APPENDIX A – DIRECTOR-GENERALS REQUIREMENTS

NSW GOVERNMENT | Office of Environment & Heritage

Our reference : DOC12/25378
Contact : Allison Treweek (02) 62297082

Tim Shepherd
Regional Manager Far South Coast
National Parks and Wildlife Service
PO Box 282 Narooma NSW 2545

Dear Mr ~~Shepherd~~ Tim

Re: Director-General's Requirements for a Species Impact Statement for a mechanically treated strategic fire advantage zone, Potato Point.

I refer to your letter dated 26th of November 2013 received by the Office of Environment and Heritage (OEH), Regional Operations Group (ROG) requesting the Director-General's Requirements (DGRs) for a Species Impact Statement (SIS) for the activity cited above.

Please find enclosed a copy of the DGRs (Attachment A) issued on behalf of the Director General on 20th of December 2013.

OEH ROG has reviewed the information supplied with the request for DGR's including the Review of Environmental Factors (REF) for Stage 1 of the activity. The Director-General's Requirements are being sought for Stage 2 of the activity as NPWS have determined that the level of clearing required in the strategic fire advantage zone may have a significant effect on the endangered ecological community known as *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.*

Surveys to date have not included targeted surveys for threatened fauna that were identified in the REF as having the potential to occur on the subject site. The SIS must consider whether the subject site is not only utilised by these threatened species, but also whether it provides potential suitable habitat.

In assessing any request for concurrence, ROG will adopt the policy of avoid, mitigate and, as a last resort, offset the impacts of the activity to "maintain or improve" biodiversity values on site. If offsets are required as a result of the proposed activity, ROG would consider a strategy to contribute to the conservation of the affected EEC elsewhere (e.g. a funded plan of management to undertake restoration of a weed affected area in a community equivalent to the EEC being impacted) to achieve a "maintain or improve" outcome of biodiversity values. NPWS will be required to demonstrate how a biodiversity offset site is to be managed and a potential location for the offset.

To assist with the assessment process, OEH provides the following information.

Referrals

Whilst ROG is unable to provide comment on draft SISs in their entirety, we will provide comment to proponents and their consultants on key issues arising in the drafting process. The ability of ROG to provide such advice is dependent on the availability of resources and on other statutory priorities.

Please note that it is the determining or consent authority's responsibility to ensure that a draft or final SIS complies with the requirements issued by the Director-General. ROG is not available to perform this function on NPWS's behalf.

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Concurrence

If NPWS decides to approve the activity following a review of the final SIS, then the concurrence of the Director-General of OEH or a delegate is required before consent can be granted. A concurrence application is not required should NPWS decide to refuse.

Concurrence applications to ROG should be accompanied by:

1. Two copies of the SIS;
2. A copy of any preliminary flora and fauna assessment undertaken (i.e. the report addressing the assessment of significance that triggered the requirement for the SIS);
3. A copy of NPWS's determination report recommending that consent be granted for the activity and the conditions of that proposed consent;
4. A copy of any submissions or objections received by NPWS concerning the activity;
5. A copy of any other supporting information lodged in support of the activity including social and economic impact assessments; and
6. A cheque for $320 in accordance with s.252A of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) (as amended).

Advertising

NPWS is reminded that in accordance with Section 113 of the EP&A ACT, a determining authority shall give public notice in the form and manner prescribed in Sections 233,134 and 235 of the EP&A Regulation that a copy of an environmental impact statement prepared by or submitted to it is available for public inspection.

Other Information

I also refer you to the requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); The EPBC Act requires the approval of the Federal Minister for the Environment (in addition to any State or Local Government approval or determination) for an action that will have, or is likely to have, a significant impact on a matter of national environmental significance. Threatened species and communities listed by the EPBC Act are considered to be a matter of national environmental significance. ROG recommends discussing this proposal with the Department of Environment (DoE) to establish if the proposal may be determined as a controlled action. If DoE call the proposal in as a controlled action it would be beneficial to have all areas of this assessment included in the assessment undertaken for the SIS.

Many of the species and ecological communities listed in the *Threatened Species Conservation Act 1995* (NSW) are also listed in the Commonwealth EPBC Act. Further information regarding the operation of the EPBC Act (including Federally listed threatened species and communities) may be obtained from the website of the Commonwealth Department of the Environment www.environment.gov.au or by contacting the department on 1800 803 772.

Should you require any additional information please contact Allison Treweek on (02) 62297082.

Yours sincerely

20/12/2013

Michael Saxon
Regional Manager - South East
Regional Operations Group -South
Office of Environment and Heritage

ATTACHMENT A

DIRECTOR GENERAL'S REQUIREMENTS FOR A SPECIES IMPACT STATEMENT MECHANICALLY TREATED STRATEGIC FIRE ADVANTAGE ZONE, POTATO POINT

INTRODUCTION

The purpose of a Species Impact Statement (SIS) in the as it relates to your application is:

- to allow you, as applicant, to identify the issues pertaining to threatened species, populations, ecological communities or their habitats, and provide appropriate amelioration for adverse impacts resulting from the action; and
- to assist the consent or approval authorities in the assessment of your proposal pursuant to the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Section 111(1) of the *Threatened Species Conservation Act 1995* (TSC Act) requires that it must be either the applicant for the development consent or the proponent of the activity who makes the request for Director-General's Requirements (DGRs). It is also essential to note that Section 111(1) requires that the applicant must, in preparing the SIS, comply with the requirements of the Director-General. As any consent or approval granted where the Director-General's requirements are not met may be invalid, it is strongly recommended that NPWS ensure that all of the requirements detailed below are complied with.

The following requirements are based on the standards developed for other SISs prepared elsewhere in NSW. As per normal practice, specific requirements have been identified for threatened species, populations and ecological communities that are known to occur on the subject site.

DEFINITIONS

The definitions given below are relevant to these requirements:

- **Development** has the same meaning as in the EP&A Act.
- **Activity** has the same meaning as in the EP&A Act
- **Proposal** is the development, activity or action proposed
- **Subject Site** means the area directly affected by the proposal.
- **Study Area** means the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take all potential impacts into account.
- **Subject Species, Populations or Ecological Communities** means those threatened species, populations or ecological communities that are known or considered likely to occur in the study area. The SIS is to explicitly consider the impacts of the proposal on each of these entities.
- **Direct Impacts** are those that directly affect habitat and individuals, usually within the footprint of the proposal. They include, but are not limited to, clearing and habitat removal. Consideration must be given to all of the likely direct impacts of the proposed activity or development.
- **Indirect Impacts** occur when project-related actions affect species, populations or ecological communities in a manner other than direct loss, usually beyond the footprint of the proposal. Indirect impacts can include loss of individuals through predation by

domestic and/or feral animals, deleterious hydrological changes (including increased runoff and raising or lowering of the water table), erosion, weed invasion, pollution, trampling or other impacts due to increased human activity within or directly adjacent to sensitive habitat areas, altered fire regimes, habitat fragmentation and disruption of wildlife movement corridors. As with direct impacts, consideration must be given to all of the likely indirect impacts of the proposed activity or development.

- **Life Cycle** is the series or stages of reproduction, growth, development, aging and death of an organism.
- **Viable** means the capacity to successfully complete each stage of the life cycle under normal conditions.
- **Risk of Extinction** is the likelihood that the local population of the species or local occurrence of the endangered population or ecological community will become extinct either in the short, medium or long-term as a result of direct or indirect impacts on the viability of that population and includes changes to the ecological function of communities.
- **Local Population** is the population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions.
  - The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area.
  - The local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.
  - The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time.

  In cases where multiple populations occur in the study area, each population should be assessed separately.
- **Local Occurrence** means the ecological community that occurs within the study area. However the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.
- **Composition** means both the plant and animal species present, and the physical structure of the ecological community. Note that while many ecological communities are identified primarily by their vascular plant composition, an ecological community consists of all plants and animals as defined under the TSC Act that occur in that ecological community.

All other definitions are the same as those contained in the TSC Act.

MATTERS WHICH HAVE BEEN LIMITED OR MODIFIED

The SIS need not address Section 110(2)(g) and 110(3)(d) of the TSC Act. The matters raised in these sections of the TSC Act have been clarified by these DGRs.

The following matters from Section 110 of the TSC Act need only be addressed where relevant:

- All reference to threat abatement plans. There are no threat abatement plans relevant to the key threatening processes associated with the *proposal*.

- All reference to recovery plans. There are draft recovery plans relevant to the *subject species* listed in Tables 1 and 2 of these DGRs. However, if other entities should be deemed as *subject species, populations or ecological communities* by analysis in accordance with these DGRs, then any relevant recovery plans pertaining to these entities will need to be addressed in the SIS.

- All reference to key threatening processes. Only the following key threatening processes are relevant to this proposal:
  - Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands
  - Clearing of native vegetation;
  - Invasion of native plant communities by exotic perennial grasses
  - Removal of dead wood and dead trees;
  - Loss of hollow-bearing trees

For each *subject species, population or ecological community* likely to be affected by any of these key threatening processes, the SIS shall address whether the action will increase this threat, and shall describe proposed measures to ameliorate such threats.

Please note that recovery plans may be approved, critical habitat may be declared and key threatening processes may be listed between the issue of these DGRs and the determination of the *proposal*. If this occurs, these additional matters will need to be addressed in the SIS and considered by the consent, determining or concurrence authority.

MATTERS TO BE ADDRESSED

The TSC Act provides that the SIS must meet all the matters specified in Sections 109 and 110 of the Act with the exception of those matters limited above. Some of the requirements outlined in Sections 109 and 110 (excluding the matters limited above) have been repeated below (italics) along with the specific Director-General's Requirements for your *proposal*.

Previous surveys and assessments may be used to assist in addressing these requirements. All references used throughout the SIS must be cited and detailed in a reference list.

1 FORM OF THE SPECIES IMPACT STATEMENT

A species impact statement must be in writing [Section 109 (1)]

A species impact statement must be signed by the principal author of the statement and by:

(a) the applicant for the licence, or

(b) if the species impact statement is prepared for the purposes of the Environmental Planning and Assessment Act 1979, the applicant for development consent or the proponent of the activity proposed to be carried out (as the case requires) [Section 109(2)].

The SIS must include the following declaration signed by the applicant or proponent:

"I...[insert name], of ..[address], being the applicant for the [choose one of the following development consent for/proponent of] the action proposed...[insert DA number, Lot & DP numbers, street, suburb and LGA names] have read and understood this species impact statement. I understand the implications of the recommendations made in the statement and accept that they may be imposed as conditions of consent or concurrence for the action proposed."

2 CONTEXTUAL INFORMATION

2.1 Description of proposal, subject site and study area

A species impact statement must include a full description of the action proposed, including its nature, extent, location, timing and layout [Section 110 (1)]

2.1.1 Description of the proposal

A full description of the activity proposed includes a description of all associated actions. These actions may occur on or off the *subject site.* In describing the action proposed, the proportion of the *subject site* and the *study area* that will be affected is to be provided.

The type of action proposed shall be detailed, including the timetable for the *proposal.* If a staged approach is adopted then the timetable shall clearly indicate this.

2.1.2 Definition of SIS study area

The SIS study area must be defined. The study area will generally be larger than the development site as it includes any adjacent areas that will be directly or indirectly affected by the proposal. In defining the study area consideration shall be given to possible indirect effects of the proposed action on the area surrounding the subject site, for example habitat fragmentation, vegetation corridors, altered hydrology regimes, soil erosion, pollution, and increased human presence or associated impacts. These may include adjacent parcels of land containing suitable habitat for threatened species. It is therefore important to recognise that these parcels may need to be investigated along with the development site. The location, size and dimensions of the study area shall be provided.

The study area should be established before the list of likely impacted threatened species, populations, ecological communities (including their habitat) is determined so species etc. that are less obviously affected are also included. The study area must be clearly defined, marked on a geo-referenced map / aerial photograph (or equivalent), clearly showing the development site boundary and any additional areas facing indirect impact, and included in the final report.

Direct impacts are those that directly affect individuals or their habitat. Examples of direct impacts include:

- poisoning or removal of the organism itself; and
- removal of habitat.

If the proposal involves the clearing of vegetation and/or removal / damage to habitat the environmental assessment must clearly articulate the size of this impact, and where applicable delineate this on the basis of vegetation / habitat type.

Indirect impacts occur when project-related activities affect species, populations or ecological communities in a manner other than direct loss. Examples of indirect impacts include (but not limited to):

- sediment, pollutant or nutrient runoff into adjacent vegetation
- habitat fragmentation or isolation
- implementation of asset protection zones (*though these may also represent direct impact)
- loss of genetic diversity of threatened species, populations or communities
- altered pollination syndromes that may adversely affect seed set
- soil erosion
- altered hydrology regimes (including downstream impacts)
- changes to the saline / freshwater balance in marine environments
- exposure to heat or predators, or loss of shade
- inhibition of nitrogen fixation
- weed invasion and feral animal incursion
- introduction and spread of pathogens, such as Dieback fungus (*Phytophthora*) and Myrtle Rust (*Uredo rangelii*)
- noise
- dust
- light pollution (i.e. increasing skyglow from uncontrolled urban uplight)
- fire (such as changes to intensity and frequency)
- fertilizer drift
- increased human activity (including litter) within or directly adjacent to sensitive habitat areas.

Indirect impacts should not be just limited to the terrestrial habitats. In stances where a development site adjoins marine, estuarine and/or riparian / riverine environs / habitat, impacts on these must be considered.

(*Note: Indirect impacts may lead to direct loss, and as such must be adequately quantified and assessed. Both impacts within the proposed development footprint and on adjacent / surrounding lands must be taken into account, and where appropriate adequately considered and addressed*).

2.1.3 Description of SIS study area

The description of the study area must include (but not limited to):

- General description of the study area, including size of the development area / area of impact and total area of clearing, and the site in relation to general locale. A 'general locale' map should be provided.
- An examination of previous land uses and events, and the effect of these land uses and events on the study area. Examples of such land uses and events are clearing, timber felling, draining, recreational use and agricultural activities (including grazing).
- An examination of the fire history, or at least the time since the last fire, for the subject site is to be provided. Ideally, information on the frequency, season and intensity of fire events on the subject site will be provided. To adequately address this requirement, it may be necessary to consider fire events in the surrounding landscape.
- The local government land zoning and any proposed rezoning, and an examination of the degree of protection that current zoning and any proposed rezoning provides or will provide to native vegetation and threatened species, populations and ecological communities on the subject site and in the study area and the locality.
- The land tenure and any proposed changes (e.g. acquisition by OEH as a Nature Reserve, National Park, Regional Park etc.), and an examination of the degree of protection that current

land tenures and any proposed land tenures provides or will provide to native vegetation and threatened species in the study area.

