(xxix) 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

(xxx) 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.

Not applicable.

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

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

(xliv) 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

(xlv) 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.

A strip approximately 4 m wide and 10 km long will be cleared directly adjacent to an existing road in order to construct the transmission line, although much of this length is already cleared pastoral land.

The vegetation clearance that will take place along the existing road will not further fragment or isolate habitat as the existing road already fragments the landscape and the additional clearing will not act to exacerbate this. Habitat will not become isolated for this species as the strip will be relatively narrow and will not form a barrier to this highly mobile species.

The habitat to be removed is not important to the long term survival of this species in the locality as it is a relatively small area, and large amounts of habitat exist in the vicinity. Small numbers of *Casuarina* and *Allocasuarina* trees will be removed, but these are insignificant compared with the large numbers remaining in adjacent vegetation. No large hollows exist in the areas of vegetation to be removed and therefore no nesting habitat will be affected by the proposed development.

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

No critical habitat for the subject species has currently been listed in the critical habitat registry by the Director-General of the DEC.

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

No recovery plan has been drafted for this species.

No threat abatement plan is relevant to 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.*

The proposed development will involve native vegetation clearance which is a listed Key Threatening Process under the TSC Act. However, the area to be cleared is relatively small and large amounts of habitat will remain in the vicinity of the development.

Conclusion

Although some removal of Glossy Black Cockatoo habitat will occur, the amount of habitat that will be removed is relatively small. Due to the location and extent of the clearance, no areas of habitat will be fragmented or isolated from other areas of habitat. Large tracts of similar vegetation occur around the subject site and foraging habitat occurs across the study area that will not be affected. Consequently, no significant impact is likely on this species and no Species Impact Statement is required.

B.16 Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*)

The Brown Treecreeper, is a grey-brown bird with black streaking on the lower breast and belly and black bars on the undertail. Pale buff bands across the flight feathers are obvious in flight. The face is pale, with a dark line through the eye, and a dark crown. The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands. This species is found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.

The Brown Treecreeper is listed as Vulnerable on the schedules of the NSW TSC Act; however is not listed as Endangered under the Commonwealth EPBC Act. No draft recovery plan has been written for this species.

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 potential habitat to be affected by the proposal consists of sections of native vegetation within a narrow corridor predominantly within a road verge for the construction of a transmission line. Much of the impact zone is within pastoral land and the areas of native vegetation to be removed are minimal. Large areas of habitat are available within adjoining areas of Ben Bullen State Forest, and the removal of narrow strips of roadside vegetation will not make this area of extensive habitat less suitable for this species. Therefore the proposed development will not have an adverse effect on the life cycle of this 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,

Not applicable.

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

(xxxi) 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

(xxxii) 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.

Not applicable.

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

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

(xlvii) 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

(xlviii) 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.

A strip approximately 4 m wide and 10 km long will be cleared directly adjacent to an existing road in order to construct the transmission line, although much of this length is already cleared pastoral land.

The vegetation clearance that will take place along the existing road will not further fragment or isolate habitat as the existing road already fragments the landscape and the additional clearing will not act to exacerbate this. Habitat will not become isolated for this species as the strip will be relatively narrow and will not form a barrier to this highly mobile species.

The habitat to be removed is not important to the long term survival of this species in the locality as it is a relatively small area, and large amounts of habitat exist in the vicinity.

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

No critical habitat for the subject species has currently been listed in the critical habitat registry by the Director-General of the DEC.

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

No recovery plan has been drafted for this species.

No threat abatement plan is relevant to 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.

The proposed development will involve native vegetation clearance which is a listed Key Threatening Process under the TSC Act. However, the area to be cleared is relatively small and large amounts of habitat will remain in the vicinity of the development.

Conclusion

Although some removal of Brown Treeecreeper habitat will occur, the amount of habitat that will be removed is relatively small. Due to the location and extent of the clearance, no areas of habitat will be fragmented or isolated from other areas of habitat. Large tracts of similar vegetation occur around the subject site and foraging habitat occurs across the study area that will not be affected. Consequently, no significant impact is likely on this species and no Species Impact Statement is required.

B.17 Diamond Firetail (*Stagonopleura guttata*)

The Diamond Firetail has a bright red bill, red eyes and rump. The white throat and lower breast are separated by a broad black breast-band that extends into the strongly white-spotted, black flanks. It has a grey back and head, and ashy-brown wings. The Diamond Firetail is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Cental and South Western Slopes and the

North West Plains and Riverina. It is not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. These birds roost in dense shrubs or in smaller nests built especially for roosting, mostly in grassy eucalypt woodlands.

