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Flora and Fauna Assessment: Douglas North Substation

Final Report

February 2007

Terri-Ann English
Sian Wilkins

Natural & Cultural Heritage Consultants 15-17 Henrietta St Chippendale NSW 2008

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Report for BHP Billiton Illawarra Coal

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ABBREVIATIONS

DEC	NSW Department of Environment and Conservation
DEH	Commonwealth Department of the Environment and Heritage
DNR	Department of Natural Resources
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act* 1979
EPBC Act	*Environment Protection and Biodiversity Conservation Act* 1999
KTP	Key Threatening Process
LGA	Local Government Area
MNES	Matter of National Environmental Significance
NPWS	NSW National Parks and Wildlife Service (now DEC)
ROTAP	Rare or Threatened Australian Plant as listed by Briggs and Leigh
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
TSC Act	*Threatened Species Conservation Act* 1995
sp.	species (singular)
spp.	species (plural)
ssp.	subspecies
var.	variety

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1.0 SUMMARY

Biosis Research Pty. Ltd. was commissioned by BHP Billiton Illawarra Coal (BHPBIC) to undertake a terrestrial flora and fauna assessment for the proposed Douglas North Substation. The proposed Douglas North Substation, boreholes and power line will enable power to be supplied to the underground workings.

The study area supports Shale Sandstone Transition Forest and Western Sandstone Gully Forest in varying condition, with disturbances such as the existing powerline easement and farming activities fragmenting the existing bushland and resulting in weed invasion. The native vegetation in the study area is part of a riparian corridor along the Nepean River.

The proposal will involve clearing approximately 1.5 ha of native vegetation, with a further 2.9 ha indirectly impacted. Shale Sandstone Transition Forest, listed as an Endangered Ecological Community on the TSC and EPBC Acts, was recorded in the study area. As such, an Assessment of Significance under the TSC Act and Significant Impact Criteria under the EPBC Act were carried out for this EEC. It was found that a significant impact is not likely.

No threatened plant species were recorded within the study area. However, potential habitat for six threatened plant species (*Epacris purpurescens* var. *purpurescens, Grevillea parviflora* spp. *parviflora, Persoonia bargoensis, Persoonia hirsuta, Pomaderris brunnea* and *Pultenaea pedunculata*) occurs within the study area.

Assessments of Significance under the TSC Act and/or Significant Impact Criteria under the EPBC Act have been prepared for these species. These assessments concluded that the proposal is unlikely to have a significant impact, given that approximately 5,481 ha of Shale Sandstone Transition Forest and approximately 1,900 ha of Western Sandstone Gully Forest has been mapped by DEC (NPWS 2002b) as occurring within a 10 km radius of the study area, and that none of the species were recorded during surveys of the study area.

The proposal is likely to modify potential breeding and foraging resources for the Red-crowned Toadlet *Pseudophryne australis*, listed on the TSC Act. Based on the Assessment of Significance the proposal is unlikely to result in a significant impact on this species given the small area to be impacted (6.1 ha) and the extent of potential habitat in the local area (approximately 7,544 ha).

The remaining 22 threatened and/or migratory species with potential habitat within the study area are unlikely to be significantly impacted by the proposal, given the mobility of these species and the extent of potential habitat in the immediate vicinity of the study area. It is unlikely that the proposal would result in the death or injury, or loss of limiting breeding or foraging resources for any

of these threatened animal species. Therefore, Assessments of Significance under the TSC and EPBC Acts have not been prepared for these species.

A Species Impact Statement (TSC Act) or a Referral for Matters of National Significance (EPBC Act) is not considered necessary for any threatened flora or fauna within the study area for the proposed activities.

It is recommended that the following points be taken into consideration to minimise any disturbances on the ecological values of the study area:

- adjustment of the location of the access track to avoid native trees;
- where possible trees with hollows should be retained;
- proposed boreholes and access tracks should be located within existing cleared areas where possible;
- appropriate sediment/erosion and drainage control devices should be utilised to prevent sediment laden run off and erosion which could potentially impact on the Nepean River and its tributaries;
- disturbance to native vegetation should be minimised;
- Spread of exotic species propagules into the adjoining vegetation should be avoided;
- any landscaping or rehabilitation works should use local native species;
- any chemicals used on site will be taken off site after use and disposed of appropriately;
- any native shrubs, logs or bush-rock that are removed should be stockpiled on the side of the proposed access routes and raked back over the site following completion of the works; and,
- If required, bush regeneration and weed control should be undertaken to ensure the flora and fauna of the local area are protected throughout the construction and operation phases of the proposed development.

2.0 INTRODUCTION

2.1 Background

Biosis Research Pty. Ltd. was commissioned by BHP Billiton Illawarra Coal (BHPBIC) to undertake a terrestrial flora and fauna assessment for the Douglas North Substation (Figure 1). This report assesses the conservation significance of the study area in terms of threatened species, populations (and/or their habitats) and ecological communities that occur, or have the potential to occur in the study area in accordance with the requirements of the *Environmental Planning and Assessment Act* 1979 (EP&A Act), *Threatened Species Conservation Act* 1995 (TSC Act) and *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act).

The proposed works for the new substation and boreholes is to be assessed under Part 3A of the EP&A Act, while the application for the upgrade of the existing substation and transmission line is to be assessed under Part 5 of the EP&A Act.

2.2 Proposed Development Activity

BHP Billiton Illawarra Coal is planning to install a new substation at Douglas North (Figure 1).

The proposal involves (BHP Billiton Illawarra Coal 2006):

- Upgrading Integral's Douglas Park Switching Station on Lot 1 DP 221431, involving expanding the substation to the north within existing cleared areas. This will not require any clearing of native vegetation,
- Constructing a new 66/11kV electrical substation located on Lot 1 DP 583323 at Douglas Park, including an access road to connect the site to Morton Park Road and a 20 m wide Asset Protection Zone.
- Upgrading the disused 33kV transmission line from the Integral Switching Station to the new electrical substation, which will involve replacing the existing wooden poles with concrete ones and insulating the line to 66kV standard. The upgrade will be contained entirely within the existing easement, with no additional clearing of vegetation required,
- Installing an underground 11kV transmission line from the new electrical substation to the boreholes located on Lot 1 DP 583323, and,
- Drilling of three boreholes on Lot 1 DP 583323 and installing 11kV cables in them to connect to the underground workings. The disturbance area for the boreholes includes a fire zone.

2.3 Definitions

The **proposal** includes the substation and associated access track, three boreholes and associated easement and the upgrade of the existing easement and substation.

The **subject site** is the area directly impacted by the proposal, and includes clearing for access tracks, installation of underground cables and fire protection.

The **study area** includes the subject site and any area indirectly impacted by the proposal. The subject site occurs within existing edge affected areas, supporting scattered patches of trees in a largely cleared landscape on the edge of a riparian corridor that follows the Nepean River. However for the purposes of this assessment, a buffer of 20 metres for indirect impacts has been assumed as the proposed altered land use is likely to introduce different edge effects to the area. Furthermore, the proposal is likely to extend existing edge effects further into bushland areas with the installation of the proposed boreholes and underground easement. The study area is illustrated in Figure 2 and described in Section 2.4.

The **local area** is defined as a 10 km radius from the subject site.

Direct impacts include but are not limited to acute death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat (DEC 2005n). In relation to the proposal, direct impacts include the clearing and crushing of native vegetation within the subject site and fragmentation of habitat.

Indirect impacts include but are not limited to starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious changes in the water table, increased soil salinity, promotion of erosion, inhibition of nitrogen fixation, provision of suitable seed bed for exotic weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas (DEC 2005n). In relation to the proposal, indirect impacts include the potential for the introduction and spread of weed species, erosion, sedimentation, increase in human activity, rubbish dumping and edge effects. The indirect impacts have been calculated based on a 20 m buffer around the subject site.

Threatened biota means threatened species, populations or ecological communities (or their potential habitats) as listed under the TSC Act or EPBC Act.

A **key threatening process** (KTP) is defined in the TSC Act as a process that threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities (DEC 2006b). Something can be a threatening process if it;

- adversely affects two or more threatened species, populations or ecological communities; or
- could cause species, populations or ecological communities that are not currently threatened to become threatened.

A list of KTPs is maintained in the relevant sections of the TSC Act and EPBC Act and includes such processes as bush rock removal, predation and competition by a variety of introduced plants and animals and the clearing of native vegetation.

2.4 Description and Features of the Study Area

The proposal is located approximate 500 m east of the Douglas Park township and approximately 250 m upslope and to the west of the Nepean River within the Wollondilly Local Government Area (LGA) (Figure 1).

The study area supports an existing substation and cleared powerline easement within cleared paddocks, with some regrowth native vegetation adjoining the easement to the east. In some sections there are also scattered patches of regrowth native vegetation occurring to the west of the powerline easement. The slopes of the Nepean River, to the east of the study area, support dense native vegetation (Figure 2).

2.5 Aims

The general aim of this report is to undertake a terrestrial flora and fauna assessment of the study area and to determine the impact of the proposal on any matter of conservation significance.

The specific aims are to:

1. conduct a literature review and database search for the study area;
2. provide a brief assessment of the habitat values of the study area;
3. undertake targeted field surveys for threatened terrestrial species, populations (and/or their habitats) and ecological communities listed under the schedules of the TSC and/or EPBC Acts that are known or likely to occur within the study area;
4. undertake Section 5A Assessments of Significance for threatened species, populations and ecological communities listed on the TSC Act and/or Assessments of Significance for threatened and migratory species listed on the EPBC Act that are either directly or indirectly impacted by the proposal; and,
5. provide recommendations to minimise the environmental impacts of the proposal.

3.0 METHODS

The study area was inspected on 30 October 2006. The general condition of the study area was assessed and observations made of extant plant and animal species and vegetation communities as detailed below. During the site visit the weather was warm and sunny.

This study was by design a habitat assessment and was conducted in accordance with the methodology employed for an assessment under Section 5A of the EP&A Act. Therefore no trapping, spotlighting, call playback or vegetation quadrat sampling techniques were used. As the assessment is based on presence or absence of suitable habitat for a threatened species, such techniques are not necessary as the habitat based approach is conservative in nature, requiring only the presence of habitat, not individual records, for a threatened species to be considered further. The methodology employed for this assessment is sufficient to determine if the proposal would have a significant impact on any threatened terrestrial species, populations or ecological communities.

3.1 Taxonomy

The plant taxonomy (method of classification) used in this report follows Harden (1990, 1992, 1993, 2002) and subsequent advice from the National Herbarium of NSW. In the body of this report plants are referred to by their scientific names only. Common names where available have been included in the Appendices.

Names of vertebrates follow the Census of Australian Vertebrates maintained by Department of Environment and Heritage (DEH). In the body of this report vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only. Common and scientific names are included in the Appendices.

3.2 Literature and Database Review

A list of documents used to prepare this report is located in *References*. Records of threatened species, populations and communities were obtained from the Department of Environment and Conservation (DEC) Atlas of NSW Wildlife within a 10 km radius of the study area, using the Wollongong 1:100 000 map sheet. Records for threatened species, populations and communities listed on the EPBC Act were obtained from the DEH EPBC Online Database within a 10 km radius of the study area. Database searches were conducted in September and October 2006.

3.3 Flora Survey

Species of plant growing in the study area were surveyed by undertaking a general habitat assessment as well as targeted searches for habitat of threatened species. The vegetation communities were surveyed using the random meander technique described by Cropper (1993).

3.3.1 Flora Habitat Assessment

The condition of the vegetation was assessed according to the degree to which it resembled relatively natural, undisturbed vegetation using the following criteria:

- species composition (species richness, degree of weed invasion); and,
- vegetation structure (representation of each of the original layers of vegetation).

The three categories used to evaluate general habitat value were Good, Moderate or Poor, as detailed below:

Good: containing a high number of indigenous species; no weeds present or weed invasion restricted to edges and track margins; vegetation community contains original layers of vegetation; vegetation layers (ground, shrub, canopy etc) are intact.

Moderate: containing a moderate number of indigenous species; moderate level of weed invasion; weeds occurring in isolated patches or scattered throughout; one or more of original layers of vegetation are modified; vegetation layers (ground, shrub, canopy etc) are largely intact.

Poor: containing a low number of indigenous species; high level of weed invasion; weeds occurring in dense patches or scattered throughout; one or more of the original layers of vegetation are highly modified; one or more original vegetation layers (ground, shrub, canopy etc) are modified or missing.

3.4 Fauna Survey

Fauna species using the site were surveyed by undertaking active searching and listening, as well as recording incidental observations.

3.4.1 Fauna Habitat Assessment

The three categories used to evaluate habitat value were Good, Moderate or Poor, as detailed below:

Good: ground flora containing a high number of indigenous species; vegetation community structure, ground, log and litter layer intact and undisturbed; a high

level of breeding, nesting, feeding and roosting resources available; a high richness and diversity of native animal species.

Moderate: ground flora containing a moderate number of indigenous species; vegetation community structure, ground log and litter layer moderately intact and undisturbed; a moderate level of breeding, nesting, feeding and roosting resources available; a moderate richness and diversity of native animal species.

Poor: ground flora containing a low number of indigenous species, vegetation community structure, ground log and litter layer disturbed and modified; a low level of breeding, nesting, feeding and roosting resources available; a low richness and diversity of native animal species.

Other habitat features, such the value of the study area as a habitat corridor, the presence of remnant communities or unusual ecological vegetation community structures, were also used to assess habitat quality.

3.5 Impact Assessment

Impact assessments were carried out on listed species, populations and ecological communities that occur or have the potential to occur within the creek and drainage lines within the Study Area based on the presence of suitable habitat.

For species listed on the TSC Act and for which the proposal may impact on individuals of the species or their habitats, Assessments of Significance are required. In the instance that an Assessment of Significance identifies that a significant impact on a species is likely, than a Species Impact Statement (SIS) may be required.

For species listed on the EPBC Act and for which the proposal may impact on individuals of the species or their habitats, EPBC Act Significant Impact Criteria are required to be considered. In the instance that the Significant Impact Criteria identifies that a significant impact on a species is likely, then a Referral to the Federal Minister for the Environment may be required.

3.6 Limitations

Some plant species that occur in the local area are annuals (completing their life cycle within a single season) and are present only in the seed bank for much of the year. Other plant species are perennial but are inconspicuous unless flowering. Similarly, some fauna may be seasonally absent from the study area.

4.0 RESULTS

A list of the plant and animal species recorded during the survey are provided in Appendix 1 and Appendix 2 respectively.

4.1 Soil

The soil landscape is mapped at a 1:100,000 scale as Blacktown (map unit bt) over the majority of the study area, with Hawkesbury (map unit ha) in the vicinity of the Nepean River and Harris Creek (Hazelton *et al.* 1990).

Blacktown soil landscape is described as gently undulating rises on Wianamatta Group shale (Hazelton *et al.* 1990). Hawkesbury soil landscape is described as rugged, rolling to very steep hills on Hawkesbury Sandstone (Hazelton *et al.* 1990).

4.2 Plant Communities

DEC vegetation mapping

DEC (NPWS 2002b) mapped the local area as part of the vegetation mapping of the Cumberland Plain. The study area was mapped as supporting Shale Sandstone Transition Forest and Western Sandstone Gully Forest, with good connection between the vegetation on-site and the vegetation corridor along the Nepean River (Figure 3). This is relatively consistent with what was recorded in the study area.

The accuracy of the vegetation connectivity along the easement shown in the DEC mapping is not consistent with what was observed in the study area. Within the study area, the native vegetation was present as scattered patches within a predominantly cleared landscape (Figure 2). Vegetation along the southern section of the existing powerline easement provides little direct connection between the relatively dense native vegetation to the east of the easement and the scattered patches of native vegetation occurring to the west of the easement. However, the northern section of the easement does provide connection between vegetation to the east and west as shown in the mapping, with a dense thicket of *Kunzea ambigua* present in this area.

Existing substation

The land supporting the existing substation was cleared of native vegetation (Plate 1). The area surrounding the substation to the south supported native vegetation that appeared to be consistent with Shale Sandstone Transition Forest. The vegetation was considered to be in a moderate condition.

Powerline easement

The existing powerline easement traverses a number of cleared paddocks (Plate 2). Scattered patches of native vegetation were present upslope of the powerline easement along with a number of greenhouses, used to grow vegetables such as cucumbers. Downslope of the easement were a number of farm dams amongst dense native vegetation on the slopes of the Nepean River.

The powerline easement itself was mostly cleared of native vegetation (Plate 2). The paddocks traversed by the easement varied in composition and structure; from supporting a mown groundlayer composed of a mix of exotic and native grass species such as *Themeda australis, Microlaena stipoides, Paspalum dilatatum* and *Briza maxima* and the occasional shrub, *Bursaria spinosa*; to overgrown paddocks dominated by exotic grasses such as *Paspalum dilatatum, Lolium perrene, Briza maxima* and *Bromus catharticus.* The dominance of exotic species along the easement appeared to be related to the proximity of the commercial greenhouses.

Further north along the easement, away from the influence of the farming activities, the dominance of native species increased, with native grasses such as *Themeda australis, Aristida vagans* and *Microlaena stipoides* dominant in the ground layer, and *Bursaria spinosa* and *Kunzea ambigua* present as scattered small shrubs. A dense thicket of *Kunzea ambigua* occurs for approximately 250 m along one section of the powerline easement, spread from the adjoining native vegetation to the east and providing a connection to scattered patches of native vegetation to the west.

Given the lack of structure and low diversity of native species, the vegetation underneath the southern section of the powerline easement was generally considered to be an unnatural landscape and does not constitute a native vegetation community. The northern section of the powerline easement supported Shale Sandstone Transition Forest and was considered to be in poor condition.

The area downslope and to the east of the powerline easement supported Shale Sandstone Transition Forest, this vegetation was considered to be in moderate condition, with a number of weed species present in the understorey and the natural structure of the community altered.

The area upslope of the powerline easement supported scattered patches of Shale Sandstone Transition Forest amongst the majority cleared landscape, with scattered trees of *Eucalyptus tereticornis, E. moluccana* and *E. fibrosa* and shrubs of *Bursaria spinosa.* The native vegetation in this area was considered to be in a poor condition, with structure and species composition altered due to ongoing disturbances.