- State Environmental Planning Policies (e.g. SEPP 14 Coastal Wetlands, SEPP 44 Koala Habitat Protection, SEPP 71 Coastal Protection) and an examination of the degree of protection these policies provide to native vegetation and threatened species on the subject site and in the study area.
- Relevant Local Government planning instruments, including Local Environmental Plans and Development Control Plans, such as: Lake Macquarie City Council '*Revised Draft Morisset Structure Plan*' (3 June 2008 – Revision 8).

If subsequent development of adjacent land is proposed by the proponent in the future, including any additional construction then this shall be identified to the extent that it is known at the time of preparing the SIS. If existing structures such as the pipeline and transmission line are to be relocated, this should also be described and assessed.

The vegetation within the study area that is to be retained is to be fully documented, and shown on the relevant plans and maps. The proposed management regimes for such areas are also to be documented.

2.2 Provision of relevant plans and maps

The following maps or plans should accompany the report:

A topographic map of the general *locality* at a scale of 1:25,000 is to be provided. This map is to detail the location of the action proposed, landscape features including rivers, swamps, wetlands, and areas of high human activity such as townships and major roads. This should also include land tenure categories.

- Super-imposed on this, any locally significant sites of *subject species, populations or ecological communities* within a radius of 10km from the subject site. All available historical records are to be included of *subject species, populations of ecological communities* sourced from various databases and other sources are to be included on this map.
- Colour aerial photography of the locality (or a reproduction of such a photograph) shall be provided. This aerial photograph shall clearly show the subject site and the scale of the photograph.
- A detailed plan of the *study area* shall be provided at a preferred scale of 1:4,000 or finer. This plan shall show the *proposal* and its footprint, the full extent of vegetation clearing anticipated (including construction footprint, see below).
- A map showing the location and extent of vegetation communities present within the *study area* (refer to Section 3, below), and, where relevant, vegetation zones within these.
- A map showing the location of any key habitat resources for threatened species (eg. hollow-bearing trees, identified feed trees, potential breeding sites, rock outcrops). See Section 4 (below) Where the general habitat of each *subject species, population or ecological community* within the *study area* can be clearly delineated, this habitat shall be represented on the plan.
- The locations of the *subject species populations or ecological communities* recorded in any survey conducted for the purposes of the SIS shall be represented on a map of the *study area* that shows the *proposal* (preferred scale 1:4,000 or finer).

2.3 Land tenure information

The land tenure across the *study area* is to be described and any limitations to sampling across the *study area* resulting from this tenure (e.g. denied access to private land) shall be noted.

3 VEGETATION MAPPING AND ASSESSMENT

3.1 Visiting the site

Conduct a preliminary site visit to refine the initial stratification units, determine the vegetation types present at the site, assess the vegetation condition and conduct a broad habitat assessment to help delineate specific features suitable for sampling.

Taking a copy of the OEH Biometric vegetation types for the relevant Catchment Management Authority (CMA) or equivalent (e.g. existing vegetation mapping) into the field during the preliminary site visit, may be useful in determining the likely vegetation types present. However, for some CMAs this should only be used as a guide as some vegetation types / communities have not been captured or delineated in the NSW Vegetation Types Database.

3.2 Mapping Vegetation Types

The vegetation communities and habitat types present on the property should be identified and mapped. The classification system used in the map should be based on vegetation types listed in the NSW Vegetation Types Database.

The classification of native vegetation in NSW follows the system described by Dr David Keith in '*Ocean Shores to Desert Dunes: The Native Vegetation of New South Wales and the ACT*' (Keith 2004). This classification scheme divides native vegetation into 17 broad vegetation formations. Each formation consists of a number of vegetation classes. There are 99 vegetation classes. These classes are further divided into vegetation types (referred to here as 'OEH BioMetric vegetation types'), which are the finest scale of vegetation classification used in NSW.

OEH has developed a NSW Vegetation Types Database for use with the BioMetric tool, which is designed to assist in assessing biodiversity values when preparing property vegetation plans under the *Native Vegetation Act 2003* and BioBanking agreements under the TSC Act. OEH has provided a spreadsheet containing a definition of these vegetation types on a catchment management authority basis, which is located at:

http://www.environment.nsw.gov.au/resources/nature/BioMetric_Vegetation_Type_CMA.xls

3.3 Identifying Vegetation Zones

Where the extent of a particular vegetation type displays significant differences in condition, these should be further split into Vegetation Zones.

3.4. Description and assessment of Vegetation Zones

Each Vegetation Zone should be adequately described in terms of its

- Vegetation Type (as per NSW Vegetation Types Database),
- The area of each vegetation type within the study area, and the subject site, and the area of this which is proposed to be cleared.
- Conservation status of that vegetation type (whether that vegetation type is listed under State or Commonwealth legislation, and, the extent to which the vegetation type has been cleared from its pre-European extent)
- Condition of the vegetation in each Vegetation Zone. To determine condition, it is recommended that a Site Value assessment be undertaken in accordance with the Biobanking Assessment Methodology. The overall Site Value, together with the scores for each habitat component, should be included in the report.
- Landscape Context of the vegetation in each Vegetation Zone. To determine landscape value, it is recommended that a Landscape Value assessment be undertaken in accordance with the Biobanking Assessment Methodology. The overall score for Landscape Value, and its four components, should be included in the report.

- A full floristic list in tabular format of all taxa (both native and exotic) recorded on the subject site, indicating which communities they occur in, their cover / abundance and frequency, conservation (including taxa of conservation significance) and comparisons to previous vegetation studies / mapping (if applicable). See Note 1 below.

Note that Section 4.4 (below) may require assessment of other habitat components within each Vegetation Zone.

Notes for Floristic surveys: Typically a floristic quadrat / transect will be used for vegetation based surveying. This should record the vegetation structure and cover of all structural layers, all species present, including their cover and abundance, and general location (e.g. Global Positioning System (GPS) co-ordinates etc.) and physiographic details (e.g. condition, position in landscape, soils etc.). These techniques are described in the OEH guideline and are generally the accepted national (NVIS – National Vegetation Inventory System) standard. Each stratification unit must be adequately sampled.

All quadrats / transects should be adequately assessed to determine a suitable vegetation classification which accurately reflects the site. This may be done manually, or through the aid of appropriate statistical software / numerical analysis, such as cluster analysis and ordination analysis computer packages (e.g. PATN [Belbin 1989]). The latter will be dependant on how detailed the survey was, the size of the area sampled, the inherent diversity / complexity of vegetation on site and the amount of plot data collected. Details of the classification and how it was determined must be supplied in the report.

To complement and better refine the vegetation classification, ground-truthing and aerial photograph or satellite imagery interpretation should be used. This will be used to generate the vegetation map and enable greater definition / delineation of vegetation communities present, and ensure a more accurate map. Ground-truthing and/or Aerial Photograph Interpretation (API) should be conducted at a level which captures all the obvious vegetation changes / communities on the subject site (particularly those that are noticeable at the ground-level) and ensure that all vegetation communities are adequately delineated on a geo-referenced map (the 'vegetation map'). Floristic quadrats / transects and any associated analysis will help define and describe the communities shown on the vegetation map. Recognition and delineation of native vegetation patterns on aerial photography may be based on combinations of:

- texture (crown size and shape)
- vegetation height and density
- vegetation and background tone and colour
- landuse pattern (non-woody areas).

3.5 Use of the Biobanking Assessment Methodology

If you are proposing to conduct a biodiversity assessment using BioBanking Assessment Methodology under Biodiversity Banking and Offsets Scheme, as outlined in the '*BioBanking Assessment Methodology and Credit Calculator Operational Manual*' (OEH 2011), to determine the offset requirements of the proposal, then it is advisable and advantageous that during the survey component of the SIS that you collect the relevant data in the appropriate format for the Biometric tool (i.e. BioBanking Credit Calculator) (*Note: this may reduce duplication or further surveying at a later date). This process can provide details of the required ecosystem and species (threatened) credits that need to be retired to offset the impacts of the development. Under this scenario all vegetation types in the study area should be identified and matched to a OEH BioMetric vegetation type.

For details on the use of Biometric, the *BioBanking Assessment Methodology and Credit Calculator Operational Manual* and BioBanking in general refer to the following OEH website (Note: - the new information posted on the OEH website, as detailed above, includes details on site selection, survey intensity and methodology, and vegetation condition measurements): www.environment.nsw.gov.au/biobanking/

If a BioBanking assessment is conducted using the Credit Calculator then OEH requests that the proponent provide an explanation of how the local vegetation communities were assigned to BioMetric vegetation types, copies of BioBanking Credit Reports and BioBanking Agreement Credit Reports, copies of .xml files generated, copies of all field data sheets, and a copy of a checklist that includes the data and underlying assumptions used at every step of the BioBanking Credit Calculator (see Section 7.5 below).

4. THREATENED SPECIES - INITIAL ASSESSMENT

A general description of the threatened species or populations known or likely to be present in the area that is the subject of the action and in any area that is likely to be affected by the action [Section 110 (2)(a)].

4.1 Identifying subject species, populations and communities

For the purposes of this SIS, the species listed in Table 1 are to be addressed as *subject species*:

Table 1. List of *subject species*.

SPECIES	SCIENTIFIC NAME	STATUS
FAUNA		
Little Eagle	*Hieraaetus morphnoides*	Vulnerable
Square-tailed Kite	*Lophoictinia isura*	Vulnerable
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Vulnerable
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	Vulnerable
Little Lorikeet	*Glossopsitta pusilla*	Vulnerable
Swift Parrot	*Lathamus discolor*	Endangered
Barking Owl	*Ninox connivens*	Vulnerable
Powerful Owl	*Ninox strenua*	Vulnerable
Masked Owl	*Tyto novaehollandiae*	Vulnerable
Sooty Owl	*Tyto tenebricosa*	Vulnerable
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	Vulnerable
Striated Fieldwren	*Calamanthus fuliginosus*	Endangered
Speckled Warbler	*Chthonicola sagittata*	Vulnerable
Regent Honeyeater	*Anthochaera phrygia*	Vulnerable
White-fronted Chat	*Epthianura albifrons*	Vulnerable
Olive Whistler	*Pachycephala olivacea*	Vulnerable
Varied Sittella	*Daphoenositta chrysoptera*	Vulnerable
Pink Robin	*Petroica rodinogaster*	Vulnerable
Scarlet Robin	*Pertoica boodang*	Vulnerable
Flame Robin	*Petroica phoenicea*	Vulnerable
Spotted-tailed Quoll	*Dasyurus maculatus*	Vulnerable
White-footed Dunnart	*Sminthopsis leucopus*	Vulnerable
Eastern Pygmy-possum	*Cercartetus nanus*	Vulnerable
Long-nosed Potoroo	*Potorous tridactylus*	Vulnerable
Southern Brown Bandicoot	*Isoodon obesulus obesulus*	Endangered
Yellow-bellied Glider	*Petaurus australis*	Vulnerable
Golden-tipped Bat	Kerivoula papuensis	Vulnerable
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	Vulnerable
Eastern Freetail-bat	*Mormopterus norfolkensis*	Vulnerable
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	Vulnerable
Southern Myotis	*Myotis macropus*	Vulnerable
Greater Broad-nosed Bat	*Scoteanax rueppellii*	Vulnerable

SPECIES	SCIENTIFIC NAME	STATUS
FLORA		
Narrow-leafed Wilsonia	*Wilsonia backhousei*	Vulnerable
Tall Knotweed	*Persicaria elatior*	Vulnerable
Tangled Bedstraw	*Galium australe*	Endangered
Austral Toadflax	*Thesium australe*	Vulnerable
Endangered Ecological Communities		
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		
Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions		

One of the roles of a SIS is to determine which species, populations or ecological communities may be utilising, or present, on a development site. This list is not exhaustive and other entities may also need to be included for assessment in this SIS on the basis of desktop and habitat analyses and the outcomes of fieldwork.

In determining whether other entities, should also be addressed as *subject species, populations and ecological communities*, consideration shall be given to the habitat types present within the *study area*, recent records of threatened species, populations or ecological communities in the *locality* and the known distributions of threatened species, populations and ecological communities. This analysis and its conclusion are to be documented in the SIS.

Databases such as the OEH Atlas of NSW Wildlife and BioNet, as well as databases held by the Australian Museum and Royal Botanic Gardens, should be consulted to assist in compiling the list of possible entities to be analysed. It should be noted that if the OEH Atlas is the only database that is referred to, due to data exchange agreements, the data provided by OEH will only include that for which OEH is a custodian. In many cases, this may only be a small subset of the data available. Other databases must also be consulted to create a comprehensive list of entities for consideration as *subject species, populations or ecological communities.*

It is acknowledged that not all of the subject species identified above will occur within the habitats that will be affected. If it is the view of the assessor that this is the case, then the rationale for this conclusion must be documented. The species that do have the potential to occur on the site and consequently will be the subject of further assessment (see below) are known as the "target species".

4.2 Identifying habitats

The purpose of this section is to identify which parts of the study area may provide habitat for the threatened species listed in Section 4.1.

A description of the habitat requirements for each species set out in Section 4.1 needs to be assessed against the habitat within the study area. The vegetation assessment provided under Section 3 will assist, particularly in relation to the condition assessment for each vegetation zone. However, for some species, additional more detailed information for some habitat components will be required.

In describing the *study area*, consideration shall be given to the previous land uses and the effect of these land uses on the *study area*. The information provided in Section 2 (above) will assist with this. Relevant historical events may include fire, clearing, logging, slashing, recreational use and agricultural activities.

A description of habitats including such components as the frequency of tree hollows, the presence of wetlands, the density of understorey vegetation, the composition of the ground cover,

the soil type and the presence of heath and permanent or ephemeral swamps shall be given. This can be based on the vegetation assessment provided under Section 3 (above). The condition of these habitats within the *study area* shall be discussed, including the prevalence of introduced species. A description of the habitat requirements of threatened species, populations or ecological communities likely to occur in the *study area* shall be provided.

Any areas which may provide habitat connectivity between the *study area* and adjacent areas of likely habitat for *subject species, populations or ecological communities* shall be identified and described.

In defining the *study area*, consideration shall be given to possible *indirect impacts* of the proposed action on species/habitats in and surrounding the *subject site*. These could include impacts arising from altered fire and hydrology regimes, soil erosion or pollution, fencing, habitat fragmentation and disruption of wildlife movement corridors, edge effects, altered light and noise regimes, disturbance of roosting areas or other impacts due to increased use of the area by humans, and the impacts of increased levels of domestic and feral predators.

5 SURVEY

5.1 Requirement to survey

A fauna and flora survey must be conducted in the study area. Surveys should be conducted for all target species determined in accordance with Section 4.1. Recent (less than five year old) surveys and assessments may be used, but surveys greater than five years will not be accepted. However, previous surveys will not be considered to have addressed this requirement if they have:

- been undertaken in seasons, weather conditions or following extensive disturbance events when the target subject species are unlikely to be detected or present (e.g. outside known flowering / fruiting periods, adverse drought conditions, flooding, bushfire [though some species are 'fire obligates' requiring fire to germinate], slashing and overgrazing etc.); or
- utilised methodologies, survey sampling intensities, timeframes or baits that are not the most appropriate ones for detecting the target subject species unless these differences can be clearly demonstrated to be likely to have had an insignificant impact upon the outcomes of the surveys.