The Diamond Firetail is listed as Vulnerable on the schedules of the NSW TSC Act; however is not listed as Endangered under the Commonwealth EPBC Act. No draft recovery plan has been written for this species.

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 potential habitat to be affected by the proposal consists of sections of native vegetation within a narrow corridor predominantly within a road verge for the construction of a transmission line. Much of the impact zone is within pastoral land and the areas of native vegetation to be removed are minimal. Large areas of habitat are available within adjoining areas of Ben Bullen State Forest, and the removal of narrow strips of roadside vegetation will not make this area of extensive habitat less suitable for this species. Therefore the proposed development will not have an adverse effect on the life cycle of this 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,

Not applicable.

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

(xxxiii) 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

(xxxiv) 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.

Not applicable.

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

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

(l) *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*

(li) *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.*

A strip approximately 4 m wide and 10 km long will be cleared directly adjacent to an existing road in order to construct the transmission line, although much of this length is already cleared pastoral land.

The vegetation clearance that will take place along the existing road will not further fragment or isolate habitat as the existing road already fragments the landscape and the additional clearing will not act to exacerbate this. Habitat will not become isolated for this species as the strip will be relatively narrow and will not form a barrier to this highly mobile species.

The habitat to be removed is not important to the long term survival of this species in the locality as it is a relatively small area, and large amounts of habitat exist in the vicinity.

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

No critical habitat for the subject species has currently been listed in the critical habitat registry by the Director-General of the DEC.

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

No recovery plan has been drafted for this species.

No threat abatement plan is relevant to 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.

The proposed development will involve native vegetation clearance which is a listed Key Threatening Process under the TSC Act. However, the area to be cleared is relatively small and large amounts of habitat will remain in the vicinity of the development.

Conclusion

Although some removal of Diamond Firetail habitat will occur, the amount of habitat that will be removed is relatively small. Due to the location and extent of the clearance, no

areas of habitat will be fragmented or isolated from other areas of habitat. Large tracts of similar vegetation occur around the subject site and foraging habitat occurs across the study area that will not be affected. Consequently, no significant impact is likely on this species and no Species Impact Statement is required.

B.18 Speckled Warbler (*Pyrrholaemus sagittatus*)

The Speckled Warbler is a small well-camouflaged very heavily streaked ground-dwelling bird related to the scrubwrens, reaching a length of 13cm. The back, wings and tail are grey-brown, with soft dark streaks. The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat includes scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area.

The Speckled Warbler is listed as Vulnerable on the schedules of the NSW TSC Act; however is not listed as Endangered under the Commonwealth EPBC Act. No draft recovery plan has been written for this species.

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 potential habitat to be affected by the proposal consists of sections of native vegetation within a narrow corridor predominantly within a road verge for the construction of a transmission line. Much of the impact zone is within pastoral land and the areas of native vegetation to be removed are minimal. Large areas of habitat are available within adjoining areas of Ben Bullen State Forest, and the removal of narrow strips of roadside vegetation will not make this area of extensive habitat less suitable for this species. Therefore the proposed development will not have an adverse effect on the life cycle of this 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,

Not applicable.

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

(xxxv) 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

(xxxvi) 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.

Not applicable.

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

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

(liii) 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

(liv) 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.

A strip approximately 4 m wide and 10 km long will be cleared directly adjacent to an existing road in order to construct the transmission line, although much of this length is already cleared pastoral land.

The vegetation clearance that will take place along the existing road will not further fragment or isolate habitat as the existing road already fragments the landscape and the additional clearing will not act to exacerbate this. Habitat will not become isolated for this species as the strip will be relatively narrow and will not form a barrier to this highly mobile species.

The habitat to be removed is not important to the long term survival of this species in the locality as it is a relatively small area, and large amounts of habitat exist in the vicinity.

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

No critical habitat for the subject species has currently been listed in the critical habitat registry by the Director-General of the DEC.

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

No recovery plan has been drafted for this species.

No threat abatement plan is relevant to 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.*

The proposed development will involve native vegetation clearance which is a listed Key Threatening Process under the TSC Act. However, the area to be cleared is relatively small and large amounts of habitat will remain in the vicinity of the development.

Conclusion

Although some removal of Speckled Warbler habitat will occur, the amount of habitat that will be removed is relatively small. Due to the location and extent of the clearance, no areas of habitat will be fragmented or isolated from other areas of habitat. Large tracts of similar vegetation occur around the subject site and foraging habitat occurs across the study area that will not be affected. Consequently, no significant impact is likely on this species and no Species Impact Statement is required.