Proposed substation and access track

The proposed substation and access track are located within a cleared paddock (Plate 3), which supports scattered trees characteristic of Shale Sandstone Transition Forest, such as *Eucalyptus moluccana* and *E. tereticornis*. Beneath the scattered patches of trees were native shrubs of *Bursaria spinosa* and understorey species including *Themeda australis, Microlaena stipoides* and *Gahnia aspera.* The native vegetation within the proposed substation area was considered to be in poor condition, given the lack of vegetation structure, poor native species diversity and lack of connectivity.

The cleared paddock within the proposed substation area was dominated by exotic grass species. A horse was observed grazing on the property at the time of survey.

The proposed access track traversed small, scattered patches of Shale Sandstone Transition Forest within the cleared paddock, supporting trees of *Eucalyptus moluccana* and *Angophora floribunda,* with shrubs of *Bursaria spinosa* and the weed species *Olea europea* growing at the base of the clumps of trees. Groundcover species recorded underneath the trees included *Einadia hastata* and *Gahnia aspera.* These patches of Shale Sandstone Transition Forest were considered to be in poor condition, given the lack of structure and native species diversity. It is recommended that the access track to the substation should be positioned to avoid clearing any trees.

Proposed boreholes and easement

The proposed boreholes and connecting easement are located downslope and to the south of the proposed substation in a transitional area between Shale Sandstone Transition Forest and Western Sandstone Gully Forest (Plate 6). Trees of *Eucalyptus tereticornis, E. globoidea* and *E. punctata* occur over a midstorey dominated by *Backhousea myrtifolia, Bursaria spinosa, Kunzea ambigua* and *Olea europea.* The understorey supported native species such as *Gahnia aspera, Themeda australis* and *Lomandra longifolia.* The vegetation in this area was considered to be in moderate to good condition, with structure relatively intact, but impacts from surrounding land use reducing species diversity.

The proposed borehole locations were approximately 10 to15 m upslope and to the north of a small ephemeral drainage line (Plate 4). This drainage line supported similar native species to the surrounding areas, with the addition of *Melaleuca styphelioides* in the midstorey and an increased dominance of *Gahnia aspera* in the understorey.

The native vegetation adjoining the proposed borehole locations and connecting easement had recently been disturbed by a newly created track, approximately 5

m wide, following a small powerline easement downslope towards the Nepean River (Plate 5). This area had only recently been cleared and had not yet had time to regenerate.

4.3 Endangered Ecological Communities

Shale Sandstone Transition Forest is listed as an Endangered Ecological Community on the TSC and EPBC Acts. The impacts of the proposal are discussed further in section 5.1.1. (See section 5.1.1).

4.4 Flora

Forty seven vascular plant species were recorded from the study area, comprising 32 (68%) locally indigenous species and 15 (32%) exotic species. A list of plant species recorded is provided in Appendix 1.

None of the exotic species recorded in the study area are listed as noxious weeds in the Wollondilly LGA.

4.4.1 Significant Flora

Sixteen threatened plant species listed on the TSC Act (Figure 4) and/or the EPBC Act and/or their habitat have been previously recorded within the local area (DEC Atlas of NSW Wildlife and DEH Online EPBC Database). These threatened plant species are considered in this report (Table 1).

No threatened plant species were recorded within the study area, however, potential habitat for six threatened plant species was recorded, *Epacris purpurescens* var. *purpurescens, Grevillea parviflora* spp. *parviflora, Persoonia bargoensis, Persoonia hirsuta, Pomaderris brunnea* and *Pultenaea pedunculata* (Table 1). These species are discussed further in the Impact Assessment (Section 5.0).

Table 1: Terrestrial flora listed on the TSC Act or EPBC Act that have the potential to occur in the local area

Species	Status			Habitat	Potential Habitat Present?
	EPBC Act[1]	TSC Act[2]	ROTAP[3]		
Acacia bynoeana	V	E1	3V	Bynoe's wattle is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra. Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches (DEC 2005a).	No. Soils in the study area are transitional between shale and sandstone.
Caladenia tessellata	V	E1	3V	Low open forest with heath or sometimes grass understorey this species only grows in very dense	No. No low open forest or heath in

Species	Status			Habitat	Potential Habitat Present?
	EPBC Act[1]	TSC Act[2]	ROTAP[3]		
				shrubbery in coastal areas (Bishop 1996). Currently known from two disjunct areas: Braidwood on southern tablelands and three populations in Wyong area on the Central Coast (DEC 2005c).	study area.
Cryptostylis hunteriana	V	V	3V	This species typically grows in swamp-heath on sandy soils chiefly in coastal districts (Harden 1993) but has also been recorded on steep bare hillsides (Bishop 1996).	No. No swamp heath in study area.
Cynanchum elegans	E	E1	3Ei	Rainforest gullies scrub and scree slopes in Gloucester and Wollongong districts (Harden 1992). Occurs mainly at the ecotone between dry subtropical rainforest and sclerophyll forest/woodland communities (NPWS 2002a). Has been recorded in dry subtropical rainforest, littoral rainforest, *Leptospermum laevigatum-Banksia integrifolia* Coastal scrub, *Eucalyptus tereticornis* forest and woodland, *Corymbia maculata* forest and woodland and *Melaleuca armillaris* scrub to open scrub (NPWS 2002a).	No. No rainforest gullies in study area.
Epacris purpurascens var. *purpurascens*	-	V	2K	Sclerophyll forest, scrub and swamps from Gosford and Sydney districts (Harden 1992) specifically this species is thought to require wet heath vegetation (T. James pers. comm.). Characteristically found in a range of habitat types, most of which have a strong shale soil influence. These include ridgetop drainage depressions supporting wet heath within or adjoining shale cap communities (including Shale Sandstone Transition Forest). Also occurs in riparian zones draining into Sydney Sandstone Gully Forest, shale lenses within sandstone habitats and colluvial areas overlying or adjoining sandstone or tertiary alluvium. Has been recorded from Gosford, Narrabeen, Silverdale and Avon Dam vicinity (DEC 2005d)	Yes. Within transitional areas between shale Sandstone Transition forest and Western Sandstone Gully Forest.
Eucalyptus benthamii	V	V	2Vi	Known from two main locations: Bents Basin and Kedumba Valley. A few scattered individuals are recorded from other sites on the sandy alluvial flats of the Kedumba/Cox/Nepean River system. Occurs only in wet open forest on sandy alluvial soils along valley floors at an elevation of 140-750 m. The soils are shallow to moderately deep and are well drained alluvial sands and gravels along stream channels, small terraces and alluvial flats (NPWS 2000b) Restricted but locally abundant (Harden 1991).	No. No wet open forest in study area.
Grevillea parviflora ssp. *parviflora*	V	V	-	Sporadically distributed throughout the Sydney Basin with the main occurrence centred around Picton, Appin and Bargo. Separate populations are also known further north from Putty to Wyong and Lake Macquarie on the Central Coast and Cessnock and Kurri Kurri in the Lower Hunter. Grows in sandy or light clay soils usually over thin shales. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. Often occurs in open, slightly disturbed sites such as along tracks. Flowering has been recorded between July to December as well as April-May (DEC 2005e).	Yes. Within Shale Sandstone Transition Forest and Western Sandstone Gully Forest.
Leucopogon exolasius	V	V	2V	Woodland on sandstone, restricted to the Woronora and Grose Rivers (Harden 1991). The plant occurs in woodland on sandstone and prefers rocky hillsides along creek banks (NPWS 1997). Flowering occurs in August and September.	No. No rocky hillsides along creek banks in study area.
Melaleuca deanei	V	V	3R	Grows in wet heath on sandstone (Harden 1991). Occurs in two distinct areas of Sydney (Ku-Ring-Gai/Berowra and Holsworthy/Wedderburn) and has isolated occurrences in the Blue Mountains, Nowra and Central Coast areas (DEC 2005g). The species grows in heath on sandstone. Flowers appear in summer but seed production appears to be small and consequently the species exhibits a limited capacity to regenerate.	No. No wet heath on sandstone in study area.
Persoonia bargoensis	V	E1	2V	Restricted to a small area south-west of Sydney on the western edge of the Woronora Plateau. Its entire range falls between Picton, Douglas Park, Yanderra,	Yes. Within Shale Sandstone Transition Forest.

Species	Status			Habitat	Potential Habitat Present?
	EPBC Act[1]	TSC Act[2]	ROTAP[3]		
				Cataract River and Thirlmere. Occurs in woodland or dry sclerophyll forest on sandstone and on heavier, well drained, loamy, gravely soils typical of Shale Sandstone Transition Forest. Like most Geebungs this species seems to benefit from the reduced competition and increased light available on disturbance margins including roadsides (DEC 2005h).	
Persoonia hirsuta	E	E1	3Ki	Occurs from Gosford to Royal NP and in the Putty district from Hill Top to Glen Davis where it grows in woodland to dry sclerophyll forest on sandstone (Harden 2002) or rarely on shale (NSW Scientific Committee 1998b). Two subspecies are recognised, *P. hirsuta* ssp. *hirsuta* (Gosford to Berowra and Manly to Royal NP) and *P. hirsuta* ssp. *evoluta* (Blue Mountains, Woronora Plateau and Southern Highlands). Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone and shale-sandstone transition areas (DEC 2005i).	Yes. Within Shale Sandstone Transition Forest.
Persoonia nutans	E	E1	2Ei	Grows in Woodland to dry sclerophyll forest on clay soils and old alluviums on the Cumberland Plain (Robinson 1994, Harden 2002). It is restricted to Castlereagh Scribbly Gum Woodlands, Agnes Banks Woodland, Shale Gravel Transition Forest and Cooks River Castlereagh Ironbark Forest (NPWS 2003). Peak flowering is from December to January with sporadic flowering all year round.	No. Listed vegetation communities not recorded in study area.
Pomaderris brunnea	V	V	2V	Open forest confined to the Colo River & upper Nepean River (Harden 1990), on clay & alluvial soils (Fairley and Moore 1995). In the Hawkesbury/Nepean region, the species is known to be associated with Dry sclerophyll forests (Cumberland, Upper Riverina, Sydney Coastal, Sydney Hinterland, Sydney Sand Flats), Coastal Floodplain Wetlands and Coastal Valley Grassy Woodlands (DEC 2005j).	Yes. Within Shale Sandstone Transition Forest.
Pterostylis saxicola	E	E1	-	Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines (NSW Scientific Committee 1997). The vegetation communities that occur above the shelves are either shale/sandstone transition or shale communities. Often occurs near streams. Picnic Point to Picton (Harden 1993). Currently known from only 5 localities (NSW Scientific Committee 1997).	No. No sandstone rock shelves above cliff lines in study area.
Pultenaea aristata	V	V	2V	Restricted to the Woronora Plateau, a small area between Helensburgh, south of Sydney, and Mt Kiera above Wollongong. The species occurs in either dry sclerophyll woodland or wet heath on sandstone. Flowering has been recorded in winter and spring (DEC 2005k).	No. No dry sclerophyll woodland or wet heath on sandstone in study area.
Pultenaea pedunculata	-	E1	-	Restricted to the Cumberland Plain and near Merimbula where it grows in dry sclerophyll forest and disturbed sites (Harden 2002). In western Sydney it occurs in three locations: within industrial and residential areas at Villawood and Prestons, and north-west of Appin between the Nepean River and Devines Tunnel No. 2 (DEC 2005l). It occurs in clay or sandy clay soils (Blacktown soil landscape) on Wianamatta shale, close to localised patches of Tertiary alluvium (Liverpool) or the shale/sandstone influence (west of Appin) (DEC 2005l). At all sites there is a lateritic influence in the soil with characteristic ironstone gravels present (DEC 2005l). This species is known to occur in remnants of Cooks River Clay Plain Scrub Forest (James *et al.* 1999).	Yes. Within Shale Sandstone Transition Forest in the study area.

Key: 1) Listed on the EPBC Act as Endangered (E) or Vulnerable (V)
2) Listed on the TSC Act as Endangered (E1), or Vulnerable (V)
3) ROTAP= Rare or Threatened Australian Plant (Briggs and Leigh 1995); for description of codes see Appendix 3

4.5 Fauna Habitats

The fauna habitat within the study area consists largely of woodland habitat and disturbed areas and broadly corresponds to the plant communities outlined in Section 4.2. For the purpose of this report, habitats are described for each proposed site. It should be noted that these habitats have been previously disturbed by agriculture (market gardens and grazing) and rural infrastructure (roads and power easement).

Existing substation

The existing substation has been previously cleared and contains no trees or shrubs providing few opportunities for native animal species. Although some bird species may use structures within the substation as perching refuges they are unlikely to be dependant on these resources.

Fauna habitat within the existing substation is considered to be in poor condition.

Powerline easement

The powerline easement has been previously cleared and is subjected to ongoing disturbances including market gardens. The easement itself consists of cleared paddocks with Eucalypts along the edge of the easement providing direct (foliage, nectar, exudates) and indirect food (arthropods) sources for a range of vertebrates, particularly birds. There were no obvious tree-hollow development and consequently there are few opportunities for hollow-dwelling fauna.

The understorey vegetation within the easement changes from scattered *Bursaria spinosa* and *Kunzea ambigua* in the southern section to a dense cover of *Kunzea ambigua* in the northern section of the easement. These species would provide important shelter and foraging habitat for a range of fauna including small birds (eg. fairywrens and robins) and ground-dwelling mammals (eg. Bushrat *Rattus fuscipes* and *Antechinus* sp.). The groundcover is dominated by a mixture of native and exotic grasses with fallen timber and rubbish scattered throughout the easement providing refuge and nesting habitat for a range invertebrates and -amphibians that rely on these 'moisture-retaining' microhabitats to over-winter or as refugia during periods of drought.

There are a number of man-made farm dams to the east of the easement. These dams are open with little emergent vegetation and no overhanging vegetation. Despite this, it is likely that common waterbirds may visit the site on any regular basis and permanent residents would be limited to common reptile and frog species.

Proposed substation and access track

The proposed substation and access track have been previously disturbed and are subjected to ongoing grazing activities. The sites are located within a cleared paddock, with scattered *Eucalyptus moluccana* and *E. tereticornis*. Although no obvious signs of tree-hollow development were observed (hence there are few opportunities for hollow-dwelling fauna), these trees are considered to be feed trees for threatened fauna such as the Koala and Swift Parrot.

The understorey has been largely removed and consists of a mixture of native and exotic grasses providing habitat resources for common birds and reptiles.

The proposed access track traverses patches of isolated Myrtaceaeous trees (*Eucalyptus moluccana* and *Angophora floribunda*) which dominate the upper canopy. The understorey is restricted to the based of the trees and consists of, shrubs of *Bursaria spinosa* and the weed species *Olea europea* providing shelter and foraging resources for small birds and mammals.

Fauna habitats within this are highly disturbed and are considered to be in Poor condition, with the ground flora containing a low number of indigenous species; fragmentation of vegetation communities; a highly disturbed ground, log and litter layer; and, few resources available for native fauna.

Proposed boreholes and easement

The proposed boreholes and connecting easement are located downslope and to the south of the proposed substation. The vegetation is dominated by Myrtaceaeous trees, mainly Eucalypts, with a dense shrub layer providing habitat for small birds and mammals. A few small tree hollows (formed in stags, mature and/or senescent trees) were recorded in the study area, providing nesting and roosting habitat for a range of common birds and arboreal mammal species.

The ground cover has a moderate layer of leaf litter and fallen branches and rock outcrops are scattered throughout the site, providing refuge and nesting habitat for a range of terrestrial animals.

The proposed borehole locations are approximately 10 to15 m upslope and to the north of a small ephemeral drainage line. The drainage line runs through the site to the Nepean River in the east and is approximately 60 cm wide and 15 cm deep with a sandy soil substrate and scattered rocky outcrops. The riparian vegetation is consistent with surrounding habitat with little or no emergent vegetation. Such drainage lines are often choked with debris such as scattered timber, bark and leaf litter providing potential habitat for reptiles and amphibians such as Red-crowned Toadlet, although not previously recorded within the local area.

Fauna habitat within the study area is considered to be in moderate to good condition, with the ground flora containing a high number of indigenous species; a dense understorey, log and litter layer largely intact and undisturbed; and a variety of habitat and resources for a range of native fauna available.

It should also be noted that the native vegetation adjoining the proposed borehole locations and connecting easement had recently been disturbed by a newly created track, approximately 5 m wide, following a small powerline easement downslope towards the Nepean River.

4.5.1 Fauna

A detailed fauna survey was not undertaken for this assessment. As the assessment is based on presence or absence of suitable habitat for a threatened species, detailed survey techniques are not necessary as the habitat based approach is conservative in nature, requiring only the presence of habitat, not individual records, for a threatened species to be considered further. The methodology employed for this assessment is sufficient to determine if the proposal would have a significant impact on any threatened terrestrial species, populations or ecological communities.

Incidental observations of animal species utilising the study site are listed in Appendix 2 and include one reptile, nine birds and three mammals (two introduced).

4.5.2 Significant Fauna

A total of 39 threatened or migratory animal species or their habitat have been previously recorded within the local area (DEC Atlas of NSW Wildlife and DEH EPBC Online Database) (Table 2, Figure 5). Of these, 34 animal species are listed under the TSC Act and 17 animal species listed under the EPBC Act.

No threatened fauna were recorded during the current survey. However, the study area contains potential habitat for 23 threatened species listed on the TSC Act and /or the EPBC Act (Table 2). These have been considered further in Section 5 (Impact Assessment).