Surveys must be undertaken by appropriately experienced and qualified persons. A recognised expert, from institutions such as the Australian Museum (Sydney), the National Herbarium of NSW at the Royal Botanic Gardens (Sydney) or the Queensland Herbarium (Brisbane), or who is otherwise considered acceptable by OEH, must be used to determine or confirm the identification of species that are unknown or which have been only provisionally identified.

Survey methods adopted must be those considered by experienced wildlife surveyors to be the ones most likely to detect the targeted subject species (more than one survey method must be utilized for those subject species for which complementary methods have the potential to result in a significant increase in detection). Survey effort (including intensity, repetition and coverage) must be at a level that can be reasonably expected to detect the subject species if present in the study area. Surveys must be undertaken at the time of year when the subject species are most likely to be detected (e.g. targeted threatened flora should be carried out when a species is flowering and/or fruiting, as these features are typically required to positively identify species) and, where possible, in appropriate weather conditions. OEH expects the weather conditions (e.g. minimum ambient air temperature, maximum ambient air temperature, amount of precipitation that occurs each 24 hour period, details about wind speed and direction and the amount of cloud cover) and the phase of the moon to be recorded for each day of survey (including dates) to be documented and included in the report.

Survey procedures and assessment of results should be consistent with those procedures and assessment approaches contained within the OEH publications:

- 'Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities' (DEC – November 2004)'. (*Note: Section 6.1 Assessment of Significance has now been amended by DECC 2007b);
- 'Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECC – April 2009b)'; and
- 'Threatened Species Assessment Guidelines: The Assessment of Significance' (DECC – August 2007b).

(Note that OEH has recently produced new survey guidelines to cover Amphibians (frogs), which replaces the amphibian section in the DEC (2004) guidelines. However, the survey requirements for all other species (flora and fauna) are still found in the DEC (2004) guidelines).

The above documents can be located on the OEH's website under the 'Threatened species survey and assessment guidelines' at:

- www.environment.nsw.gov.au/threatenedspecies/surveyassessmentgdlns.htm

If a proposed survey methodology is likely to vary significantly from widely accepted methods, the proponent should discuss the proposed methodology with the OEH prior to undertaking the SIS, to determine whether OEH considers that it is appropriate.

In addition to the above guidelines, OEH has recently posted new information on the OEH website to ensure appropriate surveys are completed, with particular reference to fauna surveying. Below is a summary of this information as well as other clarifying points, often relating to vegetation survey. This updated information can be accessed from:

- www.environment.nsw.gov.au/threatenedspecies/surveymethodsfauna.htm

False absences and imperfect detection

While the presence of a target species can often be confirmed at a site relatively easily, it is generally impossible to confirm a species is absent. Unless a species has a 100 per cent chance of being detected on a single visit (i.e. it has a probability detection of 1) non-detection does not necessarily mean the species is absent (MacKenzie et al. 2002). Very few species are so conspicuous that they are always detected in each survey (MacKenzie et al. 2002).

A species' detectability is influenced by several factors (Tyre *et al.* 2003). Such factors include:

- the species in question – fauna species with large home ranges are especially likely to go undetected in an area, as at any given time they may be in another part of their range
- climatic conditions (e.g. temperature, rainfall)
- experience of the surveyor/s
- the survey methodology used.

An observed absence may be due to an observer failing to detect a species that is actually resident at the site, for example, a bird that was elsewhere in its home range at the time of the survey or failed to call during a point count (MacKenzie 2005). False absences have serious consequences for habitat modelling and monitoring studies as well as impact assessments. When fauna surveys are conducted for the purpose of impact assessment, false absences may result in inadequate conservation measures and an increased risk of local extinction (Wintle *et al.* 2005).

Hence, the SIS should be conservative when determining whether a species, population and/or community (including their habitat) are potentially present (i.e. precautionary approach).

5.2 Stratifying the site

When designing a field survey, the study area needs to be stratified (i.e. divide the area into relatively homogenous units – often referred to as 'environmental sampling units' or 'stratification units'). Stratified sampling provides a logical, objective and efficient method of undertaking surveys and ensures that the full range of potential habitats and vegetation types will be systematically sampled and mapped.

The vegetation map and assessment completed under Section 3 (above), and particularly the Vegetation Zones identified, may be suitable to serve as these 'environmental sampling units'. Consideration could also be given to how well these Vegetation Zones identify homogenous areas of habitat for target species, i.e., they may not identify rocky habitats or wetland / riparian habitats to the level of detail necessary.

Once the stratification units have been identified, they should be recorded on a survey map. Remote sensing such as aerial or satellite photograph interpretation coupled with ground-truthing will help better refine and determine the spatial vegetation patterns and habitat types across a study area.

5.3 Survey Design, and documentation of survey effort.

Once the site has been stratified, an adequate survey design (e.g. stratified random sampling for vegetation / flora) should be developed which adequately samples all stratification units and habitat types.

Survey technique(s) shall be described and a reference given, where available, outlining the survey technique employed.

Survey site(s) shall be identified on a map with a clear legend. The size, orientation and dimensions of quadrat or length of transect shall be clearly noted for each type of survey technique undertaken. Full AMG grid references for the survey site(s) shall be provided.

OEH survey proformas are to be used by field staff when applying a range of standard fauna survey techniques. Copies of standard proformas are included in Appendix 2 to these DGRs. Digital copies of these proformas can be requested from the nominated OEH contact officer. These proformas shall be used by field staff when undertaking fauna surveys and completed data sheets are to be included as an appendix to the SIS.

The time invested in each survey technique shall be summarised in the SIS, based on completed proformas, e.g. number of person hours / transect, duration of call playback, number of nights that traps are set.

It is not sufficient to aggregate all time spent on all survey techniques. Effort must be expressed separately for each survey technique that is applied.

Personnel details including name of surveyor(s), contact phone number, qualifications and experience must be included. The person who identified records (e.g. Anabat, hair tubes, scat analysis) shall also be identified in this manner.

Environmental conditions during the survey shall be noted from the commencement of each survey technique until its completion. These conditions must be documented in the SIS.

An assessment of the efficacy of each survey regime in detecting each species under the intensity utilised by the study is to be provided. The effect of the season and weather at the time of the field survey shall be considered with respect to the adequacy of survey results. An assessment will also be made of the adequacy of the survey and background information used to assess the likely area of use (home range) for each subject species, population or ecological community, and the areas providing habitat connectivity.

A full list of all flora and fauna species recorded during the course of surveys shall be included (such information is indicative of the habitat quality of the site). Completed Atlas of NSW Wildlife cards are to be provided for each threatened species record in any survey conducted for the purposes of the SIS. For confidentiality, these cards are not to be included in the SIS but rather shall accompany the SIS when supplied to the OEH.

5.4 Habitat assessment

A pre-cursor to the habitat assessment is the completion of the requirements for Vegetation Assessment, in accordance with Section 3 (above).

Habitat assessment is recommended for all sites and should be used to supplement surveying and survey design. In instances where intensive or species specific surveys have not been carried out due to either timing or seasonality constraints, habitat assessment may be used as a surrogate for intensive surveys. However, in this instance threatened species should be assumed present if their habitat requirements are met. Ensure all impact assessments include a thorough habitat assessment.

Undertaking a habitat assessment of the study area will assist with predicting the occurrence of threatened species in the study area and will guide the location of targeted surveys. A comprehensive habitat assessment should be conducted across the whole site, identifying key habitat features for both flora and fauna.

You should be familiar with the habitat requirements of each threatened species identified as possibly occurring in the study area. This information can be obtained from recovery plans, threatened species profiles and scientific literature. Threatened species profiles are available on the OEH website:

http://www.environment.nsw.gov.au/threatenedspecies/

The habitat assessment should include information on:

- landscape features in the study area (e.g. river banks, rocky outcrops, dry slopes, wetlands, undulating terrain);
- any other features that could provide habitat such as hollow-bearing trees or culverts; and
- the vegetation types present (such as OEH's BioMetric vegetation types and/or appropriate vegetation mapping).

It is important to record all areas of native and introduced vegetation, as even weeds can potentially provide habitat for threatened fauna. As part of the habitat assessment, you should look for:

- hollow-bearing trees, including dead stags
- bush rock and rocky outcrops
- natural burrows
- large trees with basal cavities
- logs
- wetlands, streams, rivers, dams and other water bodies
- nests and roosts
- wombat burrows
- dens as used by yellow-bellied gliders, squirrel gliders and brush-tailed phascogales
- yellow-bellied glider and squirrel glider sap feed trees
- distinctive scats (e.g. those of the spotted-tailed quoll or koala)
- latrine and den sites of the spotted-tailed quoll
- Allocasuarina spp.

- flying-fox camps
- Microchiropteran bat tree roosts
- Microchiropteran bat subterranean roosts (caves, culverts, tunnels and disused mineshafts)
- swift parrot and regent honeyeater feed or nest trees
- winter-flowering eucalypts
- mistletoes
- permanent soaks and seepages
- areas that can act as corridors for plant or animal species.

Another important factor to consider is the connectivity value of the site. This should have been assessed for Landscape Value in Section 3.4. If the proposal site forms an important corridor in the area, the development is likely to have an effect on threatened species in the region.

A geo-referenced map / aerial photograph (or equivalent), of the study area detailing key habitat features, including the vegetation types, must be included in the report.

5.5 Targeted fauna and flora survey

Where the presence of a threatened species cannot be assumed from habitat assessment, or where absence cannot be presumed, it will be necessary to undertake a targeted fauna and / or flora survey. Additional targeted surveying will also be required for threatened species that are dependant on specific vegetation types and/or habitats or require specific sampling because of seasonality (e.g. flowering season for some plants, warmer months for fauna etc.).

Requirements for survey for threatened species likely to be present on the subject site are included at Attachment A. These guidelines must be followed in the survey. Fauna sites are likely to be selected on the basis of vegetation change and specific habitat types present (e.g. hollow bearing trees, feed trees, rock outcrop, presence of water etc.).

6. RESULTS AND REPORTING

6.1 Survey results

6.1.1 Subject species survey results

The report should provide a full list of all flora and fauna recorded in the study area / subject site.

Subject species recorded in the study area shall be identified, and the vegetation community in which they were recorded noted. Information concerning all records of threatened species made during the survey is to be provided in an appendix to the SIS. This information is to be in a form consistent with *Atlas of NSW Wildlife* data recording cards and include information for all fields listed on these cards.

The limitations of survey techniques employed (including survey intensity, detectability of species, seasonality, weather conditions and adverse disturbance conditions) must be considered and discussed with respect to the results of the survey, and additional subject species considered to potentially occur in the study area identified. This assessment must be robust to external evaluation.

6.1.2 General species survey results

The SIS must provide details of all the vegetation communities (including disturbed and undisturbed / modified), habitat types, and all fauna and flora recorded on the subject site and study area in general.

A full list of the protected fauna and native plant species (as defined by the *National Parks and Wildlife Act 1974*) found during the course of surveys must be included. Such information is indicative of the habitat quality of the site. This list must indicate the significance of each species, whether the species is introduced, and the habitat in which each species was recorded.

6.2 Subject species habitat mapping

Areas identified as known or potential habitat in the study area are to be mapped on a geo-referenced map / aerial photograph (or equivalent) separately for each of the subject species. These maps should be at the same scale as previous maps where feasible, and are to include any point locality records of the relevant subject species recorded from the SIS survey in the study area. Note: Records obtained from the 'Atlas of NSW Wildlife' database can be used in determining likely habitat, but they are not to be schematically mapped in the SIS, as this is considered a breach of licence conditions for such records.

While in some circumstances the task of identifying potential habitat can be problematic, the SIS should provide the best expert estimate of the habitat of each threatened species, populations and ecological communities known or considered likely to occur in the study area. This is necessary in order to clearly support conclusions concerning the quantitative significance of habitat loss associated with the proposal. Information which can be used in preparing these maps includes records of threatened species in the local area, maps of vegetation communities and broad habitat types in the study area, information on the habitat requirements of threatened species and site-specific knowledge gained through field survey and inspection during preparation of the SIS.

6.3 General report structure

In summary, the report must include details on the following (but not be limited to):

- a description of the subject site, study area and its regional context; including a geo-referenced map / aerial photograph (or equivalent) indicating their location
- details of the survey methodology and design adopted, including:
    - the number and location of traps (e.g. cage, Elliott, hair sampling tubes etc.), call playback sites, diurnal searches, random meanders, quadrats and transects
    - the number of repetitions (Note: you will need to provide a justification if this differs from the recommendations in these guidelines)
    - details of all floristic plots and/or transects
    - details of the stratification
    - identification of the classification system used (e.g. Specht *et. al.* (1974), Walker & Hopkins (1998) [Note: the classification must have regard to both structural and floristic composition elements])
    - timing of surveying, climatic (weather) conditions and phases of the moon during survey
    - details of how the vegetation classification for the site was developed, including details and associated products (e.g. dendrograms / two-way tables) of any analyses used, if applicable
    - copies of any analyses used (e.g. PATN or other statistical files) and all field data sheets
    - geo-referenced maps / aerial photographs (or equivalent) showing the location of all survey points, quadrats and transects, and stratification units.
- detailed description of all vegetation communities / types (both undisturbed and disturbed) on the site and study area (and, if applicable, OEH's BioMetric vegetation types – in which case a step by step summary of how the site vegetation was matched with available BioMetric vegetation types), including a geo-referenced map / aerial photograph (or equivalent) showing their location. The descriptions should include: - a general description, characteristic features (e.g. lacks a mid-storey, restricted to a particular geomorphic / edaphic feature etc.), their distribution and size (e.g. hectares), their vegetation structure (including cover), their condition, key diagnostic species, relationship to other communities,

species richness and any significant species present (e.g. threatened species, Rare or Threatened Australian Plants (ROTAP: Briggs & Leigh 1996), regionally significant taxa)

- details of all habitat features / types should be included and mapped (where appropriate), such as frequency and location of stags, hollow bearing trees (including size), mature / old growth trees, culverts, rock shelters, rock outcrops, presence of feed tree / shrub / groundcover species (e.g. winter-flowering eucalypts, *Acacia* and *Banksia* trees, *Casuarina / Allocasuarina* and areas of native grasses], crevices, caves, drainage lines, soaks etc.
- if a BioBanking assessment is conducted for the development site and any offset sites then the proponent must provide:
    - copies of any BioBanking Credit Reports and BioBanking Agreement Credit Reports generated
    - copies of all field data sheets
    - copies of a checklist that includes the data and underlying assumptions used at every step of the BioBanking Credit Calculator
- a list of all flora and fauna detected on the study area / subject site during the surveys, including threatened species. All threatened species, populations and ecological communities must be clearly marked on geo-referenced map / aerial photograph (or equivalent)
- details of how the proposal will impact and affect known and potential threatened species, populations and ecological communities (including their habitat). This is likely to include a revised 5A assessment of significance
- details of the habitat assessment
- details of how the proposal may impact on corridors, connective links and fragmentation
- details of how the proposal will impact (both directly and indirectly) on adjacent and/or nearby OEH conservation estate and/or if applicable, other internationally / nationally important areas, (e.g. Ramsar wetlands, wetlands listed in the *Directory of Important Wetlands*, SEPP14 mapped wetlands and Forestry flora reserves)
- details of mitigation and offset / compensatory habitat measures
- names, qualifications and experience of all personnel involved in the field surveys, analysis of results and report writing
- paper copies of any maps of proposed biodiversity offset areas at A0 or A1 scale that clearly show the location and boundaries of any proposed offset area. These maps must be prepared by a registered surveyor and be proper survey plans that are acceptable to local Councils
- an assessment of how the project meets the principles of Ecologically Sustainable Development, as defined in section 6(2) of the *Protection of the Environment Administration Act 1991*
- a discussion of the likely social and economic consequences of granting or of not granting concurrence
- any other information outlined elsewhere in these guidelines, such as background and comparisons to previous studies (e.g. vegetation mapping reports), mitigation and offset measures etc. that should be included in the report.