B.19 Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*)

The Black-chinned Honeyeater is the largest of its genus, reaching 17 cm in length. The cap is black, with a white crescent around the nape, and there is a diagnostic black centre line down the white throat. The subspecies is widespread, from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond River district. It has also been recorded at a few scattered sites in the Hunter, Central Coast and Illawarra regions. It occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*Eucalyptus albens*), Grey Box (*Eucalyptus microcarpa*), Yellow Box (*Eucalyptus melliodora*) and Forest Red Gum (*Eucalyptus tereticornis*). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees.

The Black-chinned Honeyeater is listed as Vulnerable on the schedules of the NSW TSC Act; however is not listed as Endangered under the Commonwealth EPBC Act. No draft recovery plan has been written for this species.

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 potential habitat to be affected by the proposal consists of sections of native vegetation within a narrow corridor predominantly within a road verge for the construction of a transmission line. Much of the impact zone is within pastoral land and the areas of native vegetation to be removed are minimal. Large areas of habitat are available within adjoining areas of Ben Bullen State Forest, and the removal of narrow strips of roadside

vegetation will not make this area of extensive habitat less suitable for this species. Therefore the proposed development will not have an adverse effect on the life cycle of this 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,

Not applicable.

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

(xxxvii) 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

(xxxviii) 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.

Not applicable.

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

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

(lvi) 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

(lvii) 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.

A strip approximately 4 m wide and 10 km long will be cleared directly adjacent to an existing road in order to construct the transmission line, although much of this length is already cleared pastoral land.

The vegetation clearance that will take place along the existing road will not further fragment or isolate habitat as the existing road already fragments the landscape and the additional clearing will not act to exacerbate this. Habitat will not become isolated for this species as the strip will be relatively narrow and will not form a barrier to this highly mobile species.

The habitat to be removed is not important to the long term survival of this species in the locality as it is a relatively small area, and large amounts of habitat exist in the vicinity.

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

No critical habitat for the subject species has currently been listed in the critical habitat registry by the Director-General of the DEC.

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

No recovery plan has been drafted for this species.

No threat abatement plan is relevant to 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.

The proposed development will involve native vegetation clearance which is a listed Key Threatening Process under the TSC Act. However, the area to be cleared is relatively small and large amounts of habitat will remain in the vicinity of the development.

Conclusion

Although some removal of Black-chinned Honeyeater habitat will occur, the amount of habitat that will be removed is relatively small. Due to the location and extent of the clearance, no areas of habitat will be fragmented or isolated from other areas of habitat. Large tracts of similar vegetation occur around the subject site and foraging habitat occurs across the study area that will not be affected. Consequently, no significant impact is likely on this species and no Species Impact Statement is required.

B.20 Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*)

The Grey-crowned Babbler reaches 30 cm long. Its distinctive bill is scimitar-shaped, long and heavy. The broad white eyebrow and a pale grey crown-stripe are other distinguishing characters. The Grey-crowned Babbler is found throughout large parts of northern Australia and in south-eastern Australia. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Hay. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Birds are generally unable to cross large open areas.

The Grey-crowned Babbler is listed as Vulnerable on the schedules of the NSW TSC Act; however is not listed as Endangered under the Commonwealth EPBC Act. No draft recovery plan has been written for this species.

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 potential habitat to be affected by the proposal consists of sections of native vegetation within a narrow corridor predominantly within a road verge for the construction of a transmission line. Much of the impact zone is within pastoral land and the areas of native vegetation to be removed are minimal. Large areas of habitat are available within adjoining areas of Ben Bullen State Forest, and the removal of narrow strips of roadside vegetation will not make this area of extensive habitat less suitable for this species. Therefore the proposed development will not have an adverse effect on the life cycle of this 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,

Not applicable.

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

(xxxix) 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

(xl) 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.

Not applicable.

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

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

(lix) 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

(Ix) *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.*

A strip approximately 4 m wide and 10 km long will be cleared directly adjacent to an existing road in order to construct the transmission line, although much of this length is already cleared pastoral land.

The vegetation clearance that will take place along the existing road will not further fragment or isolate habitat as the existing road already fragments the landscape and the additional clearing will not act to exacerbate this. Habitat will not become isolated for this species as the strip will be relatively narrow and will not form a barrier to this highly mobile species.

The habitat to be removed is not important to the long term survival of this species in the locality as it is a relatively small area, and large amounts of habitat exist in the vicinity.

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

No critical habitat for the subject species has currently been listed in the critical habitat registry by the Director-General of the DEC.