Table 2: Terrestrial fauna listed on the TSC Act or EPBC Act that may occur in the local area

Scientific Name	Common Name	EPBC Act [1]	TSC Act [2]	Habitat	Potential habitat
Amphibians					
Litoria aurea	Green and Golden Bell Frog	V	E1	Found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes (NPWS 1999c). Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks (White and Pyke 1996, NPWS 1999c).	No
Litoria littlejohni	Littlejohn's Tree Frog	V	V	Occurs in wet and dry sclerophyll forests associated with sandstone outcrops between 280 and 1000 m on the eastern slopes of the Great Dividing Range (Barker *et al.* 1995). Prefers rock flowing streams, but individuals have also been collected from semi-permanent dams with some emergent vegetation (Barker *et al.* 1995). Forages both in the tree canopy and on the ground, and has been observed sheltering under rocks on high exposed ridges during summer. It is not known from coastal habitats.	No
Heleioporus australiacus	Giant Burrowing Frog	V	V	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks (Daly 1996, Recsei 1996). Can also occur within shale outcrops within sandstone formations. In the southern part of its range can occur in wet and dry forests, montane sclerophyll woodland and montane riparian woodland (Daly 1996). Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water (Barker *et al.* 1995).	No
Mixophyes balbus	Stuttering Frog	V	E1	This species is usually associated with mountain streams, wet mountain forests and rainforests (Barker *et al.* 1995). It rarely wanders very far from the banks of permanent forest streams, although it will forage on nearby forest floors. Eggs are deposited in leaf litter on the banks of streams and are washed into the water during heavy rains (Barker *et al.* 1995).	No
*Pseudophryne australis**	Red-crowned Toadlet	-	V	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks that feed into larger semi-perennial streams. These creeks are characterised after rain by a series of shallow pools lined by dense grasses, ferns and low shrubs (Thumm and Mahony 1996, Thumm and Mahoney 1997).	Yes
Birds					
Haliaeetus leucogaster	White-bellied Sea-eagle	M	-	A migratory species that is resident to Australia. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes (English and Predavec 2001).	No
Hirundapus caudacutus	White-throated Needletail	M	-	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges (Pizzey 1983).	No
Burhinus grallarius	Bush Stone-curlew	-	E1	Lightly timbered open forest and woodland, or partly cleared farmland with remnants of woodland, with a ground cover of short sparse grass and few or no shrubs where fallen branches and leaf litter are present (Marchant and Higgins 1993).	Yes

Scientific Name	Common Name	EPBC Act [1]	TSC Act [2]	Habitat	Potential habitat
Callocephalon fimbriatum	Gang-gang Cockatoo	-	V	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests (Higgins 1999). Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest (Forshaw and Cooper 1981). In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas (Shields and Crome 1992). It requires tree hollows in which to breed (Gibbons and Lindenmayer 1997).	Yes
Calyptorhynchus lathami	Glossy Black-cockatoo	-	V	Inhabits forest with low nutrients, characteristically with key Allocasuarina species. Tends to prefer drier forest types (NPWS 1999b) with a middle stratum of Allocasuarina below Eucalyptus or Angophora. Often confined to remnant patches in hills and gullies (Higgins 1999). Breed in hollows stumps or limbs, either living or dead (Higgins 1999).	Yes
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	-	V	Live in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present (Traill and Duncan 2000).	No
Monarcha melanopsis	Black-faced Monarch	M	-	A migratory species found during the breeding season in damp gullies in temperate rainforests. Disperses after breeding into more open woodland (Pizzey 1983).	Yes
Rhipidura rufifrons	Rufous Fantail	M	-	Migratory species that prefers dense, moist undergrowth of tropical rainforests and scrubs. During migration it can stray into gardens and more open areas (Pizzey 1983).	Yes
Melithreptus gularis gularis	Black-chinned Honeyeater	-	V	Found mostly in open forests and woodlands dominated by box and ironbark eucalypts (Higgins *et al.* 2001). It is rarerly recorded east of the Great Dividing Range (Higgins *et al.* 2001).	No
Xanthomyza phrygia	Regent Honeyeater	E	E1	A semi-nomadic species occurring in temperate Eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forests associations and wet lowland coastal forests (Pizzey 1983, NPWS 1999d).	Yes
Pyrrholaemus sagittata	Speckled Warbler	-	V	This species occurs in eucalypt and cypress woodlands on the hills and tablelands of the Great Dividing Range. They prefer woodlands with a grassy understorey, often on ridges or gullies (Blakers *et al.* 1984, NSW Scientific Committee 2001). The species is sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground and in the understorey for arthropods and seeds (Blakers *et al.* 1984, NSW Scientific Committee 2001). Home ranges vary from 6-12 hectares (NSW Scientific Committee 2001).	No
Stagonopleura guttata	Diamond Firetail	-	V	Found in a range of habitat types including open Eucalypt forest, mallee and acacia scrubs (Pizzey and Knight 1997).	Yes
Melanodryas cucullata	Hooded Robin	-	V	This species lives in a wide range of temperate woodland habitats, and a range of woodlands and shrublands in semi-arid areas (Traill and Duncan 2000).	Yes
Lathamus discolor	Swift Parrot	EM	E1	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen an associated insects (Forshaw and Cooper 1981). The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW (Shields and Crome 1992). This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability (Pizzey 1983).	Yes

Scientific Name	Common Name	EPBC Act [1]	TSC Act [2]	Habitat	Potential habitat
Neophema pulchella	Turquoise Parrot	-	V	Occurs in open woodlands and eucalypt forests with a ground cover of grasses and understorey of low shrubs (Morris 1980). Generally found in the foothills of the Great Divide, including steep rocky ridges and gullies (Higgins 1999). Nest in hollow-bearing trees, either dead or alive; also in hollows in tree stumps. Prefer to breed in open grassy forests and woodlands, and gullies which are moist (Higgins 1999).	No
Rostratula australis	Australian Painted Snipe	V	E1	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, ephemeral or permanent, although they have been recorded in brackish waters (Marchant & Higgins 1993).	Yes
Gallinago hardwickii	Latham's Snipe	M	-	Typically found on wet soft ground or shallow water with good cover of tussocks. Often found in wet paddocks, seepage areas below dams (Pizzey and Knight 1997).	Yes
Ninox connivens	Barking Owl	-	V	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country (Pizzey 1983).	Yes
Ninox strenua	Powerful Owl	-	V	Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. It is most commonly recorded within Red Turpentine in tall open forests and Black She-oak within open forests (Debus and Chafer 1994). Large mature trees with hollows at least 0.5 m deep are required for nesting (Garnett 1992). Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials (Gibbons and Lindenmayer 1997). Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm (Gibbons and Lindenmayer 1997).	Yes
Invertebrates					
Meridolum corneovirens	Cumberland Plain Land Snail	-	E1	Most likely restricted to Cumberland Plain, Castlereagh Woodlands and boundaries between River-flat Forest and Cumberland Plain Woodland. It is normally found beneath logs, debris and amongst accumulated leaf and bark particularly at the base of trees. May also use soil cracks for refuge (NPWS 2000a).	No
Mammals					
Cercartetus nanus	Eastern Pygmy-possum	-	V	Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Will often nest in tree hollows, but can also construct its own nest (Turner and Ward 1995). Because of its small size it is able to utilise a range of hollow sizes including very small hollows (Gibbons and Lindenmayer 1997). Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5ha area over a 5 month period (Ward 1990).	No
Dasyurus maculatus	Spotted-tailed Quoll	E	V	Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests (Dickman and Read 1992). Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage (Edgar and Belcher 1995).	No
Petrogale penicillata	Brush-tailed Rock-wallaby	V	E1	Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices (Eldridge and Close 1995).	No

Scientific Name	Common Name	EPBC Act [1]	TSC Act [2]	Habitat	Potential habitat
Mormopterus norfolkensis	Eastern Freetail Bat	-	V	Most records are from dry eucalypt forests and woodlands to the east of the Great Dividing Range. Appears to roost in trees, but little is known of this species habits (Allison and Hoye 1995, Churchill 1998).	Yes
Petaurus australis	Yellow-bellied Glider	-	V	Restricted to tall native forests in regions of high rainfall. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows. Critical elements of habitat include sap-site trees, winter flowering eucalypts, mature trees suitable for den sites and a mosaic of different forest types (NPWS 1999e).	No
Petaurus norfolcensis	Squirrel Glider	-	V	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range (Suckling 1995). Requires abundant hollow bearing trees and a mix of eucalypts, banksias and acacias (Quin 1995). There is only limited information available on den tree use by Squirrel gliders, but it has been observed using both living and dead trees as well as hollow stumps (Gibbons and Lindenmayer 1997). Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked (Menkhorst *et al.* 1988).	No
Phascolarctos cinereus	Koala	-	V	Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall (Reed and Lunney 1990, Reed *et al.* 1990).	Yes
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost (Tidemann 1995) although some individuals may travel up to 70 km (Augee and Ford 1999).	Yes
	Eastern Bent-wing Bat	-	V	This species uses a broad range ogf habitat including rainforest, wet and dry sclerophyll forest, paper bark forest and open woodland and grassland (Churchill 1998). The species is cave dweller (although some individuals occasionally roost in human constructed tunnels and buildings) (Strahan 1995, Churchill 1998).	No
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range (Hoye and Dwyer 1995). Can also be found on the edges of rainforests and in wet sclerophyll forests (Churchill 1998). This species roosts in caves and mines in groups of between 3 and 37 individuals (Churchill 1998).	No
Falsistrellus tasmaniensis	Eastern False Pipistrelle	-	V	Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high (Churchill 1998). Two observations have been made of roosts in stem holes of living eucalypts (Phillips 1995). There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary but enter torpor (Menkhorst and Lumsden 1995). This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites (Menkhorst and Lumsden 1995).	No
Myotis adversus	Large-footed Myotis	-	V	Occurs in most habitat types as long as they are near permanent water bodies, including streams, lakes and reservoirs. Commonly roost in caves, but can also roost in tree hollows, under bridges and in mines (Richards 1995, Churchill 1998).	No
Scoteanax rueppellii	Greater Broad-nosed Bat	-	V	Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m (Churchill 1998)In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat (Hoye and Richards 1995). This species roosts in hollow tree trunks and branches (Churchill 1998).	No

Scientific Name	Common Name	EPBC Act [1]	TSC Act [2]	Habitat	Potential habitat
Reptiles					
Hoplocephalus bungaroides	Broad-headed Snake	V	E1	Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer (Webb 1996, Webb and Shine 1998).	Yes
Varanus rosenbergi	Rosenberg's Goanna	-	V	This species is a Hawkesbury/Narrabeen sandstone outcrop specialist (Wellington and Wells 1985). Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests (Cogger 1992).	Yes

Key: 1) Listed on the EPBC Act as Endangered (E) or Vulnerable (V) or covered under migratory provisions (M) on the EPBC Act
2) Listed on the TSC Act as Endangered (E1), Vulnerable (V)
*** not previously recorded within a 10km radius**

5.0 IMPACT ASSESSMENT

Due to the inaccuracies in the NPWS (2002) vegetation mapping (as discussed in Section 4.2 above), calculations of the impacted area are based on a combination of the NPWS (2002) vegetation mapping and the current aerial photo. The calculated area of impact is likely to be an overestimate, as areas supporting scattered trees have been included in the calculations as supporting a native vegetation community as a conservative measure.

5.1 Potential Impacts on Vegetation Communities

The proposed upgrade to the existing powerline and substation will result in the clearing of approximately 1.2 ha of native vegetation, with a further 2.3 ha being indirectly impacted. The proposed substation and boreholes and related access track and easement will result in the removal of approximately 0.2 ha of native vegetation, with a further 0.6 ha being indirectly impacted. These impacted areas overlap to some extent, leaving a total impact area of approximately 1.5 ha of vegetation cleared and a further 2.9 ha indirectly impacted.

The native vegetation communities in the study area that will be impacted by the proposal include:

- Shale Sandstone Transition Forest; and,
- Western Sandstone Gully Forest.

The impacts of the proposal on Shale Sandstone Transition Forest are discussed further in section 5.1.1 below.

Western Sandstone Gully Forest will be impacted by the proposed development, requiring the clearing of approximately 0.4 ha of Western Sandstone Gully Forest, with indirect impacts to a further 1.3 ha. Indirect impacts are likely to include weed invasion given the presence of exotic grasses within the adjoining cleared paddocks. Other indirect impacts may include trampling, rubbish dumping, erosion and edge effects. Given that approximately 1,900 ha of this vegetation community has been mapped by DEC (NPWS 2002b) as occurring in the local area (10 km radius of study area), it is not considered that impacting approximately 1.7 ha will result in a significant impact on this vegetation community. Furthermore, suitable mitigation measures such as erosion control and site rehabilitation are likely to reduce the indirect impacts on the ecological values within the study area.

Western Sandstone Gully Forest is not listed as an Endangered Ecological Community (EEC) on the TSC or EPBC Acts.

Given the proximity of the Nepean River (approximately 130 m downslope of the proposed boreholes) and the ephemeral drainage line draining to the Nepean

River (approximately 10 to 15 m to the south of the proposed boreholes), sedimentation and erosion could potentially impact the River and its tributaries. Erosion and sedimentation control measures, such as sediment fencing and placing cleared native vegetation biomass over disturbed areas to assist in natural regeneration, would assist in reducing these impacts. Techniques to minimise the impact of the proposal on the native vegetation of the area is further discussed in the Recommendations section (Section 6.0).

The proposed boreholes are adjacent to an existing disturbed area, where an approximately 5 m wide east-west running easement has been cleared on the slopes towards the Nepean River. Repositioning the easement connecting the substation to the boreholes within this disturbed area or further upslope and to the west, within existing cleared areas would reduce the impact of the proposal on Western Sandstone Gully Forest and the ephemeral drainage line.

5.1.1 Endangered Ecological Communities

The proposal will impact on one EEC: Shale Sandstone Transition Forest. As such, an Assessment of Significance under the TSC Act (Appendix 4) and Significant Impact Criteria under the EPBC Act (Appendix 5) is required for this EEC.

Approximately 1.1 ha of Shale Sandstone Transition Forest will be impacted by the proposal, with a further 1.6 ha indirectly impacted. It was found that the proposal was not likely to have a significant impact on Shale Sandstone Transition Forest given the small size and poor condition of the patches of SSTF to be impacted by the proposal and the extent of the community in the locality, with 5,481 ha mapped (NPWS 2002b).

5.2 Potential Impacts on Flora

Native plant species that will be impacted by the proposal are generally restricted to common shale and sandstone species. Impact to trees should be minimised through avoiding patches of native vegetation and scattered trees and relocating the proposed boreholes and access tracks to existing cleared areas where possible.

Natural regeneration of disturbed areas should be encouraged through bush regeneration techniques such as brush matting and spreading of any cleared native biomass back over the cleared area once works are completed. Regeneration of native plant species within the cleared areas will reduce fragmentation of habitats in the area. Techniques to minimise the impact of the proposal on native flora of the area is further discussed in the Recommendations section (Section 6.0).

5.2.1 Potential Impacts on Threatened Plant Species

No threatened plant species were recorded in the study area. However, potential habitat for six threatened flora species (*Epacris purpurescens* var. *purpurescens, Grevillea parviflora* spp. *parviflora, Persoonia bargoensis, Persoonia hirsuta, Pomaderris brunnea* and *Pultenaea pedunculata*) occurs within the study area.

The proposal will remove approximately 1.5 ha of potential habitat for these species, with a further 2.9 ha indirectly impacted.

Assessments of Significance under the TSC Act and/or Significant Impact Criteria under the EPBC Act have been prepared for these species (see Appendix 5 and 6). These assessments concluded that the proposal is unlikely to have a significant impact, given that approximately 5,481 ha of potential habitat in the form of Shale Sandstone Transition Forest and 1,900 ha of potential habitat in the form of Western Sandstone Gully Forest has been mapped by DEC (NPWS 2002b) as occurring within a 10 km radius of the study area, and that none of the species were recorded in the surveys of the study area. An SIS under the TSC Act or Referral under the provisions of the EPBC Act is not considered necessary.

Impacts on potential habitat for threatened plant species can be minimised through sedimentation and erosion controls, restrictions on landscaping, and bush regeneration techniques, as discussed in the Recommendations section (Section 6.0).

5.3 Potential Impacts on Fauna Habitats

The main impact of the proposal on fauna within the study area is the removal and/or modification of potential habitat. The proposed boreholes and construction of the substation will require clearing including subsequent slashing of the shrub layer and removal of some native trees, approximately 4.4 ha (1.5 directly and 2.9 ha indirectly impacted) of Woodland habitat would be modified. Although these habitat features are widely represented within the local area (approximately 7,381 ha within a 10 km radius of the subject site) animal species that utilise these areas may be impacted, thus the impact of the proposal on species reliant on these habitat features is discussed further below.

5.3.1 Potential Impacts on Threatened Fauna

Where there is potential habitat (foraging or breeding resources) for threatened species in the study area, further consideration must be given to the potential impact of the proposal on these species. The proposal may impact threatened species by resulting in any of the following situations arising:

- death or injury of individuals;
- loss or disturbance of limiting foraging resources; and/or
- loss or disturbance of limiting breeding resources.

Limiting resources are specialised habitat components that species are dependent on for their ongoing survival. Such limiting resources are predominantly associated with specialised breeding habitats (such as tree hollows or suitable nest/maternity roost sites) that occur at low densities, with high levels of competition from a range of species. However, for some species, limiting resources include specialised foraging habitats that have a restricted distribution (such as Koalas feeding only on specific tree species).

Actual or potential habitat exists within the study area for a total of 24 threatened animals species listed on the TSC Act and /or EPBC Act identified in Table 2.

Amphibians

Potential habitat for one threatened frog species, the Red-crowned Toadlet, occurs along the small ephemeral drainage line that runs into the Nepean River. Although the proposed works will not remove potential habitat for this species indirect impacts such as run-off and erosion may species modify potential breeding and foraging resources for this species, as such, a TSC Act Assessment of Significance has been prepared for the Red-crowned Toadlet (Appendix 4).

Based on the Assessment of Significance it is unlikely that the proposed works would have a significant impact on the Red-crowned Toadlet habitat. Given the extant of potential habitat in the local area and poor condition of habitat within the study area it is unlikely that the proposed works would have a significant impact on this species. Furthermore, with suitable mitigation measures implemented during the construction and operation phase, such as sedimentation control measures, any potential impacts will be further reduced. A SIS is not recommended for the Red-crowned Toadlet.

Birds

Potential habitat for 15 threatened bird species occurs in Woodland habitat within study area. The proposal would involve clearing and/or modification of approximately 4.4 ha (1.5 directly and 2.9 ha indirectly impacted) of this habitat and the loss of potential foraging resources for these bird species. Given the mobility of these bird species and larger areas of continuous woodland habitat (approximately 7,544ha) (NPWS 2002b) within the study area, it is unlikely that the proposal would have a significant impact on any limiting habitat. As such Assessments of Impacts have not been prepared for any bird species.