6.4 Specific survey requirements

Appendix 1 details the specific survey requirements for the *subject species, populations or ecological communities* identified in Table 1 of these DGRs. These survey requirements can

determine the presence of *subject species, populations or ecological communities* known or likely to be in the *study area* and/or can provide contextual information on habitats to allow appropriate assessment of impacts at a broader scale. The flora and fauna survey of the *study area* must include the use of these survey methods.

You are advised that discussions between the consultant(s) engaged to prepare the SIS and OEH may be necessary in order to derive an appropriate survey regime for some of these requirements, and to confirm the survey regimes proposed for any additional *subject species, populations and ecological communities* derived by analysis as part of this SIS.

7 ASSESSMENT OF LIKELY IMPACTS ON THREATENED SPECIES, POPULATIONS

For all *subject species, populations*, the SIS shall describe the following:

a. the location, nature and extent of habitat removal or modification which will result from the action proposed;

b. the likely and potential impact of the removal of habitat. Particular attention shall be given to the loss of:

   i. habitat for Glossy Black Cockatoo

   ii. hollow-bearing trees utilised for breeding, roosting or denning by threatened fauna such as micro-chiropteran bats, small woodland birds, large forest owls, gang gang cockatoos, and glossy black cockatoos.

   Similarly, attention is to be given to the likelihood of and extent of loss of food resources and the impact this may have on the *subject species, populations or ecological communities*.

c. any indirect impacts of the proposal including:

   i. the fragmentation or isolation of *local populations* and/or *local occurrences*, and the increased distance required for the movement of individuals/genetic material between habitat patches,

   ii. indirect impacts of inundation and changes in flow regimes for downstream habitats including both riparian and terrestrial habitats

   iii. change in vegetation floristics and structure resulting from edge effects,

   iv. altered hydrology regimes (including increased runoff and raising or lowering of the water table),

   v. soil erosion and pollution,

   vi. disturbance to feeding or nesting/breeding of species,

   vii. trampling or other impacts due to increased use of the area by humans

   viii. habitat fragmentation and disruption of wildlife movement corridors and pollination mechanisms

   ix. altered light and noise regimes

   x. the likely contribution of the action proposed to the threatening processes already acting on populations of those subject species or populations and occurrences of subject ecological communities in the locality.

All of the above contextual information (which can be incorporated into Sections 5.1 - 5.5 below) will assist with the assessment of cumulative impacts on the *subject species, populations and ecological communities*.

7.1 Assessment of species likely to be affected

An assessment of which threatened species or populations known or likely to be present in the area are likely to be affected by the action [Section 110(2)(b)].

This requirement allows refinement of the list of *subject species or populations* (given the outcome of survey and analysis of likely impacts) in order to identify which threatened species or populations may be affected, and the nature of the impact.

The remaining requirements in this section (5.2 – 5.5) need only be addressed for those threatened species or populations that are likely to be affected by the proposal.

7.2 Discussion of local and regional abundance

An estimate for the local and regional abundance of those species or populations [Section 110 (2)(d)]

7.2.1 Discussion of other known local populations

A discussion of other known *local populations* in the *locality* shall be provided. The long-term security of other habitats shall be examined as part of this discussion. The relative significance of the *subject site* for the *subject species, populations and ecological communities* in the *locality* shall be discussed. It is essential that the SIS includes some surveys conducted beyond the *study area* to clarify the conservation significance of the *subject site* to the *subject species and populations*.

The need for off-site surveys to provide context to the anticipated impacts of the *proposal* may also be required for other threatened species recorded during the surveys of the *study area*.

7.2.2 Discussion of habitat utilisation

An estimate of the number of individuals of each *subject species* utilising the *study area* shall be provided as well as a description of how these individuals use the *study area* (e.g. residents, transients, adults, juveniles, nesting, foraging). A discussion of the significance of these individuals to the viability of the *subject species* in the *locality* shall be provided.

7.2.3 Description of vegetation

The vegetation present within the *study area* and the surface area covered by each vegetation community shall be mapped and described. Reference to the vegetation classification system used (e.g. Specht, Benson, Keith) and to the ecological communities determined as endangered by the NSW Scientific Committee shall be provided. Classification must have regard to both structural and floristic elements.

7.2.4 Discussion of corridors

Particular attention shall be given to identifying movement corridors for *subject species* within the *study area*. The impact of the proposal on these corridors and the resulting impact on the resident *subject species* shall be discussed.

7.3 Assessment of habitat

A full description of the type, location, size and condition of the habitat (including critical habitat) of those species, populations and ecological communities and details of the distribution and condition of similar habitats in the region [Section 110 (2)(f) and Section 110 (3)(c)]

7.3.1 Description of habitat values

Specific habitat features in the *study area* shall be described and quantified (e.g. frequency and location of stags, hollow bearing trees, culverts, rock shelters, rock outcrops, crevices, caves, drainage lines, soaks, area of ecological communities etc.), as well as the density of understorey vegetation and groundcover.

The condition of the habitat within the *study area* shall be discussed, including the prevalence of introduced species, species of weeds present and an estimate of the total weed cover as a percentage of each vegetation community, whether trampling or grazing is apparent, effects of erosion, prevalence of rubbish dumping, history of resource extraction or logging and proximity to roads. Details of the *study area's* fire history (e.g. frequency, time since last fire, intensity) and the source of fire history (e.g. observation, local records), shall be provided.

7.3.2 Distribution and condition of regional habitats

For the habitats of *subject species and populations* found in the study area, the SIS shall discuss the distribution and condition of similar habitats in the region. For the *subject ecological communities* found in the study area, the SIS shall discuss the distribution and condition of these ecological communities in the region. Regional information may be obtained from existing datasets and from other sources.

7.4 Discussion of conservation status

> *For each species or population likely to be affected, and for each ecological community present, details of its local, regional and State-wide conservation status,...[and]... its habitat requirements ... [Section 110(2)(c) and Section 110(3)(b)]*

Assessment shall include reference to the threatening processes that are generally accepted by the scientific community as affecting the *subject species, population or ecological community* and which are likely to be caused or exacerbated by the *proposal.* Assessment shall also include reference to any approved or draft recovery plans which may be relevant to the *proposal.* Up-to-date lists and copies of approved and draft recovery plans are available on the OEH website www.environment.nsw.gov.au by following the links to threatened species.

7.5 Description of feasible alternatives

> *A description of any feasible alternatives to the action that are likely to be of lesser effect and the reasons justifying the carrying out of the action in the manner proposed, having regard to the biophysical, economic and social considerations and the principles of ecologically sustainable development [Section 110(2)(h) and Section 110(3)(e)].*

In this instance, any documents prepared by other NSW government agencies which clearly outlines the decision making process which supports the current proposal along with adequate social and economic reason for not pursuing other viable alternatives, shall be provided to support this description.

8 ASSESSMENT OF LIKELY IMPACTS ON ECOLOGICAL COMMUNITIES (ENDANGERED AND CRITICALLY ENDANGERED)

Section 8 need only be addressed when ecological communities are likely to be affected.

Assessment of impacts must include the assessment of indirect impacts and those of associated activities, including, but not restricted to: installation and maintenance of utilities, access and egress routes; and changes in surface water flows. These actions or impacts may occur on or off the subject land.

Assessment of impacts must also include an assessment of impacts from the provision of fire protection zones. If, as part of the development, there will be a requirement to provide fuel free and/or fuel reduced zones in retained bushland, the impacts of this on any endangered and/or critically endangered ecological communities must be addressed as part of the impacts of the

overall proposal. Proponents should also consider recommendations in 'Planning for Bushfire Protection' (NSW Rural Fire Service 2006) and consider the use of perimeter roads as an option in providing fuel free zones and reducing impacts on retained bushland.

8.1 Assessment of ecological communities (both endangered and critically endangered) likely to be affected

A general description of the ecological community present in the area that is the subject of the action and in any area that is likely to be affected by the action (Section 110(3)(a)).

This must include reference to the ecological community as described by the NSW Scientific Committee, including maps of the extent and condition of the community with particular reference to those parts of the community that may only be represented by soil stored seed with no above ground components of the community present.

8.2 Discussion of conservation status

For each ecological community present, details of its local, regional and State-wide conservation status, the key threatening processes generally affecting it, its habitat requirements and any recovery plan or any threat abatement plan applying to it (Section 110(3)(b)).

An assessment of whether those ecological communities are adequately represented in conservation reserves (or other similarly protected areas) in the region (Section 110(3)(b1)).

An assessment of whether any of those ecological communities is at the limits of its known distribution (Section 110(3)(b2)).

Assessment should include reference to the threatening processes that are generally accepted by the scientific community as affecting the endangered and/or critically endangered ecological community and are likely to be caused or exacerbated by the proposal. The assessment should also include reference to any approved or draft recovery plans which may be relevant to the proposal.

8.2.1 Significance within a local context

An assessment of the community on the subject site in relation to other sites in the study area and in the locality. The tenure and long term security of other localities shall be examined as part of this discussion.

The relative significance of the subject site for the endangered and/or critically endangered ecological community shall be discussed. The assessment of the community should be considered in terms of the following features including, the size of the remnant, the quality of the habitat and the level of disturbance on this site in comparison to other sites in the locality.

8.2.2 Discussion of corridor values

The potential of the proposal to increase fragmentation of the community and increase edge effects.

If corridors that allow connectivity between localities of endangered and/or critically endangered ecological communities are present within the subject site, the impact of the proposal on these areas shall also be discussed.

8.2.3 Discussion of regional significance

The significance of the locality for the community from a regional perspective shall be noted and discussed.

8.2.4 Impacts on Ecological Communities in OEH Estate

This section only needs to be addressed when endangered and/or critically endangered ecological communities in OEH estate are likely to be either directly or indirectly impacted upon.

The SIS must assess the potential impacts on any endangered and/or critically endangered ecological communities which may likely be directly or indirectly impacted upon that reside with OEH estate.

OEH notes a number of conservation estates which may contain ecological communities in the vicinity (5 km radius) as outlined in Section 5.4.4.

8.3 Assessment of habitat

A full description of the type, location, size and condition of the habitat of the ecological community and details of the distribution and condition of similar habitats in the region (Section 110 (3)(c)).

8.3.1 Description of disturbance history

If the site shows signs of disturbance, details should be provided of the site's disturbance history and an assessment should be made of the ability of the ecological community to recover to a pre-disturbance condition.

8.3.2 Extent of habitat removal

The location, nature and extent of habitat removal or modification which may result from the proposed action including the cumulative loss of habitat from the study area (including all proposed DAs and those areas in the subject area already with development consent or identified for development) and the impacts of this on the viability of the endangered and/or critically endangered ecological community in the locality.

This shall include an assessment of the proportion of the ecological community to be affected by the proposal, in relation to the total extent of the ecological community, and the impact of this on the viability of the ecological community in the locality.

8.4 Description of feasible alternatives

A description of any feasible alternatives to the action that are likely to be of lesser effect and the reasons justifying the carrying out of the action in the manner proposed having regard to the biophysical, economic and social considerations and the principles of ecologically sustainable development (Section 110(3)(e)).

In this instance, any documents prepared by other NSW government agencies which clearly outlines the decision making process which supports the current proposal along with adequate social and economic reason for not pursuing other viable alternatives, shall be provided to support this description

9 IMPACT AMELIORATION

9.1 Description of ameliorative measures

A full description and justification of the measures proposed to mitigate any adverse effect of the action on the species, populations and ecological communities including a compilation (in a single section of the statement) of those measures [Section 110 (2)(i) and Section 110 (3)(f)].

9.1.1 Long term management strategies

Consideration shall be given to the information contained in approved and draft recovery plans or threat abatement plans for existing taxa, known or likely to occur in the study area, and whether any recommendation is applicable to the proposal.

The development of long-term management strategies shall be considered to protect areas within the study area which are of particular importance for the subject species, populations or ecological communities likely to be affected by the proposal. This may include proposals to restore or improve habitat on site where possible. If mitigation is to include rehabilitation of the site, then the rehabilitation strategy shall be detailed.

Any measures proposed to mitigate the effect of the proposal on local populations of threatened species and populations and/or local occurrences of ecological communities shall be described. The potential effectiveness of any such amelioration in maintaining a viable local population and/or local occurrence in the short, medium and long term shall be discussed (e.g. fauna underpasses, vegetation management).

9.1.2 Compensatory strategies

OEH notes that its 'offset provision' principles state that impacts must be avoided first by using prevention and mitigation measures (DECC 2007a). Where significant modification of the proposal to minimise impacts on threatened species, populations or endangered / critically endangered ecological communities is not possible then compensatory strategies should be considered. These should include offsite or local area proposals that contribute to long term conservation of affected threatened species, population or ecological communities. If on or off-site compensatory habitat is not considered appropriate, justification must be provided. OEH is of the opinion that where a proposal which involves the clearing of threatened species habitat (i.e. native vegetation) that can not be avoided or mitigated against, then appropriate offsets which compensate for the clearing of the habitat must be provided. In this instance the proposal should clearly indicate the scale / size of the impact so that appropriate comparisons can be made to any offset packages, including a specific breakdown of the vegetation / types being impacted upon and/or cleared. The proponent must provide proper survey plans of any biodiversity offsets with the SIS, as described in sections 2.2 and 4.5 above.

Compensatory benefits likely to result from such measures proposed for alternative sites are to be discussed and evaluated along with a discussion of mechanisms of how they might best occur.

The tenure of lands, land use and the future use of lands proposed to support compensatory habitat must be considered.

Justification for any area(s) proposed as compensatory habitat / offsets is to include an assessment of the threatened species / biodiversity values impacted on by the proposed works (i.e. those of the subject site) and a comparison of whether the proposed offset area(s) provides equivalent or greater values – 'improve or maintain important biodiversity values'.