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

No recovery plan has been drafted for this species.

No threat abatement plan is relevant to 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.

The proposed development will involve native vegetation clearance which is a listed Key Threatening Process under the TSC Act. However, the area to be cleared is relatively small and large amounts of habitat will remain in the vicinity of the development.

Conclusion

Although some removal of Grey-crowned Babbler habitat will occur, the amount of habitat that will be removed is relatively small. Due to the location and extent of the clearance, no areas of habitat will be fragmented or isolated from other areas of habitat. Large tracts of similar vegetation occur around the subject site and foraging habitat occurs across the study area that will not be affected. Consequently, no significant impact is likely on this species and no Species Impact Statement is required.

B.21 Regent Honeyeater (*Xanthomyza phrygia*)

The Regent Honeyeater is a medium-sized, black and yellow honeyeater with a sturdy, curved bill. Its head, neck, throat, upper breast and bill are black and the back and lower breast are pale lemon in colour with a black scalloped pattern. The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years non-breeding flocks converge on flowering coastal woodlands and forests.

The Regent Honeyeater is listed as Endangered on the schedules of the NSW TSC Act; and is listed as Endangered under the Commonwealth EPBC Act. No draft recovery plan has been written for this species.

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 potential habitat to be affected by the proposal consists of sections of native vegetation within a narrow corridor predominantly within a road verge for the construction of a transmission line. Much of the impact zone is within pastoral land and the areas of native vegetation to be removed are minimal. Large areas of habitat are available within adjoining areas of Ben Bullen State Forest, and the removal of narrow strips of roadside vegetation will not make this area of extensive habitat less suitable for this species. Therefore the proposed development will not have an adverse effect on the life cycle of this 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,

Not applicable.

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

(xli) 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

(xlii) 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.

Not applicable.

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

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

(lxii) 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

(lxiii) 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.

A strip approximately 4 m wide and 10 km long will be cleared directly adjacent to an existing road in order to construct the transmission line, although much of this length is already cleared pastoral land.

The vegetation clearance that will take place along the existing road will not further fragment or isolate habitat as the existing road already fragments the landscape and the additional clearing will not act to exacerbate this. Habitat will not become isolated for this species as the strip will be relatively narrow and will not form a barrier to this highly mobile species.

The habitat to be removed is not important to the long term survival of this species in the locality as it is a relatively small area, and large amounts of habitat exist in the vicinity.

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

No critical habitat for the subject species has currently been listed in the critical habitat registry by the Director-General of the DEC.

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

No recovery plan has been drafted for this species.

No threat abatement plan is relevant to 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.

The proposed development will involve native vegetation clearance which is a listed Key Threatening Process under the TSC Act. However, the area to be cleared is relatively small and large amounts of habitat will remain in the vicinity of the development.

Conclusion

Although some removal of Regent Honeyeater habitat will occur, the amount of habitat that will be removed is relatively small. Due to the location and extent of the clearance, no areas of habitat will be fragmented or isolated from other areas of habitat. Large tracts of similar vegetation occur around the subject site and foraging habitat occurs across the study area that will not be affected. Consequently, no significant impact is likely on this species and no Species Impact Statement is required.

B.22 Swift Parrot (*Lathamus discolor*)

The Swift Parrot is small parrot about 25 cm long. It is bright green with red around the bill, throat and forehead. The red on its throat is edged with yellow. Its crown is blue-purple. There are bright red patches under the wings. One of most distinctive features from a distance is its long (12 cm), thin tail, which is dark red. The species breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.

The Swift Parrot is listed as Endangered on the schedules of the NSW TSC Act; and is listed as Endangered under the Commonwealth EPBC Act. No draft recovery plan has been written for this species.

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 potential habitat to be affected by the proposal consists of sections of native vegetation within a narrow corridor predominantly within a road verge for the construction of a transmission line. Much of the impact zone is within pastoral land and the areas of native vegetation to be removed are minimal. Large areas of habitat are available within adjoining areas of Ben Bullen State Forest, and the removal of narrow strips of roadside vegetation will not make this area of extensive habitat less suitable for this species. Therefore the proposed development will not have an adverse effect on the life cycle of this 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,

Not applicable.

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

(xliii) 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

(xliv) 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.

Not applicable.

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

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

(lxv) 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

(lxvi) 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.

A strip approximately 4 m wide and 10 km long will be cleared directly adjacent to an existing road in order to construct the transmission line, although much of this length is already cleared pastoral land.