Mammals

Potential habitat for six threatened mammals has been identified in the Woodland habitat within the study area. Habitat for these species occurs along the Nepean River and within Woodland habitat. The proposed works are unlikely to cross the Nepean River, hence the impact of the proposed works on species reliant on these habitat features will be low (e.g. Large-footed Myotis). However the proposed clearing of approximately 4.4 ha (1.5 directly and 2.9 ha indirectly impacted) of potential Woodland habitat may reduce the availability of nesting and foraging resources for species such as micro-bats. Given the large area of continuous Woodland habitat in the study area (approximately 7,544 ha) it is considered unlikely that the loss of 0.06% of habitat would have long-term negative consequences for the species local occurrence. As such Assessments of Impacts have not been prepared for these species.

Reptiles

Two threatened reptiles (Broad-headed Snake and Rosenberg's Goanna) have potential habitat within the study area. Rocky outcrops and small crevices occur near the proposed borehole sites within the study area. These habitats provide refuge for a range of reptile species, including the threatened Broad-headed Snake. This species requires these habitats for over-wintering, thermoregulation and shelter as well as refuges for neonates, juveniles and potential prey species.

The proposal will avoid areas identified as potential habitat for threatened Broad-headed Snake including rocky outcrops where exfoliating sandstone sheets have been observed. Therefore, it is unlikely that the proposal would have a significant impact on any Broad-headed Snake habitat.

Potential habitat for Rosenberg's Goanna occurs within the Woodland habitat. Given the extent of continuous Woodland, the loss of 0.06% of habitat is unlikely to have long-term negative consequences for the species local occurrence. As such Assessments of Impacts have not been prepared for Rosenberg's Goanna or the Broad-headed Snake.

6.0 RECOMMENDATIONS

The proposal is unlikely to have a significant impact on threatened species, endangered ecological communities or populations, however, it is recommended that the following points be taken into consideration to minimise any disturbances on the ecological values of the study area:

- adjustment of the location of the access track to avoid native trees;
- where possible trees with hollows should be retained;
- proposed boreholes and access tracks should be located within existing cleared areas where possible;
- appropriate sediment/erosion and drainage control devices should be utilised during and after excavation works in order to prevent erosion resulting in sediment laden run off, which could potentially impact on the Nepean River and its tributaries;
- care should be taken during construction to minimise disturbance to native vegetation and to avoid spreading exotic species propagules into the adjoining vegetation. To minimise the likelihood of weed spread or the introduction of disease, vehicles should be cleaned prior to use in the study area;
- any landscaping or rehabilitation works should use local native species;
- any chemicals used on site during the construction and operation phase of the proposal will be taken off site after use and disposed of appropriately;
- any native shrubs, logs or bush-rock that are removed should be stockpiled on the side of the proposed access routes and raked back over the site following completion of the works; and,
- If required, bush regeneration and weed control should be undertaken to ensure the flora and fauna of the local area are protected throughout the construction and operation phases of the proposed development. Bush regeneration works, including weed control and rehabilitation, may be required if the area does not regenerate naturally or if exotic species become established in the area. Bush regeneration techniques such as brush matting and spreading of cleared native biomass over disturbed areas should be used to encourage native regeneration where necessary. Such works should be undertaken by suitably qualified and experienced personnel.

7.0 CONCLUSION

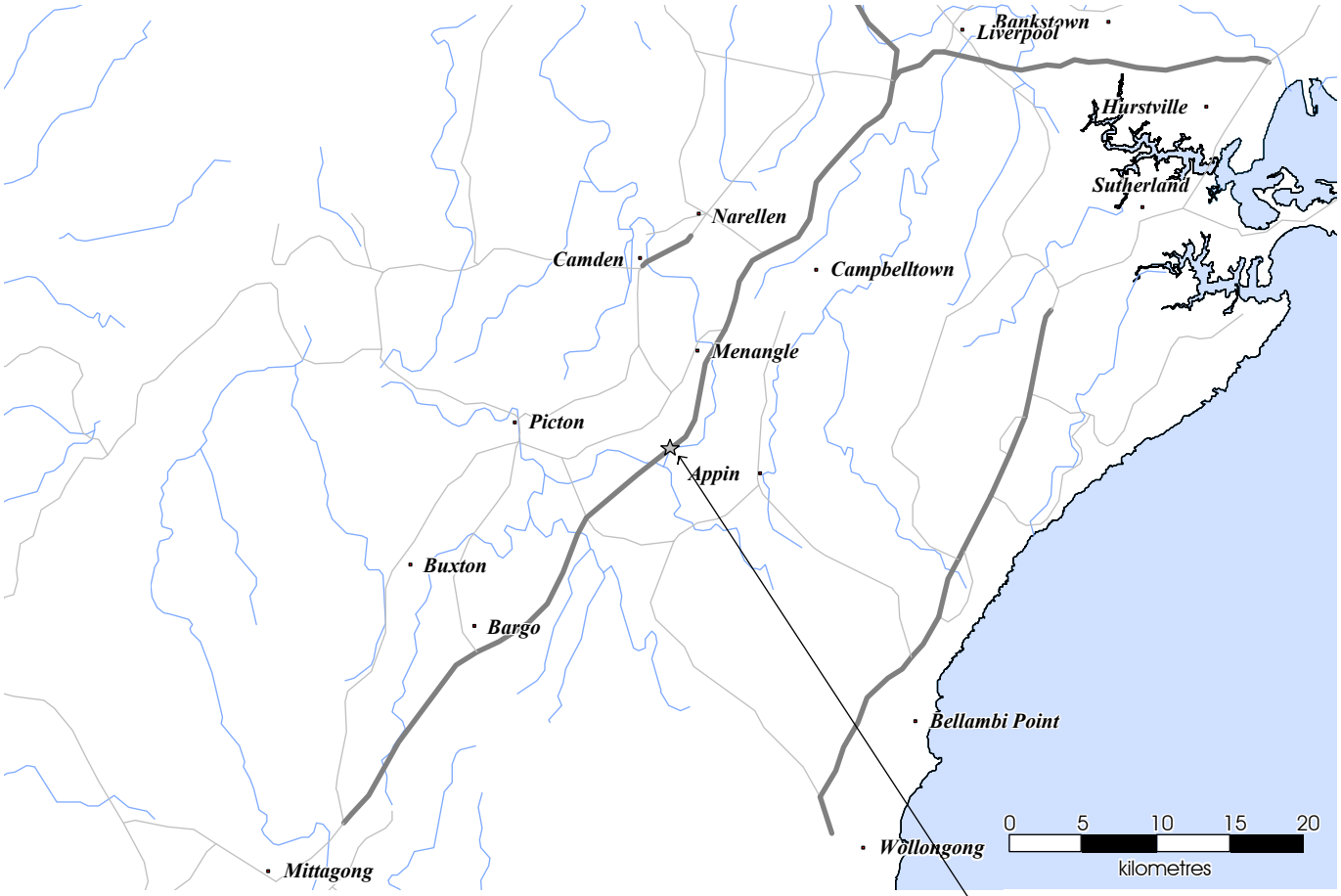
The study area supports cleared paddocks and patches of native vegetation consistent with Shale Sandstone Transition Forest and Western Sandstone Gully Forest in varying condition. The proposal will involve clearing of vegetation (approximately 1.5 ha), the construction of a substation and associated access track, three boreholes and associated easement and the upgrade of an existing easement and substation. It is likely that indirect impacts will occur over a further 2.9 ha of native vegetation.

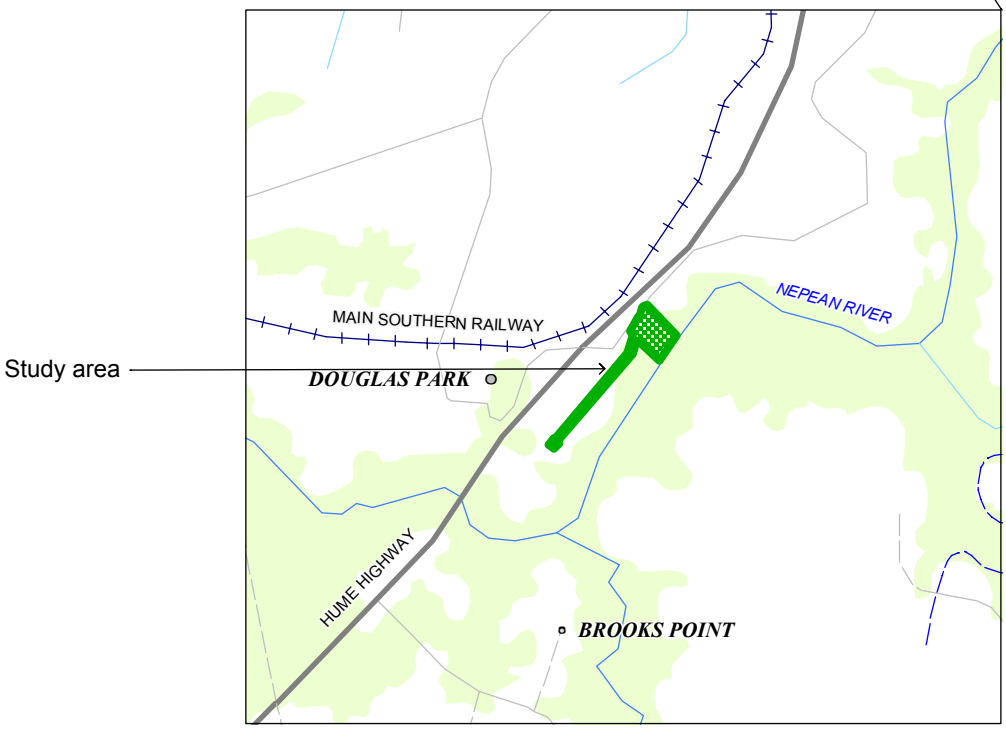
The proposed development will impact on one Endangered Ecological Community (Shale Sandstone Transition Forest), potential habitat for six threatened plant species (*Epacris purpurescens* var. *purpurescens, Grevillea parviflora* spp. *parviflora, Persoonia bargoensis, Persoonia hirsuta, Pomaderris brunnea* and *Pultenaea pedunculata*) and potential habitat for one threatened animal species the Red-crowned Toadlet. As such, Assessments of Significance under the TSC Act and/or Significant Impact Criteria under the EPBC Act were undertaken for these threatened biota, which concluded that the proposal was not likely to have a significant impact.

A Species Impact Statement (TSC Act) or a Referral for Matters of National Significance (EPBC Act) is not considered necessary for any threatened species, populations of endangered ecological communities within the study area for the proposed activities.

Recommendations to minimise any disturbances on the ecological values have been provided in Section 6.0.

FIGURES





BIOSIS RESEARCH Pty. Ltd.

15 - 17 Henrietta Street
Chippendale
NEW SOUTH WALES 2008

Figure 1: Location of the Study Area in a regional context.

DATE: 15 November 2006

Checked by: TE | File number: S4567

Location:-.4000\4500s\4567\Mapping\S4567 F1_locality.WOR

Scale: 0 0.5 1.0 1.5 2.0 kilometres

N W E S

Key

- Proposed borehole
- Existing pole
- Road boundary
- Cable corridor
- Compound boundary
- Existing transmission line
- Study Area

Acknowledgements: BHP Billiton

Hume Highway

NEPEAN RIVER

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Figure 2: Proposal

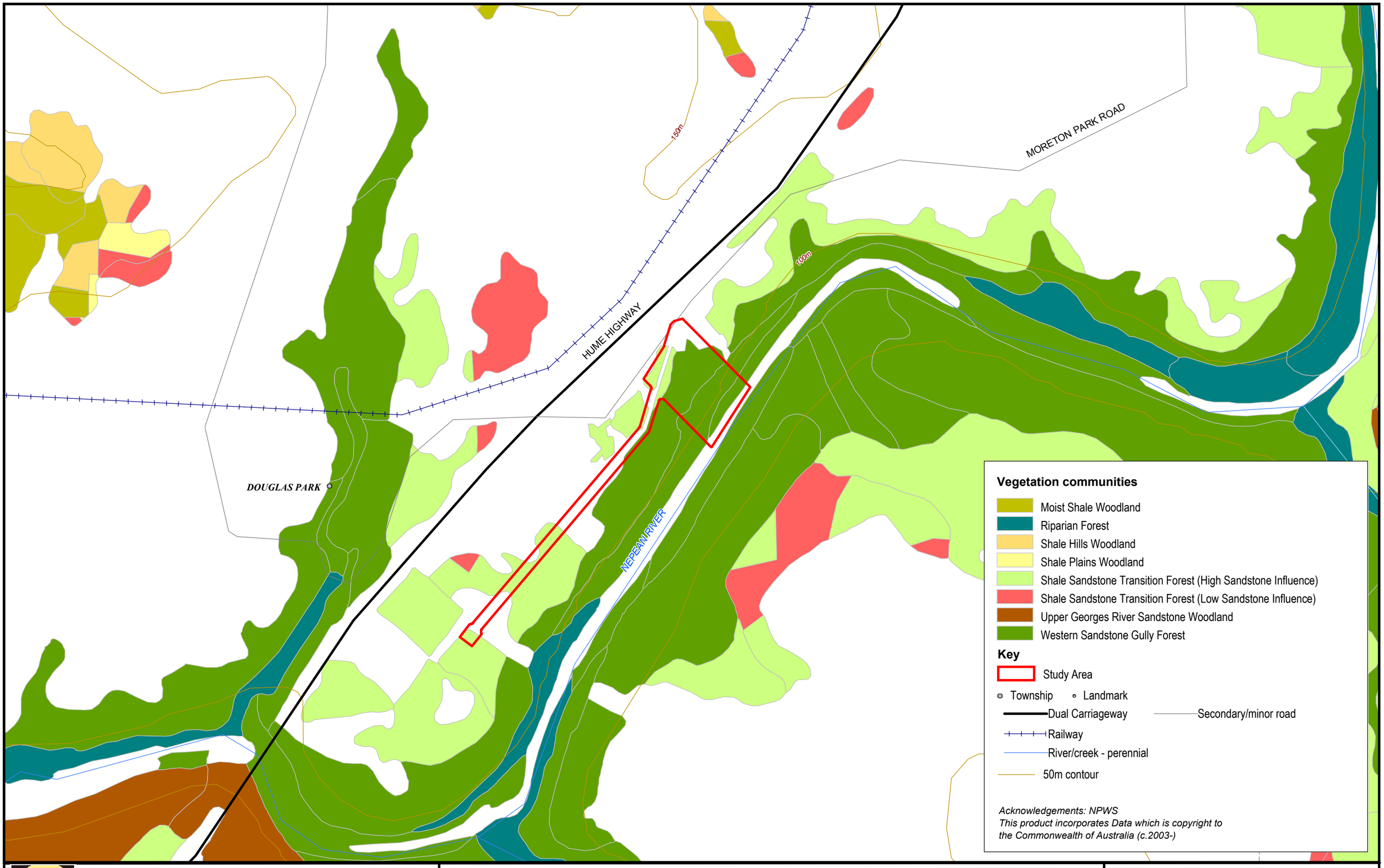
DATE: 7 February 2007

Checked by: TE | File number: S4567

Location:-...4000\4500s\4567\Mapping\S4567 F2_plan.WOR

Scale: 0 30 60 90 120 150 metres

N W E S



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NEW SOUTH WALES 2008

Figure 3: Vegetation mapping (NPWS 2002b)

DATE: 7 February 2007

Checked by: SEW

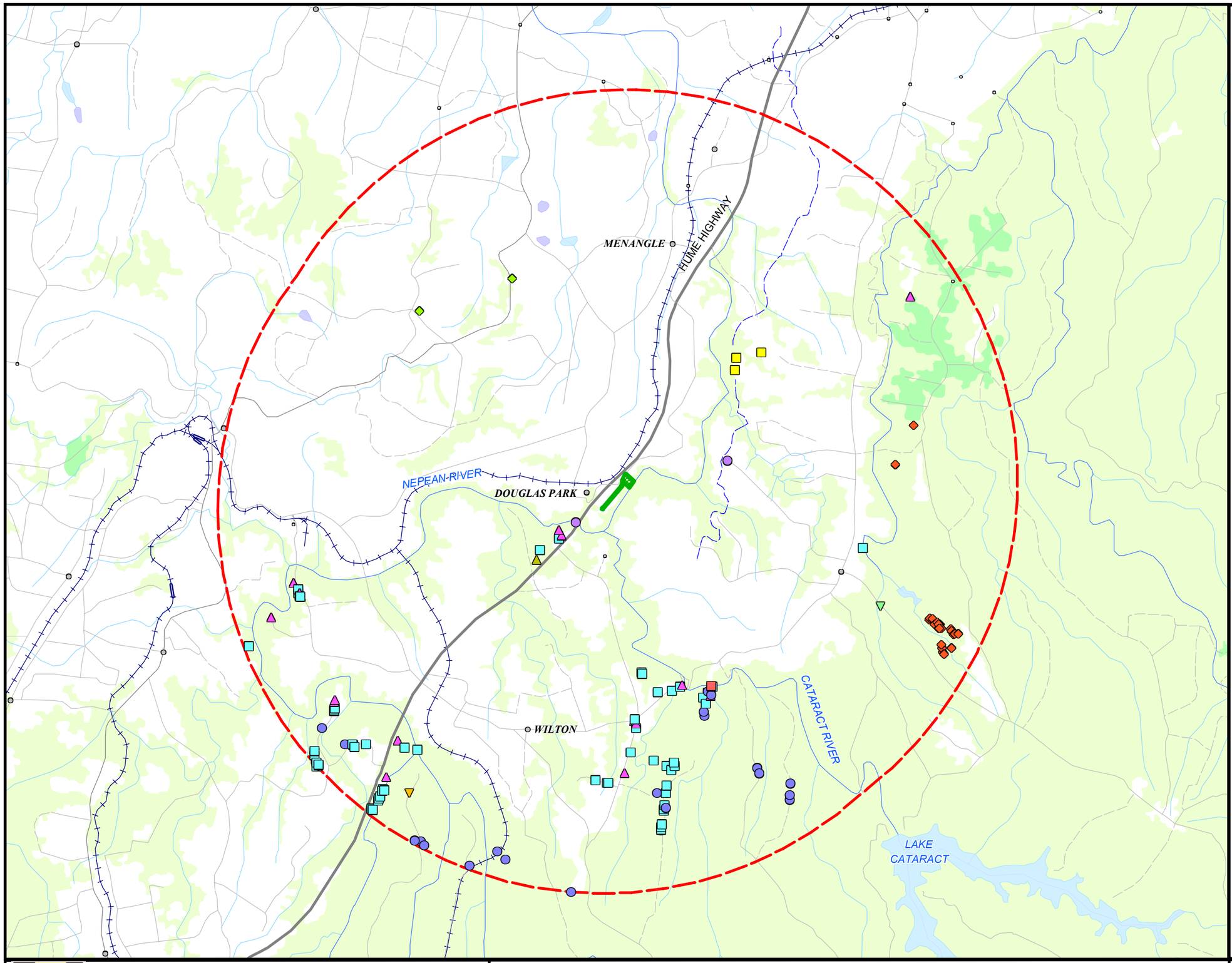
File number: S4567

Location:-..4000\4500s\4569\Mapping\S4567 F3_veg.WOR

Scale: 0 0.1 0.2 0.3 0.4 0.5 kilometres

N W E S

Figure 3: Vegetation mapping (NPWS 2002b)