To determine the adequate biodiversity offset required to compensate the loss of threatened species, populations, ecological communities and/or their habitat (e.g. vegetation communities) either one of the following methodologies are to be used:

- OEH 'offsetting principles', as outlined on the website: *Principles for the use of biodiversity offsets in NSW* (OEH website 2011 –: Appendix 1) can be used as general guide for

offsetting and compensatory habitat requirements (www.environment.nsw.gov.au/biocertification/offsets.htm)

- a biodiversity assessment using BioBanking Assessment Methodology under Biodiversity Banking and Offsets Scheme, as outlined in the '*BioBanking Assessment Methodology and Credit Calculator Operational Manual*' (OEH 2011). This would provide details of the required ecosystem and species (threatened) credits that need to be retired to offset the impacts of the development.

Although the BioBanking Assessment Methodology (BBAM) under the Biodiversity Banking and Offsets Scheme represents an alternative pathway to that of the SIS for Part 4 matter, OEH is of the opinion that a biodiversity assessment using process provides a transparent framework and a quantitative alternative to the principles-based approach (i.e. 'offset provision' principles as outlined in the biodiversity accreditation guideline - DECC 2011 – Appendix 1). OEH acknowledges that in this instance BBAM is a voluntary process and not a requirement under the SIS DGRs, but believes it provides a valuable insight and quantitative appraisal into what would be an acceptable offset package to compensate the likely impacts of the development.

Note: On 1 April 2012, the BioBanking Credit Calculator Version 2 has become the compulsory version of the tool to use for BioBanking assessments (see www.environment.nsw.gov.au/biobanking/calculator.htm for more details). The credit calculator is now web-based and no longer produces 'xml' files. Instead a copy of the assessment can be sent electronically to OEH by following the steps outlined in Appendix 2. The requirement of submitting background files for OEH to use in checking the BioBanking assessment still stands and is also explained in Appendix 2.

The following principles are relevant to areas without an existing biodiversity offsets program. Offsets will require the proponent to consider adequate conservation in perpetuity, appropriate management regimes (including other habitat enhancement or mitigation measures) and financial security with respect to ongoing management. OEH would typically consider suitable measures to ensure conservation in perpetuity, such as:

- The establishment of BioBanking sites with BioBanking agreements under the TSC Act
- The retirement of BioBanking credits (where appropriate credits are available)
- The dedication of land as a public reserve under the *National Parks and Wildlife Act 1974* (NPW Act)
- A Conservation Agreement in-perpetuity registered on title under s69A-KA of the NPW Act
- A Trust Agreement in-perpetuity registered on title under the *Nature Conservation Trust Act 2001*
- A Planning Agreement under s 93F (soon to be s116T) of the EP&A Act.

The principles do not apply where there is legislation defining requirements for biodiversity offsets (e.g. under the *Native Vegetation Act 2003*).

To appropriately manage any proposed compensatory offsets, any retained habitat enhancement features within the development footprint and/or impact mitigation measures (including proposed rehabilitation and/or monitoring programs), OEH would require that an appropriate Management Plan (such as vegetation or habitat) be developed as a key amelioration measure. These plans should be prepared prior to any potential approval of the development. Management Plans should clearly document how any retained vegetated areas or habitat features will be managed with respect to long-term conservation and viability, including clear details on how they will be funded. They should cover, but not be limited to, the following issues:

- weed management (both control and suppression) and monitoring

- management of retained native vegetation and habitat (including buffer zones)
- feral animal control
- fire management (including asset protection zones [APZs])
- public access (including restriction of, increased traffic, and associated impacts, such as increased refuse and pets)
- size and management of buffer zones
- minimisation of edge effects and fragmentation
- stormwater control and changes to hydrology (including stormwater / runoff control and sediment / erosion control measures)
- management of specific habitat enhancement measures (e.g. hollow / habitat trees, animal fencing to facilitate movement, artificial hollows and nest boxes etc.)
- fauna displacement and if appropriate translocation (including any licence requirements),
- proposed surveys, such as pre-extraction baseline, pre-clearance and rehabilitation surveys
- details of long-term monitoring (including proposed timing)
- details of any rehabilitation program, including details of timing (including proposed staging details), rehabilitation measures (including details of proposed revegetation and species mix), and post-rehabilitation monitoring
- measures to ensure conservation in perpetuity (e.g. transfer to OEH [NPWS] estate, conservation agreements or covenants)

funding details of long-term financial commitment to any proposed conservation measures, including any mechanisms to be implemented to achieve this

9.1.3 Ongoing monitoring

Any proposed pre-construction monitoring plans or on-going monitoring of the effectiveness of the mitigation measures shall be outlined in detail, including the objectives of the monitoring program, method of monitoring, reporting framework, duration and frequency. Generally, ameliorative strategies that have not been proved effective should be undertaken under experimental design conditions and appropriately monitored. Objectives of any monitoring plans are to include identifying any modifications needed to improve the effectiveness of ameliorative measures. These aspects should also be covered in any relevant management plans. Additionally a review of management plans should be undertaken at regular interviews (e.g. 5 years) to ensure adaptive management, where required, is undertaken.

9.1.4 Translocation

OEH does not consider that translocation of threatened species, populations and ecological communities is an appropriate ameliorative strategy for the purposes of considering impacts of a particular development/activity. It strongly supports the view that development proposals which may impact on significant local populations of *subject species and populations* or significant local occurrences of *subject ecological communities* as determined by the SIS should aim to:

i. minimise the impacts by considering all possible alternatives to the *proposal*, such that a significant impact is not likely; and

ii. manage the remaining habitat (if any) to ensure that the *local population* and/or *local occurrence* continues to exist in the long term.

The translocation of *subject species, populations and ecological communities* is only supported by OEH in specific conservation programs (e.g. recovery planning).

10. ASSESSMENT OF SIGNIFICANCE OF LIKELY EFFECT OF PROPOSED ACTION

An assessment of significance (s5A EP&A Act) is to be provided for each *subject species, population or ecological community* identified in the SIS, incorporating relevant information from sections 5.1 to 7 of the SIS. On the basis of these assessments, a conclusion is to be provided concerning whether, based on more detailed assessment through the SIS process and consideration of alternatives and/or ameliorative measures proposed in the SIS, the proposal is still considered likely to have a significant effect on threatened species, populations or ecological communities or their habitats.

The threatened species 'Assessment of significance' should be consistent with those procedures and assessment approaches contained within the OEH publication:

- "*Threatened Species Assessment Guidelines: The Assessment of Significance*" (DECC – August 2007b). This document is available from OEH's website: www.environment.nsw.gov.au/surveys/BiodiversitySurveyGuidelinesDraft.htm

11 ADDITIONAL INFORMATION

11.1 Qualifications and experience

A species impact statement must include details of the qualifications and experience in threatened species conservation of the person preparing the statement and of any other person who has conducted research or investigations relied on in preparing the statement [Section 110(4)]

11.2 Other approvals required for the development or activity

A list of any approvals that must be obtained under any other Act or law before the action may be lawfully carried out, including details of the conditions of any existing approvals that are relevant to the species or population or ecological community [Sections 110(2)(j) and 110(3)(g)]

In providing a list of other approvals the following shall be included:

- Where consent is required under Part 4 of the *Environmental Planning and Assessment Act 1979*, the name of the consent authority and the timing of the development application shall be included; or
- Where approval is required under Part 5 of the *Environmental Planning and Assessment Act 1979*, the name of the determining authority, the basis for the approval and when the approval is proposed to be obtained shall be included.
- Where consent or approval is required under any other Act, the name of the consent or determining authority and the timing of the development application, basis for the approval and when the approval is proposed to be obtained shall be included

Environment Protection and Biodiversity Conservation Act 1999

An action will require the approval of the Federal Minister for the Environment (in addition to any State or Local Government approval or determination) if that action will have, or is likely to have, a significant impact on a matter of national environmental significance. Threatened species and communities listed in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are considered to be a matter of national environmental significance.

Many of the species and ecological communities listed in the TSC Act (NSW) are also listed in the Commonwealth EPBC Act. Further information regarding the operation of the EPBC Act

(including Federally-listed threatened species and communities) may be obtained from the Department of the Environment (DoE) website www.environment.gov.au or by contacting DoE on 1800 803 722.

11.3 Licensing matters relating to flora and fauna surveys

Persons conducting flora and fauna surveys must have appropriate licences or approvals under relevant legislation. The relevant legislation and associated licences and approvals that may be required are listed below:

National Parks and Wildlife Act 1974:

- General Licence (Section 120) to harm or obtain protected fauna (this may include threatened fauna).
- Licence to pick protected native plants (Section 131).
- Scientific Licence (Section 132C) to authorise the carrying out of actions for scientific, educational or conservation purposes.

Threatened Species Conservation Act 1995:

- Licence to harm threatened animal species, and/or pick threatened plants and/or damage the habitat of a threatened species (Section 91).

Animal Research Act 1985:

- Animal Research Authority to undertake fauna surveys.

11.4 Reports of State-wide conservation status

Section 110(5) of the *Threatened Species Conservation Act 1995* has the effect of requiring OEH to provide available information regarding the State-wide conservation status of the subject species, populations or ecological communities, in order to satisfy ss.110(2)&(3) of the Act.

OEH has also produced a set of profiles for a number of threatened species, populations and ecological communities that are available on the OEH threatened species website (www.threatenedspecies.environment.nsw.gov.au). Some of these are relevant to the list of *subject species, populations and ecological communities* for this *proposal.*

Proponents and consultants should note that OEH has no further published information available to satisfy s.110(5) of the Act and that receipt and use of the above profiles can be taken to have satisfied the requirements of ss.110(2)&(3) in relation to the State-wide conservation status of the listed species, populations and ecological communities.

Appendix 1: Survey Requirements for Subject Species - DGRs for mechanically treated strategic fire advantage zone, Potato Point

Scientific Name	Common Name	Survey Requirements		Survey Season	Habitat
MAMMALS					
Potorous tridactylus *Isoodon obesulus*	Long-nosed Potoroo Southern Brown Bandicoot	V E	Surveys for these species may be conducted with "handiglaze" hair tubes spaced at 20-50m intervals. Hair tubes must be left in place for a minimum of 7 days. Alternatively the infrared cameras used for Southern Brown Bandicoots may also be used. Survey methods for the Southern Brown Bandicoot are still being clarified however the following methods may used for this species 1. The area should be surveyed for diggings and the amount and size of digging should be noted. 2. Digital Infra-red Cameras are considered to be the most effective and cost-efficient technique. Bait stations are set up with cameras mounted to them and then left in situ for 2 weeks. Approximately three bait stations each with a camera would suffice for the site. Cameras cost about $600-$700 Bait should consist of a mixture of peanut butter, honey and rolled oats, alternatively black truffle may be used in some bait stations 3. Alternatively, a program of small cage trapping could be employed, using at least 25 cage traps set over at least 4 nights, to provide coverage of the areas required for targeted survey. The Environmental consultant should discuss the appropriate survey methods with OEH prior to undertaking the survey.	All year	Forest, woodland, coastal banksia scrub, heath.

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
Cercartetus nanus	Eastern Pygmy Possum	Surveys for this species should be conducted with a combination of pitfall and live-capture e.g., "Elliot", "Sherman" or "Longworth" traps. Pitfall trapping should be conducted with buckets or sections of poly pipe at least 40 cm deep set in clusters of three with each pit/trap in a cluster being approximately 5 m apart. These trap clusters should be spaced at 50 m intervals along transects at least 200 m in length (i.e 15 pitfalls per 200 m). Pitfall trapping must be conducted for a minimum of two (but preferably three) separate sessions during different seasons of 5 consecutive nights. Pitfall traps can be combined with live-capture traps spaced at 10-20m intervals along transects provided the traps are set very sensitively and/or animals are prevented from entering the trap under the trigger plate. An improved rate of capture success can be achieved by positioning traps on the branches or trunks of flowering *Banksia* if these occur on the subject site. Alternatively the use of digital infra red cameras may also be used to detect this species. Survey should be undertaken at a rate of 10 cameras at 10-20m spacing with alternating horizontal and vertical mounting, per 100ha of habitat. Cameras should be in place (and functioning) for a minimum of 14 days. A further 5 tree mounted cameras per 100ha targeting key resources (i.e. habitat trees, flowering banksias etc.). Attractants or baits should be used with the cameras. Appropriate cameras techniques are important please contact OEH Queanbeyan to obtain a copy of the manual for the use of cameras in wildlife surveys. The status of the Eastern Pygmy Possum in the region is poorly known. If this species is found on the subject site, then additional surveys in the locality must be undertaken to determine the significance of the population on the subject site.	September to May inclusive. Surveying in and around populations of *Banskia* during the flowering period is advised.	Forest, woodland, coastal banksia scrub, heath.