The vegetation clearance that will take place along the existing road will not further fragment or isolate habitat as the existing road already fragments the landscape and the additional clearing will not act to exacerbate this. Habitat will not become isolated for this species as the strip will be relatively narrow and will not form a barrier to this highly mobile species.

The habitat to be removed is not important to the long term survival of this species in the locality as it is a relatively small area, and large amounts of habitat exist in the vicinity.

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

No critical habitat for the subject species has currently been listed in the critical habitat registry by the Director-General of the DEC.

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

No recovery plan has been drafted for this species.

No threat abatement plan is relevant to 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.*

The proposed development will involve native vegetation clearance which is a listed Key Threatening Process under the TSC Act. However, the area to be cleared is relatively small and large amounts of habitat will remain in the vicinity of the development.

Conclusion

Although some removal of Swift Parrot habitat will occur, the amount of habitat that will be removed is relatively small. Due to the location and extent of the clearance, no areas of habitat will be fragmented or isolated from other areas of habitat. Large tracts of similar vegetation occur around the subject site and foraging habitat occurs across the study area that will not be affected. Consequently, no significant impact is likely on this species and no Species Impact Statement is required.

B.23 Clandulla Geebung (*Persoonia marginata*)

A spreading shrub that grows to 50 cm high and up to 1 m across. Young branches are hairy. Leaves are elliptic to obovate, 2 – 4 cm long and 6 – 23 mm wide, sparsely hairy when young and hairless when mature. Flowers are yellow with brownish hairs; have a densely hairy ovary; and occur on short stalks 2 – 7 mm long. It is known from only four disjunct locations on the Central Tablelands and Central Coast. The core of the species distribution is within Clandulla State Forest, west of Kandons. Disjunct populations occur; to the north at Dingo Creek and Mount Dangar within the Wollemi and Goulburn River National Parks; to the south within Ben Bullen State Forest, south-east of Capertee; and to the south-east at Devils Hole, north of Colo Heights within Parr State Recreation Area. *Persoonia marginata* grows in dry sclerophyll forest and woodland communities on sandstone.

Persoonia marginata is listed as Vulnerable on the schedules of the NSW TSC Act; and is listed as Vulnerable under the Commonwealth EPBC Act.

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,

One plant of *Persoonia marginata* was recorded on the road margin, approximately 10.6 km southwest of the gate into the proposed resort property. This specimen was located on the southeastern side, less than one metre from the road pavement and would be removed by the development activities. This was the only specimen recorded from the subject site and therefore it is unlikely that this plant represents a viable local population of the species. Therefore the proposed development will not have an adverse effect on the life cycle of this 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,

Not applicable.

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

(xlv) 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

(xlvi) 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.

Not applicable.

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

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

(lxviii) 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

(lxix) 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.

A strip approximately 4 m wide and 10 km long will be cleared directly adjacent to an existing road in order to construct the transmission line, although much of this length is already cleared pastoral land.

The clearing that will take place for the powerline will remove a strip of vegetation along the road that contains a specimen of *Persoonia marginata*, however this will not fragment or isolate habitat for this species as the existing road already fragments the landscape and the additional clearing will not act to exacerbate this.

The only specimen of *Persoonia marginata* recorded within the subject site will be removed as part of the proposed development, however adjacent land is likely to be potentially suitable habitat for the species. Despite the individual specimen that will be removed, the habitat to be removed is not important to the long term survival of this species in the locality as it is a relatively small area, and large amounts of potentially suitable habitat exist in the vicinity.

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

No critical habitat for the subject species has currently been listed in the critical habitat registry by the Director-General of the DEC.

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

No recovery plan has been drafted for this species.

No threat abatement plan is relevant to 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.

The proposed development will involve native vegetation clearance which is a listed Key Threatening Process under the TSC Act. However, the area to be cleared is relatively small and large amounts of potential habitat will remain in the vicinity of the development.

Conclusion

Although one specimen of *Persoonia marginata* will be removed, the amount of potential habitat for this species that will be removed is relatively small. Due to the location and extent of the clearance, no areas of habitat will be fragmented or isolated from other areas of habitat. Large tracts of similar vegetation occur around the subject site and foraging habitat occurs across the study area that will not be affected. Consequently, no significant impact is likely on this species and no Species Impact Statement is required.