Threatened plant species

- *Acacia bynoeana*
- *Cynanchum elegans*
- *Epacris purpurascens var. purpurascens*
- *Grevillea parviflora subsp. parviflora*
- *Melaleuca deanei*
- *Persoonia bargoensis*
- *Persoonia hirsuta*
- *Pomaderris brunnea*
- *Pterostylis saxicola*
- *Pultenaea aristata*
- *Pultenaea pedunculata*

Key

- Study Area
- 10km search area
- Township
- Landmark
- Dual Carriageway
- Major road
- Secondary/minor road
- Track
- Railway
- Rail tunnel
- Canal
- River/creek - perennial
- River/creek - ephemeral
- Lake
- Reservoir
- Forest
- Orchard

Acknowledgements: NPWS

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Chippendale
NEW SOUTH WALES 2008

Figure 4: Threatened flora, listed on the TSC Act, recorded within 10km of the Study Area

DATE: 24 October 2006
Checked by: SEW
File number: S4567
Location:-..4000\4500s\4569\Mapping\S4567 F4_flora.WOR

Scale: 0 1 2 3 4 5 kilometres

N W E S

Figure 4: Threatened flora, listed on the TSC Act, recorded within 10km of the Study Area

MENANGLE

HUME HIGHWAY

NEPEAN RIVER

WILTON

CATARACT RIVER

LAKE CATARACT

Threatened fauna

- Barking Owl
- Black-chinned Honeyeater (eastern subspecies)
- Broad-headed Snake
- Brown Treecreeper
- Bush Stone-curlew
- Cumberland Plain Land Snail
- Diamond Firetail
- Eastern Bentwing-bat
- Eastern False Pipistrelle
- Eastern Freetail-bat
- Eastern Pygmy-possum
- Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Greater Broad-nosed Bat
- Grey-headed Flying-fox
- Hooded Robin
- Koala
- Large-eared Pied Bat
- Large-footed Myotis
- Powerful Owl
- Regent Honeyeater
- Rosenberg's Goanna
- Speckled Warbler
- Spotted-tailed Quoll
- Squirrel Glider
- Swift Parrot
- Turquoise Parrot
- Yellow-bellied Glider

Key

- Study Area
- 10km search area
- Township
- Landmark
- Dual Carriageway
- Major road
- Secondary/minor road
- Track
- Railway
- Rail tunnel
- Canal
- River/creek - perennial
- River/creek - ephemeral
- Lake
- Reservoir
- Forest
- Orchard

Acknowledgements: NPWS

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Chippendale
NEW SOUTH WALES 2008

Figure 5: Threatened fauna, listed on the TSC Act, recorded within 10km of the Study Area

DATE: 24 October 2006

Checked by: SEW | File number: S4567

Location:-..4000\4500s\4569\Mapping\S4567 F5_fauna.WOR

Scale: 0 1 2 3 4 5 kilometres

N W E S

Figure 5: Threatened fauna, listed on the TSC Act, recorded within 10km of the Study Area

PLATES

Plate 1: Existing substation

Plate 2: Existing powerline easement

Plate 3: Location of proposed substation

Plate 4: Ephemeral drainage line within Western Sandstone Gully Forest

Plate 5: Recently cleared track in vicinity of proposed boreholes and suggested location of easement connecting borehole to substation

Plate 6: Location of proposed boreholes

APPENDICES

APPENDIX 1
Flora Results

Family		Scientific Name	Common Name
Monocotyledons			
Cyperaceae			
		Gahnia aspera	
Lomandraceae			
		Lomandra longifolia	Spiny-headed Mat-rush
		Lomandra multiflora ssp. *multiflora*	Many-flowered Mat-rush
Poaceae			
		Aira spp.	
	*	*Andropogon virginicus*	Whisky Grass
		Aristida vagans	Threeawn Speargrass
	*	*Arundo donax*	Giant Reed
	*	*Briza maxima*	Quaking Grass
	*	*Bromus catharticus*	Prairie Grass
		Cynodon dactylon	Common Couch
		Echinopogon ovatus	Forest Hedgehog Grass
		Imperata cylindrica var. *major*	Blady Grass
	*	*Lolium perenne*	Perennial Ryegrass
		Microlaena stipoides var. *stipoides*	Weeping Grass
	*	*Paspalum dilatatum*	Paspalum
		Themeda australis	Kangaroo Grass
Dicotyledons			
Apiaceae			
		Centella asiatica	Pennywort
Asteraceae			
		Calotis dentex	
	*	*Cirsium vulgare*	Spear Thistle
	*	*Hypochaeris radicata*	Catsear
	*	*Senecio madagascariensis*	Fireweed
Chenopodiaceae			
		Einadia hastata	Berry Saltbush
Convolvulaceae			
		Dichondra repens	Kidney Weed
Fabaceae (Mimosoideae)			
		Acacia falcata	
		Acacia floribunda	White Sally
		Acacia parramattensis	Parramatta Wattle
Gentianaceae			
	*	*Centaurium tenuiflorum*	Slender Centaury
Lauraceae			
		Cassytha pubescens	
Malvaceae			
	*	*Sida rhombifolia*	Paddy's Lucerne
Myrtaceae			

Family		Scientific Name	Common Name
		Angophora floribunda	Rough-barked Apple
		Backhousia myrtifolia	Grey Myrtle
		Eucalyptus crebra	Narrow-leaved Ironbark
		Eucalyptus fibrosa	Red Ironbark
		Eucalyptus globoidea	White Stringybark
		Eucalyptus moluccana	Grey Box
		Eucalyptus punctata	Grey Gum
		Eucalyptus tereticornis	Forest Red Gum
		Kunzea ambigua	Tick Bush
		Melaleuca styphelioides	Prickly-leaved Tea Tree
Oleaceae			
	*	*Olea europaea*	Common Olive
Oxalidaceae			
		Oxalis perennans	Grassland Wood-sorrel
Pittosporaceae			
		Bursaria spinosa ssp. *spinosa*	Sweet Bursaria
Plantaginaceae			
	*	*Plantago lanceolata*	Lamb's Tongues
Proteaceae			
		Grevillea mucronulata	
		Persoonia linearis	Narrow-leaved Geebung
Rutaceae			
		Zieria smithii	Sandfly Zieria
Santalaceae			
		Exocarpos cupressiformis	Native Cherry

Note: * signifies exotic species

APPENDIX 2

Fauna Results

Terrestrial fauna recorded in study site

Scientific Name	Common Name	Record Type
Birds		
Gymnorhina tibicen	Australian Magpie	O
Coracina novaehollandiae	Black-faced Cuckoo-shrike	O
Cacomantis flabelliformis	Fan-tailed Cuckoo	H
Rhipidura fuliginosa	Grey Fantail	O/H
Malurus cyaneus	Superb Fairy-wren	O
Anthochaera carunculata	Red Wattlebird	H
Lichenostomus chrysops	Yellow-faced Honeyeater	O/H
Manorina melanophrys	Bell Miner	H
Pardalotus punctatus	Spotted Pardalote	H
Mammals		
Equus caballus	Horse (feral)	O
Oryctolagus cuniculus	Rabbit	I
Macropus giganteus	Eastern Grey Kangaroo	I
Reptiles		
Lampropholis guichenoti	Garden Skink	O

Key: O=observed, H-Heard, I= Indirect evidence (scats, tracks, marks….)

APPENDIX 3

Conservation Rating According to Briggs and Leigh (1995)

Conservation Rating According to Briggs and Leigh (1996)

Briggs and Leigh (1996) list over 5,031 species, subspecies and varieties of plants (5% of native vascular flora of Australia) that have been ranked according to their conservation status. While many of these species are contained within the schedules of various state and federal threatened species legislation (eg. TSC Act and *EPBC* Act), and are subject to legislative provisions under those acts, a great many more do not and as a such are extraneous to statutory assessment processes.

The modified list below presents the range of codes that are, in various combinations, applied to each listed plant species.

- **1** Species only known from one collection
- **2** Species with a geographic range of less than 100km in Australia
- **3** Species with a geographic range of more than 100km in Australia
- **X** Species presumed extinct; no new collections for at least 50 years
- **E** Endangered species at risk of disappearing from the wild state if present land use and other causal factors continue to operate
- **V** Vulnerable species at risk of long-term disappearance through continued depletion.
- **R** Rare, but not currently considered to be endangered.
- **K** Poorly known species that are suspected to be threatened.
- **C** Known to be represented within a conserved area.
- **a** At least 1,000 plants are known to occur within a conservation reserve(s).
- **i** Less than 1,000 plants are known to occur within a conservation reserve(s).
- **-** The reserved population size is unknown.
- **t** The total known population is reserved.
- + The species has a natural occurrence overseas.

APPENDIX 4

TSC Assessment of Significance

Assessments of Significance

The Assessment of Significance is a statutory mechanism under Section 5A of the EP&A Act, as amended by the *Threatened species Conservation Amendment Act* 2002*,* for assessing whether a proposal activity may have a significant impact on threatened species, populations or ecological communities or their habitats. The results of this test are used to determine if a Species Impact Statement is required for each species potentially occurring within the study area.

When a threatened species known to occur within the vicinity of a study area is not recorded during a survey, the presence of potential habitat for this species is used to determine the need to undertake an Assessment of Significance. Where there is no potential habitat in the study area for threatened species, there is unlikely to be any impact on these species and therefore Assessments of Significance are not required.

Ecological Communities

An Assessment of Significance is undertaken for one Endangered Ecological Community occurring in the study area: Shale Sandstone Transition Forest.

Shale Sandstone Transition Forest

Shale Sandstone Transition Forest (SSTF) is an EEC listed on the TSC and EPBC Acts. SSTF occurs on transitional areas between the clay soils derived from Wianamatta Shale and the sandy soils derived from Hawkesbury Sandstone on the margins of the Cumberland Plain.

Shale Sandstone Transition Forest occurs in the study area. The DEC (NPWS 2002b) mapping of the study area was ground-truthed in the current assessment and was found to be relatively accurate (Figure 3). SSTF is mapped as occurring within the area of the proposed electricity easement upgrade and the proposed substation and associated access track (Figure 3).

Impacts of the proposal include direct impacts (clearing) of approximately 1.1 ha of SSTF and indirect impacts, including possible weed invasion and erosion, extending to a further 1.6 ha of SSTF.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

N/A.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

N/A.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The proposal will result in the removal of approximately 1.1 ha of SSTF in the study area. DEC (NPWS 2002b) have mapped approximately 5,481 ha of SSTF within 10 km of the study area. This mapping also shows the vegetation community generally occurs as small disturbed remnants within agricultural land and developed land. The removal of 1.1 ha of SSTF is not likely to have an adverse effect on the extent of this ecological community.

The patches of SSTF that will be removed as a result of the proposal are in poor condition, existing as scattered patches of regrowth, modified through disturbances such as weed invasion, fragmentation and edge effects. Given the small size of the patches and the presence of ongoing disturbances, without significant resources allocated to its rehabilitation it is likely that the patches will further degrade with time.

The species composition of the patches of SSTF are already modified, with exotic species present in the midstorey and understorey. The ecosystem functioning of this community has been significantly altered due to the variety of disturbances that the vegetation is exposed to. Indirect impacts from edge effects, such as weed invasion and erosion, could potentially further modify the composition of the SSTF in the study area. Indirect impacts could extend to a further 1.6 ha of the ecological community. Mitigation measures such as erosion control, restrictions on landscaping and employment of techniques to encourage natural regeneration of disturbed areas should reduce the indirect impacts on the ecological community. The proposal is not likely to substantially and adversely modify the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which the habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

DEC (NPWS 2002b) have mapped approximately 5,481 ha of SSTF with a 10 km radius of the study area. The SSTF within the study area is in poor condition, with impacts from vegetation clearance, edge effects, grazing, fragmentation and weed invasion altering the species composition and structure of the ecological community.

Approximately 1.1 ha of the habitat in the study area will be cleared by the proposal, with a further 1.6 ha being indirectly impacted. The area of habitat in the study area to be impacted (directly and indirectly) by the proposal equates to 0.05 % of SSTF in the locality.

Shale Sandstone Transition Forest that will be disturbed as part of the proposal consists of small patches of vegetation within a cleared paddock. The proposal would not result in the isolation of any areas of SSTF.

Given the condition and size of the SSTF to be removed, these patches of SSTF are not considered to be important for the long term survival of the ecological community in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Under the TSC Act, the Director-General of Department of Environment and Conservation maintains a Register of Critical Habitat. To date, no critical habitat has been declared for SSTF.

The proposal will not have an adverse effect on critical habitat (directly or indirectly).

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

A recovery plan for SSTF is currently being prepared, as part of the recovery planning for the endangered ecological communities of the Cumberland Plain. The endangered ecological community information for SSTF (DEC 2005m) lists the following priority actions to recover this ecological community:

- Promote public involvement in restoration activities;
- Apply necessary fire regimes to maintain appropriate floristic and structural diversity;
- Protect habitat by minimising further clearing. This requires recognition of the values of all remnants in the land use planning process, particularly development consents, rezonings and regional planning;
- Protect habitat by controlling run-off entering the site if it would change water, nutrient or sediment levels or cause erosion;
- Weed control; and,
- Undertake restoration including bush regeneration and revegetation.

The proposal is not likely to interfere with the recovery of this ecological community given the small size and poor condition of the areas of SSTF that will be impacted.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The following Key Threatening Processes listed under Schedule 3 of the TSC Act may impact on SSTF in the study area:

- 'Clearing of native vegetation' - approximately 1.1 ha of SSTF will be cleared for the proposal.
- 'Ecological consequences of high frequency fires' – the proposal is not likely to increase the frequency of fires in the area.
- 'Invasion of native plant communities by exotic perennial grasses' – the proposal may increase the threat of weed invasion by exotic perennial grasses, particularly given the presence of exotic perennial grasses in the cleared paddock areas adjoining the SSTF in the study area.

Recommended mitigation measures aimed at reducing the impact of weed invasion are detailed in Section 6.0 of the report.

- 'Exotic vines and scramblers' – no exotic vines were recorded in the study area. The proposal is therefore not likely to increase the threat of exotic vines and scramblers. Furthermore, recommended mitigation measures aimed at reducing the impact of weed invasion are detailed in Section 6.0 of the report.

Conclusion

The proposal is not likely to have a significant impact on SSTF in the study area given the small size and poor condition of the patches of SSTF to be impacted by the proposal and the extent of the community in the locality. A Species Impact Statement is not recommended.

Flora

Seven part tests are undertaken for six threatened plant species with potential habitat in the study area:

- Epacris purpurescens var. purpurescens,
- Grevillea parviflora spp. parviflora,
- Persoonia bargoensis,
- Persoonia hirsuta,
- Pomaderris brunnea and
- Pultenaea pedunculata

Epacris purpurescens var. *purpurescens*

Epacris purpurescens var. *purpurescens* is listed as Vulnerable on Schedule 2 of the TSC Act.

Epacris purpurescens var. *purpurescens* is an erect shrub, 50 - 180 cm high, with showy white or sometimes pinkish flowers (DEC 2005d). It occurs in a range of habitat types, most of which have a strong shale soil influence, including ridgetop drainage depressions supporting wet heath within or adjoining shale cap communities (including Shale Sandstone Transition Forest), riparian zones draining into Sydney Sandstone Gully Forest, shale lenses within sandstone

habitats and colluvial areas overlying or adjoining sandstone or tertiary alluvium (DEC 2005d).

Epacris purpurescens var. *purpurescens* was not recorded in the study area, however, potential habitat for the species exists in SSTF and Western Sandstone Gully Forest in the study area, particularly within the ephemeral drainage line that occurs within the area transitional between SSTF and Western Sandstone Gully Forest (approximately 10 to 15 m south of the proposed boreholes). Approximately 1.5 ha of potential habitat for *E. purpurescens* var. *purpurescens* will be cleared as part of the proposal. There may also be approximately 2.9 ha of potential habitat indirectly impacted by potential weed invasion, trampling, rubbish dumping and edge effects.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The following is known about the lifespan of *E. purpurescens* var. *purpurescens* (DEC 2005d):

- Found in a range of habitat types, most of which have a strong shale soil influence.
- Lifespan is recorded to be 5-20 years, requiring 2-4 years before seed is produced in the wild.
- Killed by fire and re-establishes from soil-stored seed.

Since *E. purpurescens* var. *purpurescens* is known to occur in habitats with a strong shale influence, SSTF and transitional areas within Western Sandstone Gully Forest are considered to be potential habitat for the species. The proposal will result in the removal of 1.5 ha of potential habitat for *E. purpurescens* var. *purpurescens*.

The proposal is not likely to alter the existing fire frequency of the local area.

The clearing of approximately 1.5 ha of potential habitat for *E. purpurescens* var. *purpurescens* and possible indirect impacts to a further 2.9 ha of potential habitat is not likely to impact the lifecycle of the species such that a viable local population of the species would be placed at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that

constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

NA.

(c) In the case of a critically endangered or endangered ecological community, whether the action proposed:

I. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

II. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

NA.