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
Sminthopsis leucopus	White-footed Dunnart	Surveys for these species must be conducted with pitfall traps. Pitfall trapping should be conducted with buckets or sections of poly pipe at least 40 cm deep set in clusters of three with each pit/trap in a cluster being approximately 5 m apart. These trap clusters should be spaced at 50 m intervals along transects at least 200 m in length (i.e 15 pitfalls per 200 m). Pitfall trapping must be conducted for a minimum of two (but preferably three) separate sessions of 5 consecutive nights. This can be combined with live-capture e.g. "Elliott" traps provided they are set very sensitively and/or animals are prevented from entering the trap under the trigger plate. Capture rates for this species in "Elliott" traps is generally low. An alternative may be type A "Sherman" traps (very small gap between the door and trigger plate) or "Longworth" traps. The status of the White-footed Dunnart in the region is poorly known. If either of these species is found on the subject site, then additional surveys in the locality must be undertaken to determine the significance of the population on the subject site.	September to April inclusive.	Forest, woodland, coastal banksia scrub, heath.
Petaurus australis	Yellow-bellied Glider	Map the location of den sites and feed trees within and adjacent to the study area. All trees to be removed or isolated by the development must be assessed to determine if they are being used as den or feed trees. Map the location and size of the areas occupied by Yellow-bellied Glider family groups in the locality. Surveys must consist of stag watching, spotlighting, call play-back and habitat assessment. Spotlighting and call play-back surveys must be undertaken on foot. At each call play-back site, the call of the Yellow-bellied Glider should be played through a megaphone for 5 minutes, followed by at least 10 minutes of listening. An assessment of potential links between habitat on the subject site and habitats in the locality must be conducted particularly identifying routes used by the resident Yellow-bellied Gliders within and adjacent to the subject site. Surveys for yellow bellied gliders are to be undertaken over different seasons to identify family groups and home ranges. Call playback for YBG is not to be undertaken during the same period as call back for large forest owls.	All year	Eucalypt forest and woodland. Feed trees are characterised by 'v'-shaped scars on the trunks and branches where gliders have incised the surface to extract sap.
Dasyurus maculatus	Spotted-tailed Quoll	Surveys using camera traps should be used to detect this species. Due to the low densities at which Spot-tailed Quolls occur, and their large area requirements, surveys must be conducted at a broad-scale in order to detect them; an area	Breeding season May - August when activity and movement peaks.	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
		of 1,000 ha may only support one or two resident female quolls and form part of a larger area used by several males. Surveys should consist of a minimum of 5 widely spaced cameras (e.g. 500 m apart) deployed within 100 ha sampling units for at least three weeks. Cameras should be set for 24 hour operation as quolls may be active during the day as well as at night. It is also recommended that surveys aim to cover as many 100 ha sites as possible within the designated survey area (e.g. 40 - 50 % of the 100 ha sites present) to maximise the likelihood of detecting this wide-ranging thinly distributed species. Appropriate meat bait (chicken frame or peanut butter oats and tuna in a bait holder) should be fixed 1-2 m in front of the camera. Cameras should be programmed so when triggered, three photographs are taken one second apart with no minimum time delay between triggers. Monochromatic images taken at night should use an infrared flash. Searching for scats can also be used a part of the survey effort where there suitable sites (e.g. rocky habitats, large fallen logs, tree stumps) which can be targeted for searching. When fresh Spotted-tailed Quoll scats have a strong and distinctive odour, and when deposited in a latrine, can be readily identified. Scats should be photographed and latrine's GPS coordinates recorded.		sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber and may raid possum and glider dens and prey on roosting birds. Use 'latrine sites', often on flat rocks among boulder fields and rocky cliff-faces; these may be visited by a number of individuals; latrine sites can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals.
Minopterus schreibersii oceanensis	Eastern Bent-wing Bat	Surveys using bat detectors and should aim to identify important foraging habitat in the study area and the locality. The species is a seasonal migrant and OEH can provide further advice on the location and timing of use of caves known to be inhabited by this species for breeding and roosting.	Spring, Summer, Autumn	Forage in forests and woodlands. Roost in caves or rock cavities.
Mormopterus norfolkensis	Eastern Freetail-bat	Surveys using bat detectors and stag watching should aim to identify the number and location of roosts and identify important foraging habitat in the study area and the locality. If required, OEH can provide further advice on bat survey techniques to acquire this information.	Spring, Summer, Autumn	Forage in forests and woodlands. Roost in tree hollows.
Falsistrellis tasmaniensis	Eastern False pipistrelle			Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy.
Saccolaimus flaviventris	Yellow Bellied Sheathtailed bat			Roosts singly or in groups of up to six, in tree hollows and buildings Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Breeding has been recorded

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
				from December to mid-March.
Chalinolobus nanus	Large-eared Pied bat			Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (Hirundo ariel), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. Likely to hibernate through the coolest months. It is uncertain whether mating occurs early in winter or in spring.
Scoteanax rueppellii	Greater Broad nosed bat			Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Roosts in hollow Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species.
Kerivoula papuensis	*Golden Tipped Bat*			Found in rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, *Casuarina*-dominated riparian forest and coastal *Melaleuca* forests. Roost mainly in abandoned hanging Yellow-throated Scrubwren and Brown

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
				Gerygone nests, also in tree hollows, dense foliage and epiphytes; located in rainforest gullies on small first- and second-order streams. Will fly up to two kilometres from roosts to forage inforest and sclerophyll forest on mid and upper-es. ecialist feeder on small web-building spiders.
Myotis adversus	Large-footed Myotis			Forage over streams and pools. Roost close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
BIRDS				
Calyptorhynchus lathami	Glossy Black Cockatoo	Diurnal bird surveys across the study area for breeding activity in woodland/forest with hollow-bearing trees. Nesting surveys involve listening for birds returning to nests and stagwatching and must be undertaken from 1 to 3 hours prior to dusk until dusk. Areas/groups of suitable nesting trees (with hollows 15 cm in diameter or larger) are targeted initially and then narrowed down by more targeted approaches should the species be recorded. Waterbodies (dams, creeks, pools, puddles) on the subject site can also be targeted in the first few hours of after sunrise and the last three hours before sunset, as birds drink from these waterbodies. With careful observation, their movements to nests and roosts can then be tracked after their departure from drinking. Diurnal bird surveys across the study area in vegetation with *Allocasuarina littoralis* understorey for foraging activity (or signs of foraging from chewed Allocasuarina cones). Map foraging habitat, including locations with foraging sign, on subject site and in the locality. Identify and map all hollow-bearing trees with hollows of 15 cm diameter or larger (potential nest trees) on the subject site and	Breeding activity - March to May. Non-breeding and foraging habitat surveys - all year	Nest in large hollow-bearing trees (dead and alive) with hollows 15 cm in diameter or larger in forest and woodland. Forage in forest, woodland or heath with *Allocasuarina littoralis*

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
		estimate the availability of hollow-bearing trees in the locality. Target survey potential nests during known breeding season of species to determine any parts of the site need to be excluded from development ie nest trees and appropriate vegetated buffers of hollow bearing trees		
Callocephalon fimbriatum	Gang-gang Cockatoo	Diurnal bird surveys across the study area. Nesting surveys involve listening for birds returning to nests and stagwatching and must be undertaken from 1 to 3 hours prior to dusk until dusk. Areas/groups of suitable nesting trees (with hollows of 10 cm diameter or larger) are targeted initially and then narrowed down by more targeted approaches should the species be recorded. Identify and map all hollow-bearing trees with hollows of 10 cm diameter or larger (potential nest trees) on the subject site and estimate the availability of hollow-bearing trees in the locality. Target the survey to potential nests during known breeding season of species to determine any parts of the site which need to be excluded from development ie nest trees and appropriate vegetated buffers of hollow bearing trees	Breeding surveys in Oct-Jan. Non-breeding foraging habitat surveys all year	Eucalypt forest and woodland.
Ninox connivens	Barking Owl	Nocturnal call playback (1 site per 100 ha) with an initial listening period of 10 min then play the call of each subject species separated by at least a 2 min listening period, then finish with a 10 minute listening period. Identify and map all hollow-bearing trees with hollows of 20 cm diameter or larger (potential nest trees) on the subject site and estimate the availability of hollow-bearing trees in the locality. Target the survey to potential nests during known breeding season of species to determine any parts of the site which need to be excluded from development ie nest trees and appropriate vegetated buffers of hollow bearing trees. Nesting surveys involve listening for birds leaving nests and stagwatching and must be undertaken from sunset for a period of at least 1.5 hours on each occassion. Areas/groups of suitable nesting trees (with hollows of 20 cm diameter or larger) are targeted initially and then narrowed down by more targeted approaches should the species be recorded.	All year	Eucalypt forest and woodland.
Ninox strenua	Powerful Owl	Nocturnal call playback is intermittent with short calls and short listening periods, with long wait periods afterwards as Powerfuls Owls are reticent to respond (e.g. one hour later. I	Call playback from March to June. Nesting starts in July.	Eucalypt forest and woodland. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
		site per vegetation stratification unit . Identify and map all hollow-bearing trees (potential nest trees) on the subject site and estimate the availability of hollow-bearing trees in the locality. Target the survey to potential nests (trees with hollows of 45 cm diameter or larger) during known breeding season of species to determine any parts of the site which need to be excluded from development ie nest trees and appropriate vegetated buffers of hollow bearing trees. Nesting surveys involve listening for birds leaving nests and stagwatching and must be undertaken from sunset for a period of at least 1.5 hours on each occasion. Areas/groups of suitable nesting trees (with hollows of 45 cm diameter or larger) are targeted initially and then narrowed down by more targeted approaches should the species be recorded. Drainage lines should also be searched for evidence of 'white-wash' indicating roost sites. Roost sites detected during this period may indicate nearby breeding habitat (large trees with large hollows often close to drainage lines) that should be retained and buffered from disturbance. Searches for pellets must be conducted at any roost or nest tree that is located. These are to be analysed to identify key prey items. This information should be used to identify strategies to protect prey species on the site. Opportunistic surveys should be conducted in the locality given the large home range of the species.	No call playback when nesting starts.	particular preference for timbered watercourses. Nests are generally located in trees along or near watercourses, in a fork or on large horizontal limbs.
Tyto novaehollandiae	Masked Owl	Nocturnal call playback (1 site per within each vegetation stratification) with an initial listening period of 10 min then play the call of each subject species separated by at least a 2 min listening period, then finish with a 10 minute listening period. Identify and map all hollow-bearing trees (potential nest trees) on the subject site and estimate the availability of hollow-bearing trees with hollow of 40 cm diameter or larger in the locality. Target the survey to potential nests (tree with hollows of 40 cm diameter or larger) during known breeding season of species to determine any parts of the site which need to be excluded from development ie nest trees and appropriate vegetated buffers of hollow bearing trees. Nesting surveys involve listening for birds leaving nests and stagwatching and must be undertaken from sunset for a period of at least 1.5 hours on each occassion. Areas/groups of suitable nesting trees are	June to September for breeding habitat surveys	Eucalypt forest and woodland. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. Nests are generally located in trees along or near watercourses, in a fork or on large horizontal limbs.

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
		targeted initially and then narrowed down by more targeted approaches should the species be recorded. Drainage lines should also be searched for evidence of 'white-wash' indicating roost sites. Roost sites detected during this period may indicate nearby breeding habitat (large trees with large hollows often close to drainage lines) that should be retained and buffered from disturbance. Searches for pellets must be conducted at any roost or nest tree that is located. These are to be analysed to identify key prey items. This information should be used to identify strategies to protect prey species on the site. Opportunistic surveys should be conducted in the locality given the large home range of the species.		
Tyto tenebricosa	Sooty Owl	Nocturnal call playback (1 site per 100 ha) with an initial listening period of 10 min then play the call of each subject species separated by at least a 2 min listening period, then finish with a 10 minute listening period. Identify and map all hollow-bearing trees with hollows 30 cm in diameter or larger (potential nest trees) on the subject site and estimate the availability of hollow-bearing trees in the locality. Target the survey to potential nests (trees with hollows of 30 cm diameter or larger) during known breeding season of species to determine any parts of the site which need to be excluded from development ie nest trees and appropriate vegetated buffers of hollow bearing trees. Nesting surveys involve listening for birds leaving nests and stagwatching and must be undertaken from sunset for a period of at least 1.5 hours on each occasion. Areas/groups of suitable nesting trees are targeted initially and then narrowed down by more targeted approaches should the species be recorded. Drainage lines should also be searched for evidence of 'white-wash' indicating roost sites. Roost sites detected during this period may indicate nearby breeding habitat (large trees with large hollows often close to drainage lines) that should be retained and buffered from disturbance. Searches for pellets must be conducted at any roost or nest tree that is located. These are to be analysed to identify key prey items. This information should be used to identify strategies to protect prey species on the site. Opportunistic surveys should be conducted in the locality	June to September for breeding habitat surveys	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
		given the large home range of the species.		
Lophoictinia isura	Square-tailed Kite	A small site less than < 2 ha a survey should be conducted for a 10 min point counts with a radius of 50 m, a site that is between 2 - 100 ha, a 2 ha 20 min survey should be conducted for every 10 ha (*Barret et al. 2003*), a long linear transect with 10 min point counts for a radius of 50 m every 500 m are for remnants less than 100m wide. Opportunistic surveys should be conducted in the locality given the large home range of the species.	July to February	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. Nests are generally located in trees along or near watercourses, in a fork or on large horizontal limbs.
Hieraaetus morphnoides	Little Eagle	For a small site (less than < 2 ha) a survey should be conducted for 10 minutes at point locations with a radius of 50 m, a site that is between 2 - 100 ha, a 2 ha 20 min survey should be conducted for every 10 ha (*Barrett et al. 2003*),..	All year (breeding in spring and summer)	Occupies open eucalypt forest, woodland or open woodland and riparian forest
Glossopsitta pusilla	Little Lorikeet		All year (breeding June to December)	Eucalypt forests and woodlands
Anthochaera phrygia	Regent Honeyeater		All year (breeding Sep-Jan)	Eucalypt forest and woodland, riparian Gallery Forest
Epthianura albifrons	White-fronted Chat		All year (breeding Jul – Dec)	Saltmarshes, wetlands, open grassy areas
Daphoenositta chrysoptera	Varied Sittella		All year (breeding Aug-Feb)	Eucalypt forest and woodland
Chthonicola sagittata	Speckled Warbler		All year, though is shy and cryptic	Range of *Eucalyptus* communities with a grassy understorey. Rarely observed on the coast.
Petroica phoenicea	*Pink Robin*		Autumn and winter in non-breeding season	Inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies. Breeds between October and January and can produce two clutches in a season.
Petroica boodang	Scarlet Robin		Autumn and winter in non-breeding season	Scarlet Robin lives in dry eucalypt forests and dlands. The understorey is usually open and sy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin pairs defend a breeding territory and mainly breed between the months of July and January; they may raise

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
				two or three broods in each season.
Petroica phoenicea	Flame Robin		Autumn and winter in non-breeding season	
Pachycephala olivacea	Olive Whislter		Autumn and winter in non-breeding season	Mostly inhabit wet forests above about 500m. During the winter months they may move to lower altitudes. Forage in trees and shrubs and on the ground, feeding on berries and insects. Make nests of twigs and grass in low forks of shrubs. Lay two or three eggs between September and January
Calamanthus fuliginosus	Striated Fieldwren		August-December	Nests on ground under bushes and tussocks and forages in undergrowth and on ground.