Appendix B: Heritage Assessment

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Aboriginal Heritage Assessment for the Proposed Wolgan Valley Electricity Distribution Line

November 2006

Prepared for:
Clifton Coney Group of behalf of Emirates (Hotels) Australia Pty Limited

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HLA Ref: S60501_HeritageRPT_Final_17Nov06

DISTRIBUTION

Aboriginal Heritage Assessment for the Proposed Wolgan Valley Electricity Distribution Line

November 2006

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By

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Associate Archaeologist

Technical Peer Reviewer: **Date:**

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Senior Archaeologist

CONTENTS

1 INTRODUCTION

This report outlines an Aboriginal heritage assessment undertaken by HLA-Envirosciences Pty Limited (HLA) for a proposed electricity line easement in the Wolgan Valley on behalf of Emirates Hotels Australia Pty Ltd (Emirates). The survey was undertaken to assess the impact on Aboriginal archaeological sites of the placement of power poles for the carriage of overhead powerlines from the head of Wolgan Valley (from The Gap) to the entry point onto the property acquired by Emirates for a resort development. The proposed electricity line largely follows the existing road easement on either side of Wolgan Road. The survey was carried out by two HLA archaeologists on 2 and 3 November 2006. Representatives of the Bathurst Local Aboriginal Land Council and Wiradjuri Nation assisted in the survey on 3 November.

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2 BACKGROUND AND CONTEXT

2.1 Environment

The Wolgan Valley is situated within the western escarpment of the Blue Mountains. The region is characterised physiographically by ridgetops, broad valleys, steep gullies and sheer cliffs. Elevation reaches as high as 1300m above sea level and in the western part of the chain the main topographic feature are deeply incised gorges, valleys and canyons. The Wolgan Valley is one such incised valley, cut down by the Wolgan River, one of the tributaries of the Colo River. From the southwest the land rapidly descends through a traversable breach in the terrain (The Gap) to the valley floor. Here the valley is approximately 2km wide before widening into a broad valley of almost 6km width, before narrowing again to a little over 1km wide in the northeast. The valley is approximately 12km long between these two narrow sections, and descends northeastward to the level of the Wolgan River, which here in the past (before water loss through upland mining activity and recent droughts) used to periodically flood much of the surrounding low lying land.

Flanking the valley are high and spectacular vertical escarpments. An "island" of high land – known as Donkey Mountain – lies in the central northeast portion of the valley. Vegetation on the valley slopes consists of dense woodland, which thins out at the base of slopes and the Wolgan River floodplain. Areas of the valley floor have been cleared for grazing.

2.2 Human Occupation

2.2.1 Prehistory

The antiquity of Aboriginal occupation of the Wolgan Valley has yet to be ascertained. However, archaeological research in the Blue Mountains region shows habitation extending back to at least the terminal Pleistocene, 12-13,000 years ago (Birmingham 1966; Stockton and Holland 1974, 1979). A similar timeframe could be expected for the Wolgan Valley.

Only limited archaeology has been undertaken in this part of the Blue Mountains. Australian Museum Business Services (AMBS) (2006: 7) summarise five archaeological surveys in the region since 1981 (Brayshaw 1981, 1983; Gorecki 1982/83; Gollan 1983; McIntyre 1990), which have resulted in the identification of at least 99 sites and 55 PADs (potential archaeological deposit). A search of the Department of Environment and Conservation's Aboriginal Heritage Information Management System database (AHIMS)[1] on 30 October 2006 revealed 28 Aboriginal sites within the immediate vicinity of the Wolgan Valley (**Figure 1**) although none are in the valley floor itself.

In relation to the current study, the most relevant and recent work has been that of AMBS, who carried out a four day survey for Emirates in 2005 (AMBS, 2006). This involved a survey of the entire proposed development site using a mixture of pedestrian and vehicle survey methods. Twelve sites and three PADs were identified, with one extensive PAD and site discovered near the intersection of Wolgan River and Tunnel Creek, at the entrance to the Emirates property. The site consists of several hundred stone artefacts of tuff, silcrete, quartzite, and chert covering an area of approximately 50m by 200m (AMBS, 2006: 20). This location marks the northern terminus of the survey discussed in the report presented here.

[1] Note that further sites may have been added to the AHIMS database after the time of accession, and in the absence of groundtruthing no guarantee can be given to the accuracy of the site locations depicted.

The limited archaeology thus far done in the Wolgan Valley region demonstrates that a potential exists for a high site density, at least in some parts of the valley floor. The predictions of site location made in the AMBS report (AMBS 2006: 9), drawn from previous studies, include the presence of "major site complexes" at the head of valleys and at the junction of major watercourse, where there is relatively easy access from ridgetops. The survey presented in this report offered an opportunity to test this predicted Aboriginal occupation pattern by examining a roughly linear transect from the top of the valley to the low lying northern end, where extensive sites were found by AMBS.

