to extend the power supply into this subdivision. The electrical conduits would be located in the area allocated for services in the footpath.

An electrical servicing plan will be prepared during the detailed design phase.

4.6 Telephone Services

Underground facilities adjoin the site in Trevor Judd Avenue, Steve Eagleton Drive and Keith Andrews Avenue. All services have capacity to be augmented to

connect with the residential project. As this development exceeds 100 Lots it will need to be registered with NBN for provisioning.

It is proposed that telecommunications pit & pipe will be designed and constructed under a shared trench arrangement with the electrical supply.

A telecommunications layout plan will be prepared during the detailed design phase.

6 Conclusion

The subject site has been zoned for residential purposes since 1987. In the twenty-four years since, all services infrastructure for residential development of the locality have been completed to the east, south & north. All such works have been designed and co-ordinated to take into consideration the eventual residential development of this site as per Kempsey Shire Council's urban growth strategies for South West Rocks.

Moreover, Kempsey Shire Council has DCPs in place which anticipate this development accordingly, and Kempsey Council's Engineering Guidelines Code DCP 36 has been utilised to design and construct the integrated residential development. Those guidelines will be adhered to within the design plans for the site.

Principal infrastructure components of the concept plan are:

1. Kerbed and sealed sheets;
2. Concrete footpaths;
3. Traffic calming;
4. Stormwater drainage to AR & R specifications;
5. Functional accesses to all lots;
6. Water Sensitive Urban Design and ongoing water quality maintenance infrastructure;
7. Town water, sewer and electricity and telephone services to standard designs and within registered easements where required;
8. Detailed erosion and sediment control strategies during civil construction and construction maintenance.

All such items of infrastructure will be detailed at the Development Application and/or Construction Certificate phase.

APPENDIX A

Concept Plan of Residential Subdivision

TYPICAL ROAD CROSS SECTION (16m RESERVE)

TYPICAL ROAD CROSS SECTION (22m RESERVE)

No.	DATE	REVISIONS	BY
-			

SETTLERS RIDGE

SOUTH WEST ROCKS

HOPKINS CONSULTANTS PTY LTD
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PLAN OF PROPOSED SUBDIVISION
LOT 31 & 223, DP754396 & LOT 57, DP1117398

DRAWING NUMBER/REFERENCE: 6383-0002-01			REV.
DESIGNER	ORIGIN OF LEVELS	DATE	7-8-2012
SURVEYOR	HEIGHT	SHEET SIZE	A1
DRAFTING: GA	DATUM: AHD	SHEET NO.	01
APPROVED: AL	SCALE: 1:1000	TOTAL	04

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APPENDIX B

Proposed Drainage Strategy

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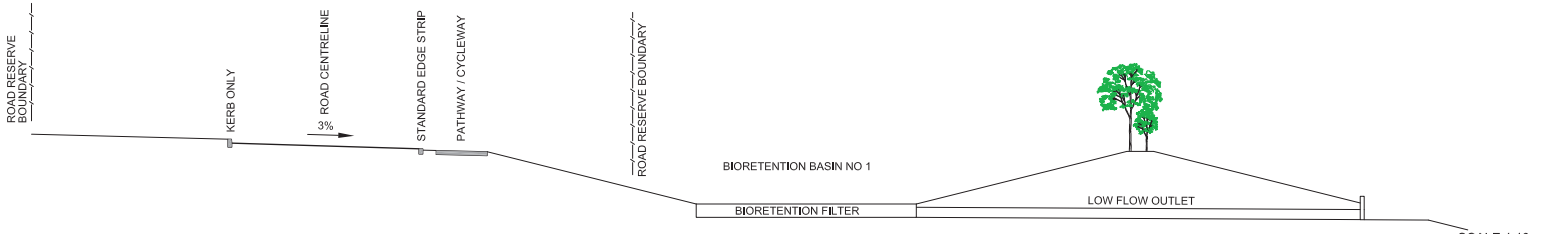
LEGEND

- PROPOSED DRAINAGE STRATEGY
- DRAINAGE CATCHMENT AREAS
- BIORETENTION BASIN

BIORETENTION BASIN

- BIORETENTION BASIN
  CATCHMENT AREA 2 : 12.54ha
  BASIN AREA: 3140m² (APPRX 2.5% OF CATCHMENT)

NOTE:
ALL DIMENSIONS, AREAS, LOT LAYOUTS & SERVICES DESIGN ARE SUBJECT TO FINAL SURVEY, DETAILED DESIGN WORKS, ENVIRONMENTAL STUDIES & APPROVAL BY PORT MACQUARIE HASTINGS COUNCIL.



TYPICAL SECTION AA

SCALE 1:10

No.	DATE	REVISIONS	BY
-			

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SOUTH WEST ROCKS

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PROPOSED DRAINAGE STRATEGY
LOT 31 & 223, DP754396 & LOT 57, DP1117398

DRAWING NUMBER/REFERENCE: 6383-00-0002-02			REV.
DESIGNER: GA	ORIGIN OF LEVELS	DATE: 7-8-2012	
SURVEYOR	HEIGHT	SHEET SIZE: A1	
DRAFTING: GA	DATUM: AHD	SHEET NO: 02	
APPROVED: AL	SCALE: 1:1250	TOTAL: 04	

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APPENDIX C

Concept Water Reticulation Strategy

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-			

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WATER RETICULATION
LOT 31 & 223, DP754396 & LOT 57, DP1117398

DRAWING NUMBER/REFERENCE: 6383-00-0002-03			REV.
DESIGNER: GA	ORIGIN OF LEVELS	DATE: 7-8-2012	
SURVEYOR	HEIGHT	SHEET SIZE: A1	
DRAFTING: GA	DATUM: AHD	SHEET NO: 03	
APPROVED: AL	SCALE: 1:1000	TOTAL: 04	

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APPENDIX D

Concept Sewer Reticulation Strategy

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No.	DATE	REVISIONS	BY
-			

SETTLERS RIDGE

SOUTH WEST ROCKS

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SEWER RETICULATION
LOT 31 & 223, DP754396 & LOT 57, DP1117398

DRAWING NUMBER/REFERENCE			REV.
6383-00-0002-04			
DESIGNER	ORIGIN OF LEVELS	DATE	
GA		7-8-2012	
SURVEYOR	HEIGHT	SHEET SIZE	
		A1	
DRAFTING	DATUM	SHEET NO.	
GA	AHD	04	
APPROVED	SCALE	TOTAL	
AL	1:1000	04	

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