(d) In relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The species is known to occur in a range of vegetation types, most of which have a strong shale influence (DEC 2005d). Shale Sandstone Transition Forest and transitional areas with SSTF and Western Sandstone Gully Forest in the study area are considered to be potential habitat for *E. purpurescens* var. *purpurescens.*

There are areas of known and potential habitat for *E. purpurescens* var. *purpurescens* in the local area, with:

- Approximately 20 previous recordings of the species within a 10 km radius of the study area, located to the south;
- DEC (NPWS 2002b) mapping approximately 7,381 ha of similar habitats (SSTF and WSGF) within a 10 km radius of the study area;

- Approximately 4.4 ha of potential habitat in varying condition within the study area.

Approximately 4.4 ha of the potential habitat in the study area will be impacted by the proposal, with 2.9 ha being indirectly impacted from edge effects. The area of habitat in the study area to be impacted (directly and indirectly) by the proposal equates to 0.06 % of similar habitat types in the region (10 km radius of study area).

The habitat to be affected in the study area was considered to be in poor condition in the fragmented patches of SSTF and in moderate-good condition within the areas transitional between SSTF and Western Sandstone Gully Forest. Habitat that will not be impacted in the area is in varying condition, with the scattered patches of SSTF in poor condition and the native vegetation on the slopes of the Nepean River to the east of the subject site in good condition.

Potential habitat for *E. purpurescens* var. *purpurescens* that will be disturbed as part of the proposal is on the margins of a vegetation corridor that follows the Nepean River and is in varying condition. The area of proposed disturbance is situated in the proximity of other previous disturbances associated with rural development, such as cleared paddocks, roads and railway lines. The proposal will involve clearing of potential habitat for this species located in or adjacent to previously disturbed areas. The proposal is not likely to result in the isolation of any areas of potential habitat.

Given the area of the potential habitat to be removed, the amount of similar vegetation types in the local area and the fact that no individuals were recorded during the current survey, this patch of vegetation is not considered to be important for the long term survival of the species in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Under the TSC Act, the Director-General of Department of Environment and Conservation maintains a Register of Critical Habitat. To date, no critical habitat has been declared for *E. purpurescens* var. *purpurescens.*

The proposal will not have an adverse effect on critical habitat (directly or indirectly).

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

To date, no recovery plan or threat abatement plan has been prepared for this species. DEC (DEC 2005d) has listed four priority actions to help recover *E. purpurescens* var. *purpurescens* in NSW:

- Liaise with land managers to encourage the preparation of site management plans and the implementation of appropriate threat abatement measures, such as weed control/bush regeneration, site protection (fencing/signage) and fire management;
- Identify priority sites for formal habitat protection;
- Monitor known populations, so that potential local extinctions are detected before they occur and mechanisms can be put in place to reverse trends; and,
- Identify and survey potential habitat to detect new populations.

DEC (2005d) also state that the following could be done to assist in recovery of the species:

- Fire intervals of 10-15 yrs (where there are no needs for asset protection zones).
- Prevent further loss and fragmentation of habitat.

The proposal will result in the loss of approximately 1.5 ha of potential habitat for *E. purpurescens* var. *purpurescens*, but will not increase fragmentation. The proposal is not likely to alter the fire frequency of the local area.

The proposal is not likely to interfere with the recovery of the species.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key Threatening Processes listed on Schedule 3 the TSC Act that may impact on potential habitat for *E. purpurescens* var. *purpurescens* include:

- 'Clearing of native vegetation' - the proposal will result in the removal of approximately 1.5 ha of potential habitat for *E. purpurescens* var. *purpurescens*, with indirect impacts to a further 2.9 ha.
- 'Ecological consequences of high frequency fires' - the proposal is not likely to alter the fire frequency of the local area.

- 'Infection of native plants by *Phytophthora cinnamomi'* – the proposal is not likely to increase the threat of *Phytophthora cinnamomi* to native plants in the study area. As a precaution, construction vehicles should be washed down prior to use on site.

- 'Invasion of native plant communities by exotic perennial grasses' – the proposal could potentially increase the threat of this KTP, given the dominance of exotic perennial grasses in areas surrounding potential habitat for *E. purpurescens* var. *purpurescens*. Recommended mitigation measures (Section 6.0) should however minimise this threat.

The proposal is not likely to increase the threat of the listed KTP, provided that recommended mitigation measures are implemented.

Conclusion:

The proposal is not likely to result in a significant impact on *E. purpurescens* var. *purpurescens* given the fact that no individuals were recorded in the study area and the large expanse of potential habitat in the local area (approximately 7,544 ha).

Grevillea parviflora ssp. *parviflora*

Grevillea parviflora ssp. *parviflora* is listed as Vulnerable on Schedule 2 of the TSC Act. This species is also listed as Vulnerable on the EPBC Act.

Grevillea parviflora subsp. *parviflora* is a low open to erect shrub, 0.3-1 m tall. It occurs in light clayey soils in woodlands and most plants appear capable of suckering from a rootstock (NSW Scientific Committee 1998a).

Grevillea parviflora ssp. *parviflora* was not recorded in the study area, however, potential habitat for the species exists in the SSTF and Western Sandstone Gully Forest in the study area. Approximately 1.5 ha of potential habitat for *G. parviflora* spp. *parviflora* will be cleared as part of the proposal. There may also be approximately 2.9 ha of potential habitat indirectly impacted by potential edge effects such as weed invasion, trampling and rubbish dumping.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Grevillea parviflora ssp. *parviflora* is known to (DEC 2005e):

- occur in open, slightly disturbed sites such as along tracks.
- be capable of suckering from a rootstock and most populations demonstrate a degree of vegetative spread, particularly after disturbance such as fire.
- Flower between July to December as well as April-May. Flowers are insect-pollinated and seed dispersal is limited.

Since *G. parviflora* ssp. *parviflora* is known to occur in disturbed areas such as tracks (DEC 2005e), the proposed upgrade of the existing easement and substation will have minimal impact on this species as it will not change the existing land use. However the proposal will involve some initial disturbance during installation of the concrete poles and powerlines. *Grevillea parviflora* ssp. *parviflora* is known to respond well to disturbance and the potential habitat for this species is likely to regenerate underneath the existing powerline after the initial disturbance.

The proposal will result in the clearing of approximately 1.5 ha of potential habitat for *G. parviflora* ssp. *parviflora* for the installation of the substation and associated access track and boreholes and associated easement. There will also possibly be indirect impacts to a further 2.9 ha of potential habitat for this species. This is considered to be a relatively small area of habitat given that a total of approximately 7,381 ha of similar potential habitat has been mapped (NPWS 2002b) as occurring in the local area (10 km radius).

The proposal is not likely to alter the existing fire frequency of the local area.

The proposal is not likely to impact the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

NA.

(c) In the case of a critically endangered or endangered ecological community, whether the action proposed:

III. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

IV. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

NA.

(d) In relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The species is known to occur in a range of vegetation types from heath and shrubby woodland to open forest (DEC 2005e). SSTF and Western Sandstone Gully Forest (WSGF) in the study area is considered to be potential habitat for *G. parviflora* ssp. *parviflora.*

There are areas of known and potential habitat for *G. parviflora* ssp. *parviflora* in the local area, with:

- Twelve previous recordings of the species within a 10 km radius of the study area (Figure 4);
- DEC (NPWS 2002b) mapping approximately 7,381 ha of similar potential habitats (SSTF and WSGF) within a 10 km radius of the study area;
- Approximately 4.4 ha of potential habitat in varying condition within the study area.

Approximately 4.4 ha of the habitat in the study area will be impacted by the proposal, with 2.9 ha being indirectly impacted from edge effects. The area of habitat in the study area to be impacted (directly and indirectly) by the proposal equates to 0.06 % of similar habitat types in the local area (10 km radius).

The habitat to be affected in the study area was considered to be in varying condition, with the scattered patches of SSTF within the area of the proposed substation, access track and along the existing easement considered to be in poor

condition; and the WSGF in the area of the proposed boreholes was considered to be in moderate-good condition. Habitat for the species in the surrounding area is considered to be in varying condition, with the fragmented patches of vegetation considered to be in poor condition and the vegetation along the slopes of the Nepean River considered to be in moderate to good condition.

Potential habitat for *G. parviflora* spp. *parviflora* that will be disturbed as part of the proposal is on the edge of a riparian corridor along the Nepean River. The area of proposed disturbance is situated in the proximity of other rural development, including cleared paddocks, roads and railway lines. The proposal is not likely to result in the isolation of any areas of potential habitat.

Given the area of the potential habitat to be removed, the amount of similar vegetation types in the local area and the fact that no individuals were recorded during the current survey, this patch of vegetation is not considered to be important for the long term survival of the species in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Under the TSC Act, the Director-General of Department of Environment and Conservation maintains a Register of Critical Habitat. To date, no critical habitat has been declared for *G. parviflora* spp. *parviflora.*

The proposal will not have an adverse effect on critical habitat (directly or indirectly).

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

To date, no recovery plan has been prepared for this species. DEC (2005e) has listed four priority actions to help recover *G. parviflora* spp. *parviflora* in NSW:

- Liaise with land managers to encourage the preparation of site management plans and the implementation of appropriate threat abatement measures, particularly in fire management, bush regeneration, roadside management, weed control and fencing and signage.
- Monitor known populations, so that potential local extinctions are detected before they occur and mechanisms can be put in place to reverse trends.

- Conduct research into life history, genetic diversity of known populations, production and viability of seed, seed predation or germination rates and requirements.

- Identify and survey potential habitat to detect new populations.

The proposal is not likely to interfere with the recovery of the species.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key Threatening Processes listed on Schedule 3 the TSC Act relevant to the proposal that may impact on potential habitat for *G. parviflora* spp. *parviflora* include:

- 'Clearing of native vegetation' - the proposal will result in the removal of approximately 1.5 ha of potential habitat for this species, with indirect impacts to a further 2.9 ha.

- 'Ecological consequences of high frequency fires' – the proposal is not likely to alter the fire frequency of the area.

- 'Infection of native plants by *Phytophthora cinnamomi*' – the proposal is not likely to increase this KTP in the study area. As a precaution, all vehicles should be washed down prior to use on site.

- 'Invasion of native plant communities by exotic perennial grasses' – the proposal could potentially increase the threat of this KTP, given the dominance of exotic perennial grasses in areas surrounding potential habitat for *G. parviflora* spp. *parviflora*. Recommended mitigation measures (Section 6.0) should however minimise this threat.

Conclusion:

The proposal is not likely to result in a significant impact on *G. parviflora* spp. *parviflora* given the fact that no individuals were recorded in the study area and the large expanse of potential habitat in the local area (approximately 7,544 ha).

Persoonia bargoensis

Persoonia bargoensis is listed as Endangered on the TSC Act.

Persoonia bargoensis is an erect bushy, shrub which grows to a height of 2.5 m (DEC 2005b). This species is known to occur within Shale Sandstone Transition Forest (SSTF).

Persoonia bargoensis was not recorded in the study area, however, suitable habitat does exist within SSTF in the study area. Approximately 1.1 ha of potential habitat for *P. bargoensis* will be cleared as part of the proposal. There may also be approximately 1.6 ha of potential habitat indirectly impacted by potential weed invasion, trampling, rubbish dumping and edge effects.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Persoonia bargoensis is known to (DEC 2005h):

- Occur in woodland or dry sclerophyll forest on sandstone and on heavier, well drained, loamy, gravely soils.
- be likely killed by fire and recruitment is solely from seed.
- benefit from the reduced competition and increased light available on disturbance margins including roadsides.

Since *P. bargoensis* is known to benefit from disturbance, the proposed upgrade of the existing easement and substation will have minimal impact on this species as it will not change the existing land use. However the proposal will involve some initial disturbance during installation of the concrete poles and powerlines. *Persoonia bargoensis* is known to respond well to disturbance and the potential habitat for this species is likely to regenerate underneath the existing powerline after the initial disturbance.

The proposal will result in the clearing of approximately 1.1 ha of potential habitat for *P. bargoensis* for the installation of the substation and associated access track and boreholes and associated easement. There will also be possible indirect impacts to a further 1.6 ha of potential habitat for this species. This is considered to be a relatively small area of habitat given that a total of approximately 5,481 ha of similar habitat (SSTF) has been mapped (NPWS 2002b) as occurring in the local area (10 km radius).

The proposal is not likely to alter the existing fire frequency of the local area.

The proposal is not likely to impact the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

N/A.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

N/A.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which the habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

SSTF in the study area is considered to be potential habitat for *P. bargoensis.*

There are areas of known and potential habitat for *P. bargoensis* in the local area, with:

- Numerous previous recordings of the species within a 10 km radius of the study area mostly to the south (Figure 4);
- DEC (NPWS 2002b) mapping approximately 5,481 ha of similar potential habitat (SSTF) within a 10 km radius of the study area;
- Approximately 2.7 ha of potential habitat in varying condition within the study area.

Approximately 2.7 ha of the habitat in the study area will be impacted by the proposal, with 1.6 ha being indirectly impacted from edge effects. The area of habitat in the study area to be impacted (directly and indirectly) by the proposal equates to 0.05 % of similar habitat types in the local area (19 km radius).

The habitat to be affected in the study area was considered to be in poor condition. Habitat for the species in the surrounding area is considered to be in varying condition, with the fragmented patches of vegetation considered to be in poor condition and the vegetation along the slopes of the Nepean River considered to be in moderate-good condition.

Potential habitat for *P. bargoensis* that will be disturbed as part of the proposal is on the edge of a riparian corridor along the Nepean River. The area of proposed disturbance is situated in the proximity of other rural development, including cleared paddocks, roads and railway lines. The proposal is not likely to result in the isolation of any areas of potential habitat.

Given the area of the potential habitat to be removed, the amount of similar vegetation in the local area and the fact that no individuals were recorded during the current survey, this patch of vegetation is not considered to be important for the long term survival of the species in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for *P. bargoensis.* The proposal is not likely to impact on critical habitat for this species (directly or indirectly).

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

To date, no recovery plan or threat abatement plan has been written for *P. bargoensis.* DEC (DEC 2005b) have listed 19 priority actions to assist in the recovery of this species:

- Assess the relative conservation significance of sites to determine recovery priorities;
- Advise and liaise with private land managers to facilitate the preparation and implementation of site management plans that address threatening processes;

- Incorporate best knowledge regarding appropriate fire regime into land management practices;
- Prepare species profile in accordance with contractual obligations with DEH by June 2006;
- Prepare EIA guidelines;
- Review classification of Crown land where sites occur to ensure appropriate classification and management for nature conservation;
- Ensure that council-managed land on which sites occur are appropriately classified and managed for conservation;
- Incorporate site-specific threat abatement measures for the species into Plans of Management for sites in Sydney Catchment Authority (SCA) areas;
- Prepare and implement site management plans for sites that are located on public land outside the NPWS/SCA estate;
- Develop and implement site-awareness and protection procedures for use by land owners/managers and public utilities and their contractors when undertaking road, trail, or easement maintenance;
- Restrict vehicular and pedestrian access to sites, where necessary;
- Fence sites and exclude livestock and/or feral animals, where required;
- Undertake targeted bush regeneration works, where required;
- Seek to increase the level of legislative protection for sites through land-use planning mechanisms and conservation agreements;
- Retain or re-establish vegetation and fauna movement linkages between sites;
- Prepare state and national priority recovery plan in accordance with contractual obligations between DEC and DEH by June 2006;
- Undertake management-focused ecological studies, including fire frequency requirements;
- Consider inclusion in SeedQuest NSW program for research on seed viability and requirements for successful conservation storage; and,

- Carry out targeted surveys in potential habitat, particularly freehold lands, Crown land that may be alienated, leasehold Crown land and council-managed lands.

The proposal is not likely to interfere with the recovery of this species.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key Threatening Processes listed on Schedule 3 the TSC Act relevant to the proposal that may impact on potential habitat for *P. bargoensis* include:

- 'Clearing of native vegetation' - the proposal will result in the removal of approximately 1.1 ha of potential habitat for this species, with indirect impacts to a further 1.6 ha.
- 'Ecological consequences of high frequency fires' – the proposal is not likely to alter the fire frequency of the area.
- 'Infection of native plants by *Phytophthora cinnamomi*' – the proposal is not likely to increase this KTP in the study area. As a precaution, all vehicles should be washed down prior to use on site.
- 'Invasion of native plant communities by exotic perennial grasses' – the proposal could potentially increase the threat of this KTP, given the dominance of exotic perennial grasses in areas surrounding potential habitat for *P. bargoensis*. Recommended mitigation measures (Section 6.0) should however minimise this threat.

Conclusion

Persoonia bargoensis is known to occur within 10 km of the study area; however, it was not recorded during the field surveys for this assessment. Potential habitat for this species may potentially be impacted by the proposal, however, given the amount of potential habitat mapped as occurring in the local area (NPWS 2002b) and the poor condition and fragmented nature of the potential habitat that will be impacted, the proposal is not likely to have a significant impact on this species. A Species Impact Statement is not recommended.

Persoonia hirsuta

Persoonia hirsuta is listed as Endangered on Schedule 1 of the TSC Act. This species is also listed as Endangered on the EPBC Act and has been given a ROTAP conservation rating of 3Ki (Briggs and Leigh 1996).

Persoonia hirsuta is a spreading to decumbant shrub with moderate to densely hairy young branchlets. It occurs in woodlands and dry sclerophyll forest on sandstone or very rarely on shale (NSW Scientific Committee 1998b).

Persoonia hirsuta was not recorded in the study area, however, potential habitat for the species exists in SSTF in the study area. Approximately 1.1 ha of potential habitat for *P. hirsuta* will be cleared as part of the proposal. There may also be approximately 1.6 ha of potential habitat indirectly impacted by potential weed invasion, trampling, rubbish dumping and edge effects.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Persoonia hirsuta is (DEC 2005i):

- usually present as isolated individuals or very small populations.
- probably killed by fire (as other Persoonia species are) but will regenerate from seed.

The proposal is not likely to alter the existing fire frequency of the local area.

The clearing of approximately 1.1 ha of potential habitat for *P. hirsuta,* and potential indirect impacts to a further 1.6 ha of potential habitat is not likely to impact the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

NA.

(c) In the case of a critically endangered or endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

NA.