2.2.2 History

European incursion into the Wolgan Valley probably began in the mid-1820s when outstations were established for holdings that were obtained by pastoralists granted "tickets of occupation" for land in the Capertee Valley and at Dabee on the Upper Cudgegong River. It was mining however that had the most dramatic impact on the landscape. Oil shale (torbanite) mining began in the Wolgan Valley in 1873. Substantial oil shale mining began in 1903 and in 1905 the Commonwealth Oil Company commenced operations at Newnes, in the northeastern part of the valley. Here a large refinery was established and an associated town grew to accommodate around 1500 people by 1913 (Taylor n.d.: 34). In a considerable feat of engineering, a railway (the Wolgan Valley Railway) was built to allow the transport of shale to the refinery, and the export of refined product for connection with the Sydney line. The Newness refinery closed in 1923 and this, with the 1930s Great Depression, witnessed a drift out of the valley. Much of the town was dismantled in the early years of World War Two and by the mid-1940s only a small population of residents remained. During the late 1950s and early 1960s almost all the surviving buildings were dismantled or demolished.

Vestiges of this early European occupation are visible today. Some farm fencelines date to early pastoral activity, as do a number of ruins (including a former homestead that Emirates propose to restore). The tunnels and even some rolling stock of the Wolgan Valley Railway remain in and around Newnes. The railway itself was torn up in 1943 to provide scrap metal for the war effort, although the outline of the track can be seen today. The remains of the Newnes shale oil refinery, which was partially dismantled in the late 1930s to provide materials for the Glen Davis refinery and then dynamited in 1950s and 60s to aid recovery of bricks for resale, are still visible today. House platforms and terraces mark the former presence of the buildings of Newnes.

When the first European pastoralists arrived in the Wolgan Valley and surrounds in the 1820s they encountered an Aboriginal population that had inhabited this landscape for millennia. Two main language groups were recorded – Wiradjuri to the west and Gundungurra to the southeast. Other groups of the region included Durug, Darkinjung, Capiti, Bunally and Therabulat. A small band of Gundungurra/Wiradjuri speakers possibly inhabited the Wolgan Valley at contact, with the name "Wallerawang" often applied to this group by European commentators.

3 ARCHAEOLOGICAL SURVEY

The archaeological survey consisted of traversing by foot easements either side of Wolgan Road. The length of surveyed road easement extended from beneath The Gap in the southwest to the northern end of the transect, at the entry location into the Emirates property, a distance of approximately 14km. The survey was undertaken over two days, on 2 November 2006 by Clayton Fredericksen and Emma Harrison of HLA, and on 3 November 2006 by Fredericksen, Harrison, Richard Peters (Bathurst Local Aboriginal Land Council), and Gail Radcliffe (Wiradjuri Nation).

3.1 Consultation

Aboriginal consultation for this project was facilitated by the project manager for the Emirates resort project, Clifton Coney Group. On 15 November 2005, Clifton Coney and Emirates held an Aboriginal consultation meeting in Lithgow to discuss all aspects of the overall project, including heritage surveys. This was attended by representatives of Wiradjuri Nation, the Greater Lithgow Aboriginal and Torres Strait Islander Corporation, and a number of Indigenous people culturally connected with the area. The Bathurst Local Aboriginal Land Council was unable to attend and sent its apologies. The Bathurst Local Aboriginal Land Council, in a written statement, and Wiradjuri Nation representatives indicated (as set out in the minutes of the meeting) that their organisations wished to be included in any future archaeological site investigations.

Prior to initiating the survey presented in this report, Bradley Cole (HLA), on the basis of information supplied by Clifton Coney Group, contacted Richard Peters (Bathurst Local Aboriginal Land Council) to invite his participation in the survey. Mr Peters stated that, due to prior commitments, he could not take part until 3 November, but gave an assurance that the survey could begin on 2 November as planned. Due to a communication oversight HLA were not notified of the interest of Wiradjuri Nation until 2 November, at the conclusion of the first day of the survey. However, subsequent phone communication with Wendy Lewis, a Wiradjuri Nation elder, achieved an agreement, and Gail Radcliffe (of the Wiradjuri Nation) participated in the survey the following day.

3.2 Survey Methodology

3.2.1 Field Survey

The line of the proposed electricity line was marked with survey pegs, although instructions were given to survey both side of the road in the event that a change in plans was made, necessitating realignment of the line. Accordingly, an approximately 5m wide easement on either side of the road was inspected.