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
FLORA				
Persicaria elatior	Tall Knotweed	A random meander (of one person hour per 10 ha) through suitable habitat should detect this species if present. All species in this habitat can be searched simultaneously.		Damp areas beside streams.
Galium australe	Tangled Bedstraw	This species can only be satisfactorily surveyed when it is flowering or fruiting. Systematic surveys using evenly spaced transects located about 10 m apart must be undertaken through all areas of suitable habitat	December to February	In NSW Tangled Bedstraw has been found in moist gullies of tall forest, *Eucalyptus tereticornis* forest, coastal Banksia shrubland, and *Allocasuarina nana* heathland. In other States the species is found in a range of near-coastal habitats, including sand dunes, sand spits, shrubland and woodland.
Thesium australe	Austral Toadflax	Transects and/or quadrats in suitable habitat combined with random meander surveys.	All year	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*)

Endangered Ecological Communities				
Survey requirements				
Swamp Oak flood Plain forest of the NSW North Coast, Sydney Basin and South East corner Bioregion		Surveys shall identify the extent and condition of this ecological community in the subject site, study area and locality. This shall involve the use of vegetation surveys in the subject site and the study area. Surveys can be undertaken at any time of the year under varied seasonal conditions.		This community is associated with the coastal floodplains of NSW. It has a dense to sparse tree layer in which *Casuarina glauca* (swamp oak) is the dominant species northwards from Bermagui. Other trees including *Acmena smithii* (lilly pilly), *Glochidion* spp. (cheese trees) and *Melaleuca* spp. (paperbarks) may be present as subordinate species, and are found most frequently in stands of the community northwards from Gosford. Tree diversity decreases with latitude, and *Melaleuca ericifolia* is the only abundant tree in this community south of Bermagui.
Bangalay sand forest in the Sydney Basin and South East Corner bioregions		Surveys shall identify the extent and condition of this ecological community in the subject site, study area and locality. This shall involve the use of vegetation surveys in the subject site and the study area Surveys can be undertaken at any time of the year under varied seasonal conditions.	All Year	Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions typically has a dense to open tree canopy, approximately 5 - 20 m tall, depending on exposure and disturbance history. The most common tree species include *Eucalyptus botryoides* (Bangalay) and *Banksia integrifolia* subsp. *integrifolia* (Coast Banksia), while *Eucalyptus pilularis* (Blackbutt) and *Acmena smithii* (Lilly Pilly) may occur in more sheltered situations, and *Casuarina glauca* (Swamp Oak) may occur on dunes exposed to salt-bearing sea breezes or where Bangalay Sand Forest adjoins Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions, as listed under the Threatened Species Conservation Act 1995

Appendix 2: Examples of suitable survey pro-formas

DIURNAL HERPETOFAUNA CENSUS SURVEY PROFORMA

Survey Details

Date of survey _____

Name of surveyor _____ Contact number _____

Number of surveyors _____ _____

Total effort expressed in person-hours _____

Total effort expressed in number of rocks/logs rolled _____

Location Details

Location (including basic habitat) description _____

_____

_____

_____

Map number _____ Map name _____

Type of survey, e.g. transect or quadrat _____ AMG Zone _____

Active or passive search _____ Size of survey area (ha) _____

Survey area Eastings (6 digits) _____ Northings (7 digits) _____

Eastings (6 digits) _____ Northings (7 digit) _____

Start time (24hr) _____ End time (24 hr) _____

Weather Details

At start of survey, record: Cloud cover* _____

Wind direction and speed* _____ Rain* _____

Temperature (°C) _____ Moon* _____

At end of survey, record: _____

Temperature (°C) _____

Comments _____

_____

Appendix 2: Examples of suitable survey pro-formas

Species name (Scientific/Common)	Ob. type*	MH type*	Grid reference (full AMGs i.e. Eastings and Northings)	Accuracy

* See Appendix 3: Standard reporting codes

Appendix 2: Examples of suitable survey pro-formas

DIURNAL BIRD CENSUS SURVEY PROFORMA

Survey Details

Name of surveyor _____ Contact number _____

Number of surveyors _____ Date of survey _____

Total effort expressed in person hours _____ Number of hectares covered or transect or point dimensions _____

Location Details

Location description _____

Map number _____ Map name _____

Full AMG reference(s) for survey site or transect AMG Zone _____

Start details _____ Finish details _____

Easting (6 digits) _____ Easting (6 digits) _____

Northing (7 digits) _____ Northing (7 digits) _____

Start time (24hr) _____ End time (24 hr) _____

Weather Details

At start of survey, record: Cloud cover* _____

Wind direction and speed* _____ Rain* _____

Temperature (°C) _____ Moon* _____

At end of survey record: _____

Temperature (°C) _____

Comments _____

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy

* See Appendix 3: Standard reporting codes

Appendix 2:Examples of suitable survey pro-formas

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy

* See Appendix 3: Standard reporting codes

Appendix 2: Examples of suitable survey pro-formas

DIURNAL HOLLOW-BEARING TREE CENSUS SURVEY PROFORMA

Survey Details

Date of survey _____

Name of surveyor _____ Contact number _____

Number of surveyors _____ _____

Total effort expressed in person-hours _____

Location Details

Location (including basic habitat) description _____

_____

_____

_____

Map number _____ Map name _____

Type of survey, e.g. transect or quadrat _____ AMG Zone _____

_____ Size of survey area (ha) _____

Survey area Eastings (6 digits) _____ Northings (7 digits) _____

Eastings (6 digits) _____ Northings (7 digit) _____

Start time (24hr) End time (24 hr) _____

Appendix 2: Examples of suitable survey pro-formas

Tree No.	Species (Scientific Name)	Number, sizes and types of hollows *	Grid reference (full AMGs i.e. Eastings and Northings)	Accuracy

* See Appendix 3: Standard reporting codes

Appendix 2: Examples of suitable survey pro-formas

DIURNAL TERMITE MOUND CENSUS SURVEY PROFORMA

Survey Details

Date of survey _____

Name of surveyor _____ Contact number _____

Number of surveyors _____ _____

Total effort expressed in person-hours _____

Location Details

Location (including basic habitat) description _____

_____

_____

_____

Map number _____ Map name _____

Type of survey, e.g. transect or quadrat _____ AMG Zone _____

_____ Size of survey area (ha) _____

Survey area
Eastings (6 digits) _____ Northings (7 digits) _____

Eastings (6 digits) _____ Northings (7 digit) _____

Start time (24hr) End time (24 hr)

Termite mound no.	Grid reference (full AMGs)	Accuracy

Appendix 2: **Examples of suitable survey pro-formas**

Appendix 2: Examples of suitable survey pro-formas

VERTEBRATE FAUNA SURVEY OPPORTUNISTIC RECORDS

Survey name _____ Fauna surveyors _____

Surveyor's contact details _____ Call analysis _____

AGM Zone _____

Date	Time	Site #	Easting (full 6 digits)	Northing (full 7 digits)	Species Name	No Ind	Ob. type*	MH* type*	Notes/Field No**

* See over ** Include initials of observer and any other information that will help relocation of site.

Appendix 3: Standard Reporting Codes - DGRs for Dunns Creek Road SIS

Cloud cover. Record cloud cover in eights of sky.

Moon. Record using the following codes. 0=None, 1=1/4 moon, 2=1/2 moon, 3=3/4 moon, 4=full moon.

Wind direction and speed. Record wind direction to nearest cardinal point. Record wind speed using the following codes. 0=calm 1= Light, leaves rustle 2= Moderate, branches move 3=Strong, tops of trees move

Rain. Record using the following codes. 0=none, 1=drizzle - light, 2=drizzle - heavy 3=heavy rain

Sizes of hollows. Record using the following codes. S=Small (1-5cm diameter), M=Medium (5-15cm diameter), L=Large (greater than 15cm diameter).

Types of hollows. Record using the following codes. T=Trunk hollow, B=Branch hollow

Observation type

Use the following codes:

O	Observed (sighted)	R	Road kill	F	Tracks, scratching
W	Heard call	D	Dog kill	Z	In raptor/owl pellet
X	In scat	C	Cat kill	M	Miscellaneous
P	Scat	V	Fox kill	E	Nest or roost
T	Trapped or netted	K	Dead	B	Burnt
H	Hair or feathers	S	Shot	Y	Bones or teeth
A	Stranded/beached	I	Fossil/subfossil	N	Not located

MH (microhabitat) type

Use the following codes:

AC	Flying above canopy	IB	In burrow	OB	On (beach) sand
BR	In/on bridge	IC	In cave	OL	On log
BU	In building	IG	In grass	OR	On rock
CK	Crevice in rock	IH	In tree hollow	OW	Over water
CL	Crevice in log	IL	In litter	RD	On road
DA	Farm/fire dam	IR	In reeds	TK	On trunk
DT	In dead tree (stag)	IS	In soil	UB	Under bark
EW	Edge of water	IT	In (live) tree	UC	Upper canopy
FC	In/on post or stump	IW	In water	UG	Undergrowth
FL	Flying within canopy	LC	Lower canopy	UL	Under log
GR	On ground	LS	Low shrub	UR	Under rock
HS	High shrub	MC	Mid canopy	UT	Under iron
				WH	Waterhole

APPENDIX B – FLORA SPECIES RECORDED IN THE STUDY AREA

Key to Flora List

Cover/abundance scores are based on a modified Braun-Blanquet scale:

1 = few individuals, <5 percent cover

2 = numerous individuals, >5 percent cover

3 = 5-25 percent cover

4 = 50-75 percent cover

6 = 75-100 percent cover

Scientific Name	Common Name	SR649	SR642 (modified)	Ecotonal (SR642, SR649, SR512)
NATIVES				
Acacia implexa	Hickory Wattle		2	
Acacia irrorata	Green Wattle		1	
Acacia longifolia			2	
Adiantum aethiopicum	Common Maidenhair	1		
Allocasuarina littoralis	Black She-Oak		3	1
Amyema congener subsp. congener	A Mistletoe	1		
Aristida vagans	Threeawn Speargrass		2	
Austrostipa rudis			1	
Banksia integrifolia	Coast Banksia	1	2	1
Banksia serrata	Old-man Banksia		1	
Baumea juncea	Bare Twig-rush	3		
Billardiera scandens	Hairy Apple Berry		1	
Bossiaea prostrata			1	
Breynia oblongifolia	Coffee Bush	1		
Carex longebrachiata		1		2
Casuarina glauca	Swamp Oak	4		3
Centella asiatica	Indian Pennywort	2	2	
Cheilanthes sieberi	Rock Fern		2	
Clematis aristata	Old Man's Beard	1		
Corymbia maculata	Spotted Gum		2	2
Cynodon dactylon	Common Couch		2	

Scientific Name	Common Name	SR649	SR642 (modified)	Ecotonal (SR642, SR649, SR512)
Daucus glochidiatus	Native Carrot		1	
Dichondra repens	Kidney Weed	2	2	1
Echinopogon caespitosus	Bushy Hedgehog-grass		2	
Elaeocarpus reticulatus	Blueberry Ash		1	
Entolasia marginata	Bordered Panic	3	1	2
Entolasia stricta	Wiry Panic		2	
Eragrostis leptostachya	Paddock Lovegrass		2	
Eucalyptus botryoides	Bangalay	1	1	1
Eucalyptus longifolia	Woollybutt		1	
Eucalyptus paniculata	Grey Ironbark		2	
Eustrephus latifolius	Wombat Berry			1
Gahnia clarkei	Tall Saw-sedge	2		
Gahnia melanocarpa	Black Fruit Saw-sedge	1		
Gahnia radula		2	3	
Glycine clandestina	Twining glycine	2		
Glycine tabacina	Variable Glycine	1	2	2
Gonocarpus tetragynus	Poverty Raspwort	1		
Gonocarpus teucrioides	Germander Raspwort		1	
Hakea dactyloides	Finger Hakea		1	
Hakea salicifolia subsp. salicifolia			1	
Hardenbergia violacea	False Sarsaparilla		2	
Hibbertia aspera	Rough Guinea Flower		2	1
Hibbertia obtusifolia	Hoary Guinea Flower		2	
Hibbertia scandens	Climbing Guinea Flower		1	1
Hydrocotyle laxiflora	Stinking Pennywort		1	
Hypericum gramineum	Small St John's Wort		1	
Hypolepis muelleri	Harsh Ground Fern	2		
Imperata cylindrica	Blady Grass	2	3	2
Juncus kraussii subsp. australiensis	Sea Rush	2 LM		
Kennedia rubicunda	Dusky Coral Pea		1	
Lepidosperma laterale	Variable Sword-sedge		1	

Scientific Name	Common Name	SR649	SR642 (modified)	Ecotonal (SR642, SR649, SR512)
Leptospermum polygalifolium	Tantoon	1		
Leucopogon juniperinus	Prickly Beard-heath		1	
Lobelia anceps		2		
Lomandra longifolia	Spiny-headed Mat-rush	2	2	2
Macrozamia communis	Burrawang		1	
Marsdenia rostrata	Milk Vine	1		2
Melaleuca ericifolia	Swamp Paperbark	2		2
Melaleuca hypericifolia	Hillock bush	2	1	
Melicytus dentatus	Tree Violet			1
Microlaena stipoides	Weeping Grass	2	2	2
Mimulus repens	Creeping Monkey-flower	3 LM		
Notelaea venosa	Veined Mock-olive	1		1
Oplismenus imbecillis		3	1	2
Oxalis exilis?			1	
Oxalis perennans		1		
Parsonsia straminea	Common Silkpod	2	1	2
Persoonia linearis	Narrow-leaved Geebung		1	
Pimelea linifolia	Slender Rice Flower		2	
Poa labillardierei var. labillardierei	Tussock		1	1
Poa meionectes			2	
Polymeria calycina		1	1	
Pratia purpurascens	Whiteroot	2		
Pseuderanthemum variabile	Pastel Flower	1		
Pteridium esculentum	Bracken	2	4	2
Rubus parvifolius	Native Raspberry	1	1	
Rytidosperma sp.	A Wallaby Grass		2	
Samolus repens	Creeping Brookweed	3 LM		
Sarcocornia quinqueflora subsp. quinqueflora	Samphire	2 LM		
Scaevola aemula	Fairy Fan-flower	1		
Schelhammera undulata			1	1
Selliera radicans	Swamp Weed	3 LM		

Scientific Name	Common Name	SR649	SR642 (modified)	Ecotonal (SR642, SR649, SR512)
Senecio minimus			2	
Solanum prinophyllum	Forest Nightshade	1		
Solanum pungetium	Eastern Nightshade	2	1	1
Solanum stelligerum	Devil's Needles	2	2	2
Sporobolus virginicus	Sand Couch	2 LM		
Themeda australis	Kangaroo Grass		2	
Triglochin striata	Streaked Arrowgrass	2 LM		
Tylophora barbata	Bearded Tylophora			1
Veronica plebeia	Trailing Speedwell		1	
Viola hederacea	Ivy-leaved Violet	2		
Viola sp.		2		
Xanthorrhoea sp.			1	
EXOTIC				
Anagallis arvensis	Scarlet Pimpernel		1 roadsides	
Briza minor	Shivery Grass		1 roadsides	
Centaurium erythraea	Common Centaury		1	
Cirsium vulgare	Spear Thistle	1 most edges	1 roadsides	
Conyza sumatrensis	Tall fleabane		1 roadsides	
Ehrharta erecta	Panic Veldtgrass	2 edge near houses		
Hypochaeris radicata	Catsear		1 roadsides	
Malva neglecta	Dwarf Mallow	1 roadsides		
Paspalum dilatatum	Paspalum	1 roadsides		
Rubus fruticosus sp. agg.	Blackberry complex	1		
Stenotaphrum secundatum	Buffalo Grass		2	
Zantedeschia aethiopica	Arum Lily	1 edge near houses		

APPENDIX C – FAUNA SPECIES RECORDED IN THE STUDY AREA AND LOCALITY

Asterisk = Present during field surveys.

Bold = Threatened or Migratory species as listed under TSC Act and/or EPBC Act.