(d) In relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The species is known to occur in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone and shale-sandstone transition areas (DEC 2005i). Shale Sandstone Transition Forest in the study area is considered to be potential habitat for *P. hirsuta.*

There are areas of known and potential habitat for *P. hirsuta* in the local area, with:

- Previous recordings of the species to the east of the study area (Figure 3);
- DEC (NPWS 2002b) have mapped approximately 5,481 ha of SSTF within a 10 km radius of the study area;
- Approximately 2.7 ha in poor condition within the study area.

Approximately 2.7 ha of the habitat in the study area will be impacted by the proposal, with 1.6 ha being indirectly impacted from edge effects. The area of habitat in the study area to be impacted (directly and indirectly) by the proposal equates to 0.05 % of similar habitat types in the local area.

The habitat to be affected in the study area was considered to be in poor condition. Potential habitat for *P. hirsuta* that will be disturbed as part of the proposal is on the edge of a riparian corridor along the Nepean River. The area of proposed disturbance is situated in the proximity of other previous disturbances associated with rural development, such as cleared paddocks, roads, railway lines

and powerlines. The proposal is not likely to result in the isolation of any areas of potential habitat.

Given the area of the potential habitat to be removed, the amount of similar vegetation types in the local area and the fact that no individuals were recorded during the current survey, this patch of vegetation is not considered to be important for the long term survival of the species in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Under the TSC Act, the Director-General of Department of Environment and Conservation maintains a Register of Critical Habitat. To date, no critical habitat has been declared for *P. hirsuta.*

The proposal will not have an adverse effect on critical habitat (directly or indirectly).

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

To date, no recovery plan has been prepared for this species. DEC (2005i) has listed 19 priority actions to help recover *P. hirsuta* in NSW:

- Assess the relative conservation significance of sites to determine recovery priorities;
- Advise and liaise with private land managers to facilitate the preparation and implementation of site management plans that address threatening processes;
- Incorporate best knowledge regarding appropriate fire regime into land management practices;
- Prepare species profile in accordance with contractual obligations with DEH by June 2006;
- Prepare EIA guidelines;
- Incorporate site-specific threat abatement measures for the species into Plans of Management for sites in DEC reserves;
- Prepare and implement site management plans for sites that are located on public land outside the NPWS estate;

- Develop and implement site-awareness and protection procedures for use by land owners/managers and public utilities and their contractors when undertaking road, trail, or easement maintenance;
- Review classification of Crown land where sites occur to ensure appropriate classification and management for nature conservation;
- Ensure that council-managed land on which sites occur are appropriately classified and managed for conservation;
- Restrict vehicular and pedestrian access to sites, where necessary;
- Fence sites and exclude livestock and/or feral animals, where required;
- Undertake targeted bush regeneration works, where required;
- Seek to increase the level of legislative protection for sites through land-use planning mechanisms and conservation agreements;
- Retain or re-establish vegetation and fauna movement linkages between sites;
- Prepare state and national priority recovery plan in accordance with contractual obligations between DEC and DEH by June 2006;
- Undertake management-focused ecological studies, including fire frequency requirements;
- Consider inclusion in SeedQuest NSW program for research on seed viability and requirements for successful conservation storage; and,
- Carry out targeted surveys in potential habitat, particularly freehold lands, Crown land that may be alienated and council-managed lands.

The proposal is not likely to interfere with the recovery of this species.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key Threatening Processes listed on Schedule 3 the TSC Act relevant to the proposal that may impact on potential habitat for *P. hirsuta* include:

- 'Clearing of native vegetation' - the proposal will result in the removal of approximately 1.1 ha of potential habitat for this species, with indirect impacts to a further 1.6 ha.
- 'Ecological consequences of high frequency fires' – the proposal is not likely to alter the fire frequency of the area.
- 'Infection of native plants by *Phytophthora cinnamomi*' – the proposal is not likely to increase this KTP in the study area. As a precaution, all vehicles should be washed down prior to use on site.
- 'Invasion of native plant communities by exotic perennial grasses' – the proposal could potentially increase the threat of this KTP, given the dominance of exotic perennial grasses in areas surrounding potential habitat for *P. hirsuta*. Recommended mitigation measures (Section 6.0) should however minimise this threat.

Conclusion:

The proposal is not likely to result in a significant impact on *P. hirsuta* given the fact that no individuals were recorded in the study area and the large expanse of potential habitat in the local area (approximately 5,635 ha).

Pomaderris brunnea

Pomaderris brunnea is listed as Vulnerable on the TSC Act.

Pomaderris brunnea is a shrub to 3 m tall that has distinctively hairy stems. It grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines (DEC 2005j).

Pomaderris brunnea was not recorded in the study area, however, potential habitat for the species exists in SSTF in the study area. Approximately 1.1 ha of potential habitat for *P. brunnea* will be cleared as part of the proposal. There may also be approximately 1.6 ha of potential habitat indirectly impacted by potential weed invasion, trampling, rubbish dumping and edge effects.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Pomaderris brunnea (DEC 2005j):

- Grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.
- Flowers in September and October.

The clearing of approximately 1.1 ha of potential habitat for *P. brunnea,* and potential indirect impacts to a further 1.6 ha of potential habitat is not likely to impact the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

NA.

(c) In the case of a critically endangered or endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

NA.

(d) In relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Shale Sandstone Transition Forest in the study area is considered to be potential habitat for *P. brunnea.*

There are areas of known and potential habitat for *P. brunnea* in the local area, with:

- Two previous recordings of the species within a 10 km radius of the study area (Figure 3);
- DEC (NPWS 2002b) have mapped approximately 5,481 ha of SSTF within a 10 km radius of the study area;
- Approximately 2.7 ha of potential habitat in poor condition within the study area.

Approximately 2.7 ha of the habitat in the study area will be impacted by the proposal, with 1.6 ha being indirectly impacted from edge effects. The area of habitat in the study area to be impacted (directly and indirectly) by the proposal equates to 0.05 % of similar habitat types in the local area.

The habitat to be affected in the study area was considered to be in poor condition. Potential habitat for *P. brunnea* that will be disturbed as part of the proposal is on the edge of a riparian corridor along the Nepean River. The area of proposed disturbance is situated in the proximity of other previous disturbances associated with rural development, such as cleared paddocks, roads, railway lines and powerlines. The proposal is not likely to result in the isolation of any areas of potential habitat.

Given the area of the potential habitat to be removed, the amount of similar vegetation types in the local area and the fact that no individuals were recorded during the current survey, these patches of vegetation are not considered to be important for the long term survival of the species in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Under the TSC Act, the Director-General of Department of Environment and Conservation maintains a Register of Critical Habitat. To date, no critical habitat has been declared for *P. brunnea.*

The proposal will not have an adverse effect on critical habitat (directly or indirectly).

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

To date, no recovery plan or threat abatement plan has been prepared for this species. DEC (DEC 2005j) has listed 8 priority actions to help recover *P. brunnea*:

- Undertake review of conservation status to assess whether upgrading to endangered is warranted.
- Ensure personnel undertaking hazard reduction burns can identify species and are aware of its habitat and habitat requirements re fire intervals.
- Prepare species profile and EIA guidelines and distribute to relevant authorities.
- Negotiate with private landholders and public authorities to prepare and implement site management statements to address threats at sites on their land.
- Prepare and implement site management statements to address threats on sites on DEC estate.
- Negotiate with private landholders and public authorities to increase protection status of sites outside conservation areas.
- Undertake biological and ecological research, particularly in regard to response to fire and other disturbances.
- Undertake surveys in potential habitat.

The proposal is not likely to interfere with the recovery of this species.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key Threatening Processes listed on Schedule 3 the TSC Act relevant to the proposal that may impact on potential habitat for *P. brunnea* include:

- 'Clearing of native vegetation' - the proposal will result in the removal of approximately 1.1 ha of potential habitat for this species, with indirect impacts to a further 1.6 ha.
- 'Ecological consequences of high frequency fires' – the proposal is not likely to alter the fire frequency of the area.

- 'Infection of native plants by *Phytophthora cinnamomi*' – the proposal is not likely to increase this KTP in the study area. As a precaution, all vehicles should be washed down prior to use on site.

- 'Invasion of native plant communities by exotic perennial grasses' – the proposal could potentially increase the threat of this KTP, given the dominance of exotic perennial grasses in areas surrounding potential habitat for *P. brunnea*. Recommended mitigation measures (Section 6.0) should however minimise this threat.

Conclusion:

The proposal is not likely to result in a significant impact on *P. brunnea* given the fact that no individuals were recorded in the study area and the large expanse of potential habitat in the local area (approximately 5,635 ha).

Pultenaea pedunculata

Pultenaea pedunculata is listed as Endangered on the TSC Act.

Pultenaea pedunculata is a shrub that forms carpets 1 m or more wide (DEC 2005f). This species is known to occur in clay or sandy clay on Wianamatta shale, close to localised patches of Tertiary alluvium or the shale/sandstone influence (west of Appin) (DEC 2005l).

Pultenaea pedunculata was not recorded in the study area, however potential habitat does exist in the SSTF in the study area. Approximately 1.1 ha of potential habitat for *P. pedunculata* will be cleared as part of the proposal. There may also be approximately 1.6 ha of potential habitat indirectly impacted by potential weed invasion, trampling, rubbish dumping and edge effects.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Pultenaea pedunculata is known to (DEC 2005l):

- Occurs in a range of habitats. NSW populations are generally among woodland vegetation but plants have also been found on road batters and coastal cliffs. It is largely confined to loamy soils in dry gullies in populations in the Windellama area.

- Colonise bare ground in many parts of its range due to the creeping stems and rooting nodes.

- Flower in spring.

The proposal will result in the clearing of approximately 1.1 ha of potential habitat for *P. pedunculata*. There will also possibly be indirect impacts to a further 1.6 ha of potential habitat for this species. This is considered to be a relatively small area of habitat given that a total of approximately 5,481 ha of similar habitat has been mapped (NPWS 2002b) as occurring in the local area (10 km radius).

The proposal is not likely to impact the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

N/A.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

N/A.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which the habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Shale Sandstone Transition Forest in the study area is considered to be potential habitat for *P. pedunculata.*

There are areas of known and potential habitat for *P. pedunculata* in the local area, with:

- Three previous recordings of the species within a 10 km radius of the study area (Figure 3);
- DEC (NPWS 2002b) have mapped approximately 5,481 ha of SSTF within a 10 km radius of the study area;
- Approximately 2.7 ha of potential habitat in poor condition within the study area.

Approximately 2.7 ha of the habitat in the study area will be impacted by the proposal, with 1.6 ha being indirectly impacted from edge effects. The area of habitat in the study area to be impacted (directly and indirectly) by the proposal equates to 0.05 % of similar habitat types in the local area.

The habitat to be affected in the study area was considered to be in poor condition. Potential habitat for *P. pedunculata* that will be disturbed as part of the proposal is on the edge of a riparian corridor along the Nepean River. The area of proposed disturbance is situated in the proximity of other previous disturbances associated with rural development, such as cleared paddocks, roads, railway lines and powerlines. The proposal is not likely to result in the isolation of any areas of potential habitat.

Given the area of the potential habitat to be removed, the amount of similar vegetation types in the local area and the fact that no individuals were recorded

during the current survey, these patches of vegetation are not considered to be important for the long term survival of the species in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for *P. pedunculata.*

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

To date, no recovery plan or threat abatement plan has been written for *P. pedunculata.* DEC (2005l) listed 9 priority actions to assist in the recovery of this species:

- Collect seed from the Villawood population for long term storage and insurance against population loss.
- Liaise with landholders of the Villawood, Prestons and Appin populations regarding management.
- Liase and negotiate with other landholders of other freehold populations regarding appropriate management.
- Review against the criteria for critically endangered.
- Install protective measures (fencing, signs, etc), if necessary, at Villawood, Appin and Prestons sites.
- Install structures to prevent accidental destruction, such as roadside signage or fencing within grazed paddocks.
- Conduct soil conservation works to prevent further erosion, where appropriate.
- Resurvey Appin, Villawood and Prestons populations to assess status.
- Prepare a regional recovery plan for this and other threatened species in the Bungonia Windellama area.

The proposal is not likely to interfere with the recovery of this species.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key Threatening Processes listed on Schedule 3 the TSC Act relevant to the proposal that may impact on potential habitat for *P. pedunculata* include:

- 'Clearing of native vegetation' - the proposal will result in the removal of approximately 1.1 ha of potential habitat for this species, with indirect impacts to a further 1.6 ha.
- 'Ecological consequences of high frequency fires' – the proposal is not likely to alter the fire frequency of the area.
- 'Infection of native plants by *Phytophthora cinnamomi*' – the proposal is not likely to increase this KTP in the study area. As a precaution, all vehicles should be washed down prior to use on site.
- 'Invasion of native plant communities by exotic perennial grasses' – the proposal could potentially increase the threat of this KTP, given the dominance of exotic perennial grasses in areas surrounding potential habitat for *P. pedunculata*. Recommended mitigation measures (Section 6.0) should however minimise this threat.

Conclusion

Pultenaea pedunculata is known to occur within 10 km of the study area; however, it was not recorded during the field surveys for this assessment. Potential habitat for this species may potentially be impacted by the proposal. However, the potential habitat within the study area was considered to be in poor condition and the area impacted by the proposal is relatively small given the extent of similar habitat types in the local area. For these reasons it is considered unlikely that the proposal would have a significant impact on this species. A Species Impact Statement is not recommended.

Fauna

Pseudophryne australis Red-crowned Toadlet

The Red-crowned Toadlet is listed as Vulnerable on Schedule 2 of the TSC Act and occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks that feed into larger semi-perennial streams. These creeks are characterised after rain by a series of shallow pools lined with dense grasses, ferns and low shrubs (Thumm and Mahony 1996, Thumm and Mahoney 1997).

Potential habitat for this species occurs in the ephemeral drainage lines within Woodland habitat. The proposal is likely to remove or modify 4.4 ha (1.5 directly and 2.9 ha indirectly impacted) of Woodland habitat within the study area resulting in a loss of potential breeding and foraging resources for this species. However, given the larger areas of continuous Woodland habitat including finer habitat features such as drainage lines in the immediate vicinity of the study area, the impacts of the proposal are likely to be minimal. With suitable mitigation measures such as sediment control measures it is unlikely that the proposal would have a significant impact on the Red-crowned Toadlet.

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Red-crowned Toadlet was not recorded within the study area during the current survey however potential habitat for this species occurs in ephemeral drainage lines within Woodland habitat. The proposal is likely to remove or modify 4.4 ha of Woodland habitat, hence the loss of potential breeding and foraging resources for this species. This is not considered to be significant given the local and regional distribution of similar habitat types (approximately 7,544ha within the local area (NPWS 2003, 2002e). Although some individuals maybe impacted by the proposal it is unlikely that the proposal would disrupt this species life cycle such that a viable local population is likely to be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

An endangered population is defined under the TSC Act as 'a population specified in Part 2 of Schedule 1'. At the present time, there are no endangered populations of this species listed under the Act.

In relation to the habitat of a threatened species, population or ecological community:

i. **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**

ii. **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**

iii. **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.**

Red-crowned Toadlet was not recorded within the study area during the current survey however potential habitat for this species occurs in ephemeral drainage lines within Woodland habitat. The proposal is likely to remove or modify 4.4 ha (1.5 ha directly and 2.9 ha indirectly impacted) of Woodland habitat, hence the loss of potential breeding and foraging resources for this species. The 4.4 ha of potential Red-crowned Toadlet habitat that would be removed represents about 0.06% of the available Woodland habitat within the local habitat and is not considered to be a significant reduction in available habitat.

Potential habitat within the study area has been previously disturbed and is currently fragmented by roads and powerline easements. The proposed works are unlikely to result in further fragmentation or isolated any areas of potential habitat from currently interconnecting habitat.

The loss of 0.06% of potential habitat is unlikely to have long-term negative consequences for the species local occurrence.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act,

the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species (DEC Threatened Species Unit).

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

To date, there is no recovery plan or threat abatement plan for the Red-crowned Toadlet (NPWS 1999a).

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key Threatening Processes (KTP) are listed on Schedule 3 of the TSC Act. The proposed activities will involve 'Clearing of Native Vegetation', and "Bush-rock Removal" which is a recognised KTP. The proposed works will clear approximately 4.4 ha of native vegetation, representing 0.08 per cent of the extant area of potential foraging and roosting habitat in the local area. This is not considered to be significant given the local distribution of similar habitat types (approximately 7544 ha; NPWS, 2004). Any bush-rock and /or scattered timber that is removed will moved to the side of the track and used to regenerate the site post works.

Additional factors identified as major causes for this species decline, include.

- Fragmentation of habitat;
- Disruption of catchment hydrology and alteration of soil pH;
- Changes in plant structure; and,
- Severe bushfires.

It is unlikely that the proposed works would increase the impact any of the above factors on potential habitat and/or the Red-crowned Toadlet.

Conclusion:

The Red-crowned Toadlet was not recorded within the study area during the current survey; however potential habitat for this species in the study area occurs in ephemeral drainage lines within Woodland habitat. Although some individuals may be impacted by the proposal it is unlikely that that the proposal will have a significant impact on the Red-Crowned Toadlet, given the extent of potential habitat for this species in the study area and local area and the minimal level of clearing.

A Species Impact Statement is not recommended.

APPENDIX 5

EPBC Act Significant Impact Criteria

Significant Impact Guidelines

The EPBC Act Significant Impact Guidelines (DEH 2006) list Significant Impact Criteria for matters of national environmental significance that should be taken into consideration to determine whether a proposal is likely to have a significance impact on threatened species, populations or ecological communities that are known to occur or potentially occur in the study area.

Under the EPBC Act, if the proposal has the potential to have an adverse impact on a threatened species, population or ecological community listed on the Act, the proposal must be referred to the Federal Minister for the Environment for further consideration.

Endangered Ecological Communities

Shale Sandstone Transition Forest is listed as an Endangered Ecological Community (EEC) under the EPBC Act. The potential impacts of the proposal on this EEC are assessed against the Significant Impact Criteria of the EPBC Act below.

Shale Sandstone Transition Forest

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

• reduce the extent of an ecological community;

The proposal will result in the removal of approximately 1.1 ha of SSTF in the study area. DEC (NPWS 2002b) have mapped approximately 5,481 ha of SSTF within 10 km of the study area. This mapping also shows the vegetation community generally occurs as small disturbed remnants within agricultural land and developed land. The removal of 1.1 ha of SSTF is not likely to have an adverse effect on the extent of the ecological community.

• fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;

Shale Sandstone Transition Forest that will be disturbed as part of the proposal consists of small patches of vegetation within a cleared paddock. The proposal would not result in the fragmentation of any areas of SSTF, as areas impacted are already fragmented.

The proposed upgrade of the electricity easement will be restricted to the existing cleared easement, with little clearing required. Clearing will be restricted to shrubs that have regenerated underneath the existing easement. These shrubs are likely to regenerate once construction is completed. The proposal is not likely to increase fragmentation of this EEC.

• adversely affect habitat critical to the survival of an ecological community;

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, no critical habitat for SSTF has been listed on the Register of Critical Habitat. A recovery plan has not yet been prepared under this EEC under the EPBC Act. Under the TSC Act, a recovery plan for SSTF is currently being prepared, as part of the recovery planning for the endangered ecological communities of the Cumberland Plain.

The SSTF in the study area is not likely to be critical habitat, given the poor condition, fragmented nature and small size of the patches of SSTF. The proposal is not likely to impact on habitat critical to the survival of this EEC.

• modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;

The proposal will result in the clearing of approximately 1.1 ha of SSTF, with indirect impacts to a further 1.6 ha. The proposed will not further modify or destroy abiotic factors necessary to the EECs survival, provided mitigation measures, such as erosion and sedimentation control, are implemented.

• cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;

The proposal would potentially increase the threat of weed invasion in the SSTF in the study area, however the SSTF in the study area is represented by small fragmented stands that are already highly impacted by weed invasion due to impacts from surrounding land uses. Implementation of mitigation measures such as bush regeneration, will reduce the threat of weed invasion on SSTF.

• cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

– assisting invasive species, that are harmful to the listed ecological community, to become established; or

– causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; or

SSTF in the study area is considered to be in poor condition, with impacts from surrounding land uses resulting in weed invasion, vegetation clearance, trampling and grazing in the scattered patches of SSTF in the study area.

The proposal would potentially increase the threat of invasive species becoming established in the SSTF in the study area, however the SSTF in the study area is represented by small fragmented stands that are already highly impacted by weed invasion. Invasive species recorded in the SSTF in the study area, such as *Olea europea,* could potentially benefit from increased disturbance resulting from the proposal. Implementation of mitigation measures such as bush regeneration, will reduce the threat of weed invasion on SSTF and known invasive species such as *Olea europea* should be a focus of any weed management programs.

The proposal will not involve the introduction of chemicals into the SSTF in the study area. Any chemicals used on site during the construction and operation phase of the proposal will be taken off site after use and disposed of appropriately. It is possible that herbicide will be used as part of the bush regeneration program to control certain weeds, however it will only be used by personnel experienced in the use of such chemicals.

The proposal is not likely to cause a substantial reduction in the quality or integrity of the occurrence SSTF in the study area, provided mitigation measures are implemented as appropriate.

- **interfere with the recovery of an ecological community.**

A recovery plan has not yet been prepared under this EEC under the EPBC Act. Under the TSC Act, a recovery plan for SSTF is currently being prepared, as part of the recovery planning for the endangered ecological communities of the Cumberland Plain. The proposal is not likely to interfere with the recovery of this EEC.

Conclusion

Based on the above assessment, SSTF is unlikely to be significantly impacted by the proposal and as such a referral under the provisions of the EPBC Act is not recommended for this EEC.

Endangered Species

Potential habitat occurs within the study site for one Endangered plant species listed on the EPBC Act: *Persoonia hirsuta.* The potential impacts of the proposal on this species are assessed against the Significant Impact Criteria of the EPBC Act below.

This species was not recorded within the study site during the current survey.

Persoonia hirsuta

Is the action likely to lead to a long-term decrease in the size of a population of a species?

Persoonia hirsuta was not recorded in the study area. The study area is not likely to support a population of the species. The proposal is therefore unlikely to lead to a long-term decrease in the size of a population of the species.

Is the action likely to reduce the area of occupancy of the species?

Persoonia hirsuta was not recorded in the study area. The removal or modification of 2.7 ha of vegetation that is potential habitat for *Persoonia hirsuta* is not likely to reduce the area of occupancy of the species.

Is the action likely to fragment an existing population into two or more populations?

No populations of *P. hirsuta* were recorded in the study area. The habitat to be affected in the study area was considered to be in poor condition. Potential habitat for *P. hirsuta* that will be disturbed as part of the proposal is on the edge of a riparian corridor along the Nepean River. The area of proposed disturbance is situated in the proximity of other previous disturbances associated with rural development, such as cleared paddocks, roads, railway lines and powerlines. The proposal is not likely to result in the further fragmentation of any areas of potential habitat.

Is the action likely to adversely affect habitat critical to the survival of a species?

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;

- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, no critical habitat for *P. hirsuta* has been listed on the Register of Critical Habitat. A recovery plan for this species is in preparation, but not yet available to the public.

The potential habitat for *P. hirsuta* in the study area is not likely to be critical habitat, as the species was not recorded in the study area and so the area is not likely to be necessary for breeding, dispersal, long-term maintenance, to maintain genetic diversity and long term evolutionary development or for the reintroduction of populations.

Is the action likely to disrupt the breeding cycle of a population?

Persoonia hirsuta was not recorded in the study area. The proposed removal of a total of 1.1 ha of vegetation that is potential habitat for *P. hirsuta* and potential indirect impacts to a further 1.6 ha of potential habitat is considered unlikely to disrupt the breeding cycle of a population.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Persoonia hirsuta was not recorded in the study area. Potential habitat for *P. hirsuta* in the study area occurs in SSTF. The proposal will remove or modify approximately 2.7 ha of vegetation that is potential habitat for *P. hirsuta.*

At least 5,481 ha of SSTF has been mapped in the locality (within 10 km of the study area) (NPWS 2002b). The area of habitat to be removed or modified as part of the proposal equates to 0.05% of similar vegetation that exists in the locality.

Potential habitat for *P. hirsuta* that will be disturbed as part of the proposal is on the edge of a riparian corridor along the Nepean River. The area of proposed disturbance is situated in the proximity of other previous disturbances associated

with rural development, such as cleared paddocks, roads, railway lines and powerlines. The proposal is not likely to result in isolation of any areas of potential habitat.

The proposal is not likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Is the action likely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat?

The proposal would potentially increase the threat of invasive species becoming established in the potential habitat for *P. hirsuta* in the study area, however the potential habitat in the study area is represented by small fragmented stands that are already highly impacted by weed invasion. Invasive species recorded in the study area, such as *Olea europea,* could potentially benefit from increased disturbance resulting from the proposal. Implementation of mitigation measures such as bush regeneration, will reduce the threat of weed invasion and known invasive species such as *Olea europea* should be a focus of any weed management programs.

Is the action likely to introduce disease that may cause the species to decline?

The removal or modification of 2.7 ha of potential habitat for *P. hirsuta* is not likely to introduce disease that may cause the species to decline. However as a precaution, vehicles should be washed prior to use on site.

Is the action likely to interfere with the recovery of the species?

The recovery plan for *P. hirsuta* is currently being prepared and is not yet available to the public. The proposal is not likely to interfere with the recovery of the species.

Conclusion

Based on the above assessment, *P. hirsuta* is unlikely to be significantly impacted by the proposal and as such a referral under the provisions of the EPBC Act is not recommended for this species.

Vulnerable Species

Potential habitat occurs within the study area for three Vulnerable plant species listed on the EPBC Act *Grevillea parviflora* spp. *parviflora, Persoonia*

bargoensis and *Pomaderris brunnea*. The potential impacts of the proposal on these species are assessed against the Significant Impact Criteria of the EPBC Act below.

Grevillea parviflora* ssp. *parviflora

Is the action likely to lead to a long-term decrease in the size of an important population of a species?

An 'important population' is defined by DEH (2006) as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal;
- populations that are necessary for maintaining genetic diversity; and/or
- populations that are near the limit of the species range.

Grevillea parviflora ssp. *parviflora* was not recorded in the study area. The study area is therefore unlikely to support an important population of this species. The proposal is not likely to lead to a long-term decrease in the size of an important population of this species.

Is the action likely to reduce the area of occupancy of an important population?

Grevillea parviflora ssp. *parviflora* was not recorded in the study area. The study area is therefore unlikely to support an important population of this species. The proposal is not likely to reduce the occupancy of an important population of this species.

Is the action likely to fragment an existing important population into two or more populations?

The study area is not considered to contain an important population of *G. parviflora* spp. *parviflora.* Furthermore, the proposal would not result in the fragmentation of any areas of potential habitat for the species. The proposal is not likely to fragment an existing important population into two or more populations.

Is the action likely to adversely affect habitat critical to the survival of a species?

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;

- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, the Register of Critical Habitat does not contain any listing for *G. parviflora* ssp. *parviflora* and a recovery plan for the species has not been prepared.

The potential habitat for *G. parviflora* ssp. *parviflora* in the study area is not likely to be critical habitat, as the species was not recorded in the study area and so the area is not likely to be necessary for breeding, dispersal, long-term maintenance, to maintain genetic diversity and long term evolutionary development or for the reintroduction of populations. The proposal is not likely to adversely affect habitat critical to the survival of this species.

Is the action likely to disrupt the breeding cycle of an important population?

The study area is not considered to contain an important population of *G. parviflora* ssp. *parviflora.* The proposal is therefore not likely to disrupt the breeding cycle of an important population of the species.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Grevillea parviflora ssp. *parviflora* was not recorded in the study area. Potential habitat for *G. parviflora* ssp. *parviflora* in the study area occurs in SSTF and Western Sandstone Gully Forest. The proposal will remove or modify approximately 4.4 ha of vegetation that is potential habitat for *G. parviflora* ssp. *parviflora.*

At least 7,381 ha of similar habitats have been mapped in the locality (within 10 km of the study area) (NPWS 2002b). The area of habitat to be removed as part of the proposal equates to 0.06% of similar vegetation that exists in the locality.

Potential habitat for *G. parviflora* spp. *parviflora* that will be disturbed as part of the proposal is on the edge of a riparian corridor along the Nepean River. The area of proposed disturbance is situated in the proximity of other previous disturbances associated with rural development, such as cleared paddocks, roads, railway lines and powerlines. The proposal is not likely to result in isolation of any areas of potential habitat.

Therefore, the proposal is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The proposal would potentially increase the threat of invasive species becoming established in the potential habitat for *G. parviflora* spp. *parviflora* in the study area, however the potential habitat in the study area is represented by small fragmented stands that are already highly impacted by weed invasion. Invasive species recorded in the study area, such as *Olea europea,* could potentially benefit from increased disturbance resulting from the proposal. Implementation of mitigation measures such as bush regeneration, will reduce the threat of weed invasion and known invasive species such as *Olea europea* should be a focus of any weed management programs.

Is the action likely to introduce disease that may cause the species to decline?

The removal or modification of 4.4 ha of potential habitat for *G. parviflora* spp. *parviflora* is not likely to introduce disease that may cause the species to decline. However as a precaution, vehicles should be washed prior to use on site.

Is the action likely to interfere substantially with the recovery of the species?

To date, no recovery plan has been written for *G. parviflora* ssp. *parviflora.* The proposal is not likely to interfere with the recovery of this species.

Conclusion

Based on the above assessment, *G. parviflora* ssp. *parviflora* is unlikely to be significantly impacted by the proposal and as such a referral under the provisions of the EPBC Act is not recommended for this species.

Persoonia bargoensis

Is the action likely to lead to a long-term decrease in the size of an important population of a species?

An 'important population' is defined by DEH (2006) as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal;
- populations that are necessary for maintaining genetic diversity; and/or
- populations that are near the limit of the species range.

Persoonia bargoensis was not recorded in the study area. The study area is therefore unlikely to support an important population of this species. Therefore the proposal is not likely to lead to a long-term decrease in the size of an important population of this species.

Is the action likely to reduce the area of occupancy of an important population?

Persoonia bargoensis was not recorded in the study area. The study area is therefore unlikely to support an important population of this species. The proposal is not likely to reduce the area of occupancy of an important population.

Is the action likely to fragment an existing important population into two or more populations?

The study area is not considered to contain an important population of *P. bargoensis.* Furthermore, the proposal would not result in the fragmentation of any areas of potential habitat for the species.

Is the action likely to adversely affect habitat critical to the survival of a species?

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, the Register of Critical Habitat does not contain any listing for *P. bargoensis* and a recovery plan for the species is in preparation, but not yet available to the public.

The potential habitat for *P. bargoensis* in the study area is not likely to be critical habitat, as the species was not recorded in the study area and so the area is not likely to be necessary for breeding, dispersal, long-term maintenance of the species, to maintain genetic diversity and long term evolutionary development or for the reintroduction of populations.

Is the action likely to disrupt the breeding cycle of an important population?

The study area is not considered to contain an important population of *P. bargoensis.* The proposal is therefore not likely to disrupt the breeding cycle of an important population of the species.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Persoonia bargoensis was not recorded in the study area. Potential habitat for *P. bargoensis* in the study area occurs in SSTF. The proposal will remove or modify approximately 2.7 ha of vegetation that is potential habitat for *P. bargoensis.*

At least 5,481 ha of similar habitats have been mapped in the locality (within 10 km of the study area) (NPWS 2002b). The area of habitat to be removed as part of the proposal equates to 0.05% of similar vegetation that exists in the locality.

Potential habitat for *P. bargoensis* that will be disturbed as part of the proposal is on the edge of a riparian corridor along the Nepean River. The area of proposed disturbance is situated in the proximity of other previous disturbances associated with rural development, such as cleared paddocks, roads, railway lines and powerlines. The proposal is not likely to result in isolation of any areas of potential habitat.

Therefore, the proposal is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The proposal would potentially increase the threat of invasive species becoming established in the potential habitat for *P. bargoensis* in the study area, however the potential habitat in the study area is represented by small fragmented stands that are already highly impacted by weed invasion. Invasive species recorded in the study area, such as *Olea europea,* could potentially benefit from increased disturbance resulting from the proposal. Implementation of mitigation measures such as bush regeneration and weed control, will reduce the threat of weed invasion and known invasive species such as *Olea europea* should be a focus of any weed management programs.

Is the action likely to introduce disease that may cause the species to decline?

The removal or modification of 2.7 ha of potential habitat for *P. bargoensis* is not likely to introduce disease that may cause the species to decline. However as a precaution, vehicles should be washed prior to use on site.

Is the action likely to interfere substantially with the recovery of the species?

To date, no recovery plan has been written for *P. bargoensis.* The proposal is not likely to interfere with the recovery of this species.

Conclusion

Based on the above assessment, *P. bargoensis* is unlikely to be significantly impacted by the proposal and as such a referral under the provisions of the EPBC Act is not recommended for these species.

Pomaderris brunnea

Is the action likely to lead to a long-term decrease in the size of an important population of a species?

An 'important population' is defined by DEH (2006) as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal;
- populations that are necessary for maintaining genetic diversity; and/or
- populations that are near the limit of the species range.

Pomaderris brunnea was not recorded in the study area. The study area is therefore unlikely to support an important population of this species. The proposal is not likely to lead to a long-term decrease in the size of an important population of this species.

Is the action likely to reduce the area of occupancy of an important population?

Pomaderris brunnea was not recorded in the study area. The study area is therefore unlikely to support an important population of this species. The proposal is not likely to reduce the area of occupancy of an important population of the species.

Is the action likely to fragment an existing important population into two or more populations?

The study area is not considered to contain an important population of *P. brunnea.* Furthermore, the proposal would not result in the fragmentation of any areas of potential habitat for the species. The proposal is not likely to fragment an existing important population into two or more populations.

Is the action likely to adversely affect habitat critical to the survival of a species?

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);

- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, the Register of Critical Habitat does not contain any listing for *P. brunnea* and a recovery plan for the species is currently being prepared, but not yet available to the public.

The potential habitat for *P. brunnea* in the study area is not likely to be critical habitat, as the species was not recorded in the study area and so the area is not likely to be necessary for breeding, dispersal, long-term maintenance of the species, to maintain genetic diversity and long term evolutionary development or for the reintroduction of populations.

Is the action likely to disrupt the breeding cycle of an important population?

The study area is not considered to contain an important population of *P. brunnea.* The proposal is therefore not likely to disrupt the breeding cycle of an important population of the species.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Pomaderris brunnea was not recorded in the study area. Potential habitat for *P. brunnea* in the study area occurs in SSTF. The proposal will remove or modify approximately 2.7 ha of vegetation that is potential habitat for *P. brunnea.*

At least 5,481 ha of similar habitats have been mapped in the locality (within 10 km of the study area) (NPWS 2002b). The area of habitat to be removed as part of the proposal equates to 0.05% of similar vegetation that exists in the locality.

Potential habitat for *P. brunnea* that will be disturbed as part of the proposal is on the edge of a riparian corridor along the Nepean River. The area of proposed disturbance is situated in the proximity of other previous disturbances associated with rural development, such as cleared paddocks, roads, railway lines and powerlines. The proposal is not likely to result in isolation of any areas of potential habitat.

Therefore, the proposal is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The proposal would potentially increase the threat of invasive species becoming established in the potential habitat for *P. brunnea* in the study area, however the potential habitat in the study area is represented by small fragmented stands that are already highly impacted by weed invasion. Invasive species recorded in the study area, such as *Olea europea,* could potentially benefit from increased disturbance resulting from the proposal. Implementation of mitigation measures such as bush regeneration, will reduce the threat of weed invasion and known invasive species such as *Olea europea* should be a focus of any weed management programs.

Is the action likely to introduce disease that may cause the species to decline?

The removal or modification of 2.7 ha of potential habitat for *P. brunnea* is not likely to introduce disease that may cause the species to decline. However as a precaution, vehicles should be washed prior to use on site.

Is the action likely to interfere substantially with the recovery of the species?

To date, no recovery plan has been written for *P. brunnea.* The proposal is not likely to interfere with the recovery of this species.

Conclusion

Based on the above assessment, *P. brunnea* is unlikely to be significantly impacted by the proposal and as such a referral under the provisions of the EPBC Act is not recommended for these species.

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