BIRDS

Common Name	Scientific Name	Study Area	Locality
Australasian Darter	*Anhinga novaehollandiae*	*	*
Australian King-Parrot	*Alisterus scapularis*	*	
Australian Magpie	*Cracticus tibicen*	*	*
Australian Owlet-nightjar	*Aegotheles cristatus*		*
Australian Raven	*Corvus coronoides*	*	*
Bell Miner	*Manorina melanophrys*	*	*
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	*	*
Black-faced Monarch	***Monarcha melanopsis***		*
Brown Falcon	*Falco berigora*		*
Brown Thornbill	*Acanthiza pusilla*	*	*
Cicadabird	*Coracina tenuirostris*	*	*
Crimson Rosella	*Platycercus elegans*	*	*
Eastern Koel	*Eudynamys orientalis*	*	
Eastern Spinebill	*Acanthorhynchus tenuirostris*	*	*
Eastern Yellow Robin	*Eopsaltria australis*	*	*
Eastern Whipbird	*Psophodes olivaceus*	*	
Eurasian Coot	*Fulica atra*		*
Emu	*Dromaius novaehollandiae*	*	*
Glossy Black-Cockatoo	***Calyptorhynchus lathami***	*	*
Golden Whistler	*Pachycephala pectoralis*	*	
Great Cormorant	*Phalacrocorax carbo*		*
Grey Butcherbird	*Cracticus torquatus*	*	*
Grey Fantail	*Rhipidura albiscapa*	*	*
Grey Shrike-thrush	*Colluricincla harmonica*	*	*
Laughing Kookaburra	*Dacelo novaeguineae*	*	*
Leaden Flycatcher	*Myiagra rubecula*	*	
Lewin's Honeyeater	*Meliphaga lewinii*	*	*
Little Wattlebird	*Anthochaera chrysoptera*	*	*
Magpie-lark	*Grallina cyanoleuca*	*	*

Common Name	Scientific Name	Study Area	Locality
Masked Lapwing	*Vanellus miles*	*	*
Mistletoebird	*Dicaeum hirundinaceum*		*
Nankeen Night-Heron	*Nycticorax caledonicus*	*	
New Holland Honeyeater	*Phylidonyris novaehollandiae*	*	*
Noisy Friarbird	*Philemon corniculatus*	*	*
Olive-backed Oriole	*Oriolus sagittatus*	*	*
Pied Currawong	*Strepera graculina*	*	*
Pilotbird	*Pycnoptilus floccosus*	*	
Rainbow Lorikeet	*Trichoglossus haematodus*	*	*
Red Wattlebird	*Anthochaera carunculata*	*	*
Red-browed Finch	*Neochmia temporalis*	*	*
Restless Flycatcher	*Myiagra inquieta*		*
Rufous Whistler	*Pachycephala rufiventris*	*	
Sacred Kingfisher	*Todiramphus sanctus*	*	
Satin Bowerbird	*Ptilonorhynchus violaceus*	*	*
Satin Flycatcher	***Myiagra cyanoleuca***		*
Silvereye	*Zosterops lateralis*	*	*
Sooty Owl	***Tyto tenebricosa***		*
Spotted Pardalote	*Pardalotus punctatus*	*	*
Square-tailed Kite	***Lophoictinia isura***	*	
Striated Thornbill	*Acanthiza lineata*	*	*
Striated Fieldwren	***Calamanthus fulginosus***	*	
Sulphur-crested Cockatoo	*Cacatua galerita*	*	*
Superb Fairy-wren	*Malurus cyaneus*	*	*
Superb Lyrebird	*Menura novaehollandiae*		*
Variegated Fairy-wren	*Malurus lamberti*	*	
Wedge-tailed Eagle	*Aquila audax*		*
Weebill	*Smicrornis brevirostris*	*	*
Welcome Swallow	*Hirundo neoxena*		*
White-bellied Sea-Eagle	*Haliaeetus leucogaster*		*
White-browed Scrubwren	*Sericornis frontalis*	*	*
White-throated Needletail	*Hirundapus caudacutus*	*	*

Common Name	Scientific Name	Study Area	Locality
White-throated Treecreeper	*Cormobates leucophaea*	*	*
Willie Wagtail	*Rhipidura leucophrys*	*	
Wonga Pigeon	*Leucosarcia picata*	*	
Yellow Thornbill	*Acanthiza nana*	*	
Yellow-faced Honeyeater	*Lichenostomus chrysops*	*	*
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	*	*

MAMMALS

Common Name	Scientific Name	Study Area	Locality
Agile Antechinus	*Antechinus agilis*	*	*
Bush Rat	*Rattus fuscipes*	*	*
Cat	*Felis catus*	*	*
Chocolate Wattled Bat	*Chalinolobus morio*		*
Common Brushtail Possum	*Trichosurus vulpecula*	*	*
Common Ringtail Possum	*Pseudocheirus peregrinus*	*	*
Dusky Antechinus	*Antechinus swainsonii*	*	*
Eastern bentwing bat	***Miniopterus orianae oceanensis***	*	*
Eastern Broad-nosed bat	*Scotorepens orion*	*	*
Eastern False Pipistrelle	***Falsistrellus tasmaniensis***		*
Eastern Free-tailed Bat	*Mormopterus ridei*		*
Eastern Grey Kangaroo	*Macropus giganteus*	*	*
European Rabbit	*Oryctolagus cuniculus*	*	*
Gould's Wattled Bat	*Chalinolobus gouldii*	*	*
Grey-headed Flying-fox	***Pteropus poliocephalus***		*
House Mouse	*Mus musculus*	*	*
Large Forest Bat	*Vespadelus darlingtoni*	*	*
Large-footed Myotis	***Myotis macropus***	*	
Little Forest Bat	*Vespadelus vulturnus*		*
Red-necked Wallaby	*Macropus rufogriseus*	*	*
Southern Forest Bat	*Vespadelus regulus*	*	*
Swamp Rat	*Rattus lutreolus*	*	
Swamp Wallaby	*Wallabia bicolor*	*	*

Common Name	Scientific Name	Study Area	Locality
White-footed Dunnart	***Sminthopsis leucopus***	*	*
White-striped Freetail-bat	*Austronomus australis*	*	*
Yellow-bellied Glider	***Petaurus australis***		*
Yellow-bellied Sheathtail Bat	***Saccolaimus flaviventris***		*
	Nyctophilus sp.		*

REPTILES

Common Name	Scientific Name	Study Area	Locality
Mustard-bellied Snake	*Drysdalia rhodogaster*	*	
Diamond Python	*Morelia spilota*	*	*
Lace Monitor	*Varanus varius*	*	*
Red-bellied Black Snake	*Pseudechis porphyriacus*	*	*
Yellow-bellied Water-skink	*Eulamprus heatwolei*	*	*
Jacky Dragon	*Amphibolurus muricatus*	*	*
Weasel Skink	*Saproscincus mustelinus*	*	*
Garden Skink	*Lampropholis guichenoti*	*	*
Grass Skink	*Lampropholis delicata*	*	*

FROGS

Common Name	Scientific Name	Study Area	Locality
Bibron's Toadlet	*Pseudophryne bibronii*	*	*
Common Froglet	*Crinia signifera*	*	*
Eastern Pobblebonk	*Limnodynastes dumerilii*		*
Southern Brown Tree Frog	*Litoria ewingii*	*	*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*		*
Striped Marsh Frog	*Limnodynastes peronii*	*	*
Whistling Tree Frog	*Litoria verreauxii*	*	*

APPENDIX E – QUALIFICATIONS AND EXPERIENCE OF PERSONNEL

Name and Qualifications	Experience
Steve Sass B.App.Sci (Env.Sci) (Hons) Director / Principal Ecologist / Project Manager Certified Environmental Practitioner, EIANZ OEH Biobanking and Biocertification Assessor Practicing Member, Ecological Consultants Association of NSW (ECA) Member, Australian Society of Herpetologists	Steve is a highly experienced Consulting Ecologist having undertaken hundreds of terrestrial and aquatic ecological surveys and assessments across Australia since 1992. He has an in-depth working knowledge of environmental and biodiversity legislation across all states and territories which allows him to provide detailed and accurate assessments and formulate practical solutions to clients and specific projects on a case-by-case basis. Previous and current research holds Steve in high regard within both the scientific and ecological consultants' community. To date, Steve has published, submitted or has in preparation, twenty-eight manuscripts within peer-reviewed scientific journals, most of which are related to threatened species survey, monitoring or management. He is a Council Member of the Ecological Consultants Association of NSW and is a member of the working committee for the development of an Ecological Consultants Accreditation Scheme for NSW consultants in collaboration with OEH. Steve was recently invited by OEH to become a sitting member of a team to develop Priority Action Statements for two species listed as Endangered under the NSW *Threatened Species Conservation Act 1995* and is currently working with OEH on the Saving our Species Program for a newly identified species of dragon lizard in western NSW (*Ctenophorus mirrityana*) which Steve collaborated with other scientists to formally describe. Steve has extensive experience in southern NSW. Over the past eight years, he has completed or provided specialist biodiversity advice to more than 600 environmental assessments for projects such as residential and industrial developments, highway upgrades and telecommunications, water, sewerage, energy, mining and electricity network infrastructure projects. Steve is highly conversant with the flora, vegetation communities, fauna and their habitats of the south coast region. His expertise with regard to forest and wetland birds, reptiles, frogs and mammals is well known. Steve brings to this project his knowledge of the biodiversity of the NSW south coast, and his extensive scientific background as past employee of the Ecology and Biodiversity Group within the Institute for Land, Water and Society (ILWS), a leading research group at Charles Sturt University, Australia's largest regional university and his accreditation as a BioBanking and Biocertification Assessor with OEH, and is a Certified Environmental Practitioner authorised by the Environment Institute of Australia and New Zealand. Steve was the Project manager and primary author of the SIS. He conducted the experimental design of the field surveys to ensure compliance with the DGR, lead many of the fauna surveys, and completed the motion-activated camera image analysis and echolocation call recording analysis.
Mark Harris B.App.Sci (Env Res Mgt) Senior Botanist / GIS Analyst OEH Biobanking Assessor	Mark is a highly experienced Botanist having undertaken flora surveys across eastern and central Australia. He has more than 12 years experience in Biodiversity Assessment and Planning. Mark has extensive experience with the flora and vegetation communities of the region confirmed by his two year tenure with the State-wide Native Vegetation Mapping Project. His expertise in southern NSW flora and vegetation communities resulted in Mark

Name and Qualifications	Experience
Practicing Member, Ecological Consultants Association of NSW (ECA)	becoming accredited as a BioBanking Assessor (Accred. No. 0062) and he has completed a number of assessments including the completion of calculations for a 400 km long electricity infrastructure project in northern NSW. As a Senior Botanist, Mark led the flora surveys for this study and was the author of the flora and vegetation community sections of the SIS. Mark is also a highly experienced GIS Analyst and completed the mapping and spatial analysis completed for the SIS.
David Bain PhD Senior Ecologist	David was one of the first persons to be accredited as a Biobanking Assessor (Accred. No. 0002) and has completed numerous assessments using the Biobanking Methodology and Calculator including Broadscale Biobanking Assessments across project areas as large as 4,000 hectares. David has been involved with a wide range of projects, from undertaking environmental assessments, large scale vegetation mapping, broad landscape planning to reviewing environmental literature for decision making and the development of policy documents. During his experience he has developed liaison skills and has experience consulting with both state agencies and private clients. For this project, David was the Senior Ecologist during some of the field surveys.
Gerry Swan Adv. Herp. Tech Ecologist/Herpetologist Practicing Member, Ecological Consultants Association of NSW (ECA)	Gerry is one of Australia's leading field herpetologists having co-authored numerous field guides including 'A Field Guide to the Reptiles of New South Wales', now in its second edition and the Whitley Award Winning 'A complete guide to Reptiles of Australia', now in its fourth edition. Gerry is also a highly experienced ecologist conversant with a variety of mammalian fauna, including Eastern Pygmy-possum and White-footed Dunnart. His experience is confirmed by the trapping and identification of hundreds of mammals along thousands of kilometres of open pipeline trenches in the QLD, NSW, SA and NT. Sass and Swan have collaborated on a number of ecological surveys, research and Major Project assessments over the past 10 years. Their collaborations have also included research on endangered species including extensive surveys and monitoring of Green and Golden Bell Frog (*Litoria aurea*) as part of major project consultancies. For this project, Gerry provided valuable expertise to the fauna surveys and assisted in the preparation of the SIS.
Sharon Wormleaton Grad.Dip Ornithology (CSU) Fauna Ecologist	Sharon has extensive experience in field ecology which has included threatened grasswren surveys in western QLD, radiotracking of Numbats in WA, pitfall trapping surveys at Scotia Sanctuary in western NSW, and termite abundance surveys in central WA. For this study, Sharon was a lead Fauna Ecologist during field surveys.
Caroline Metzler B. Sc (Comm) (Hons)	Caroline is an experienced Botanist and Field Ecologist having completed surveys in NSW, VIC, QLD, TAS and WA since 2005.

Name and Qualifications	Experience
Botanist/ Field Ecologist Practicing Member, Ecological Consultants Association of NSW (ECA)	In the field, Caroline's wide ranging skills make her a valuable part of the ecological impact assessment team. Caroline provided valuable assistance to the fauna survey team for this SIS.
Jens Birchall M. Sc (NRM) (on-going) Field Assistant (Fauna)	Jens is currently in the final stages of completing his Masters Degree in Natural Resource Management. He has a variety of field experience including a study of the frog communities across 50 wetlands on the NSW far south coast and biodiversity surveys for a study of the CSA Mine north of Cobar (c.2,500 ha). For this study, Jens assisted with pitfall trap installation and fauna field surveys.
Aimee Curtis AssocDeg. App.Sci (Parks, Recreation & Heritage) Research Assistant	Aimee provide valuable field assistance to the ecology team through her extensive research skills. These have included flora and fauna assessments for proposed safety works at more than 100 derelict mines shafts on the NSW south coast and southern tablelands, biodiversity surveys of the Panboola Wetlands near Pambula and threatened species investigations along a 35km road between Tumut and Gundagai. For this SIS, Aimee conducted the desktop analysis and research as directed.
Joshua Wellington B. Sc (Environmental) Botanist	Joshua is an experienced Botanist and Field Ecologist having completed surveys in NSW, QLD and VIC since 2008. In the field, Joshua's botanical skills make him a valuable part of the ecological impact assessment team. He is highly conversant with the flora and vegetation communities of NSW and Victoria but his knowledge of plant families and genera enable him to undertake botanical surveys in all states of Australia. Joshua's experience includes the field assessment and reporting for Review of Environmental Factors and Environmental Management Plans for various infrastructure projects within government and private industry. For this study, Joshua assisted with the preparation of the SIS.
Linda Sass B. Gn.St (Sci) (on-going), B.A, Dip. Ed (Sec) Director / Ecologist	Linda is an experienced ecologist having conducted flora and fauna surveys across southern NSW for the past 8 years. Her recent projects include Threatened Species Investigations for the Roads & Maritime Services where she completed target threatened reptile, bird and mammal surveys, and target threatened flora searches. During this work, she identified a previously unknown population of the threatened plant *Swainsona sericea*. Linda has a wide variety of experience working on the NSW south coast, with her recent projects including Biodiversity Assessments for a 13-lot rural-residential development west of Pambula and a Telecommunications Tower at Tura Beach, and extensive flora and vegetation community surveys near Tumbarumba. For this study, Linda conducted an internal review of the SIS and assisted with fauna field surveys.