Survey was carried out in two ways. On the first day Fredericksen and Harrison began at the southwestern end of Wolgan Road, walking both sides of the road and focussing particularly on exposures and road sections. The survey was conducted in 2-3km segments as backtracking was required to return to the vehicle before moving on to another segment. Inspection was also made of the land at the base of a power pole at the bottom of The Gap some 20m back from the road, where a new pylon is planned. On the second day, when Mr Peters and Ms Radcliffe joined the survey, the same technique was used but beginning at the northeastern terminus of the transect and employing two survey teams – Peters and Fredericksen (Team 1), and Radcliffe and Harrison (Team 2). The vehicle was driven south along Wolgan Road for approximately 3-4km and Team 2 dropped to begin their survey by proceeding north along the road and inspecting easements on either side. Team 1 drove the vehicle back to the starting

point and then began walking south inspecting easements on both sides of the road, until they met the northward proceeding Team 2. Fredericksen then backtracked to the vehicle, collected the other three surveyors, and then proceeded south along the road to begin a new transect segment, applying the same methods as in the previous segment.

According to the AHIMS register no sites were previously recorded along Wolgan Road, so all identified sites were regarded as a new discovery. Location was recorded using a Garman eTrex GPS (AGD 84), meaning an error of between approximately 4m and 8m in spatial accuracy must be expected. The following notes were taken for each site:

- GPS coordinates and description of location
- Site extent, measured by pacing and orientating using compass
- Site context (section, disturbed verge, erosion feature, etc)
- Artefact description (approximate size or size range of artefacts, type, lithology as estimated by eye observation of grain and colour)
- Digital photography (location of photograph through GPS coordinates and orientation of photograph by compass bearing)

Survey coverage was high for much of the transect. Vegetation in the road easements was either non-existent or of low grasses. However, in two places – the far southern end of the road and the narrow gap between the northern uplands and Donkey Mountain – dense woodland nearly came down to the roadline. Here the ground surface was obscured by leaf litter, branches, etc. Another factor that impacted on site visibility, and one that my be very significant, is roadworks. Recent and ongoing grading was evident not only along Wolgan Road but also up to 3m into the road verge in some places. This would have two potential affects – the intrusion of road ballast into possible archaeological material, and the burying and other disturbance of any archaeological deposits along the roadside.

3.2.2 Nomenclature

Of the 12 sites encountered in the AMBS survey of 2005, 11 were stone artefact scatters or stone artefact finds. It was considered that any sites identified along the electricity line easement would likely also be stone artefacts. The following broad categories were adopted in identifying stone modified by human agency:

- Flakes: possess all or a combination of the following attributes – percussion bulb, eraillure scar, striking platform, ringcracks (from hammer striking the core).
- Cores: display single or multiple negative flake scars, but with no positive flake scars.
- Retouched flakes: flakes with microflaking (i.e. retouch) along one or more margins. Flaking tends to be more regular than through treadage or most forms of usewear.
- Flaked pieces: pieces that do not possess any of the attributes of cores or flakes but are nevertheless the result of human action, usually the byproduct of tool manufacture or core preparation.

Lithology is also important in discriminating rock imported by people and that occurring naturally as background "noise". The AMBS survey (AMBS 2006) identified the following range of rock types used in the manufacture of tools – mudstone (orange/dark brown bands, cream, yellow/cream mottled), tuff (brown, orange/red, cream), siliceous tuff (grey, cream/yellow, yellow/grey, cream/grey/pink/red), chert (grey, grey/banded, orange, red, yellow,

creamy/banded), quartz (milky crystal, grey), volcanic (grey), silcrete (yellow), and quartz (grey). This wide range of rock types, evidence of prehistoric utilisation of a variety of sources, includes some materials (such as chert and tuff) that cannot normally be distinguished without geological thin sectioning. As the survey described in this report was undertaken without the aid of magnification or thin sectioning to assist in rock identification, a simplified list of rock types was compiled. This was done in the knowledge that field identification of lithology is sometimes problematic and always preliminary. The following categories of rock type are distinguished:

- Chert: a siliceous sedimentary fine-grained rock composed of micro-organisms or precipitated silica grains; can be multi-coloured to grey or white/yellow.
- Silcrete: quartz-rich sedimentary rock; often red to pink and sometimes with quartz inclusions.
- Quartz: medium-grained rock consisting of tightly interlocking grains of quartz like a 3-D jigsaw puzzle; usually white to translucent.
- Mudstone: a fine-grained sedimentary rock consisting mainly of clay mineral particles; resembles hardened clay.
- Volcanic: generic term for metamorphic rock; usually grey

3.3 Identified Sites

The survey identified five sites and one PAD. These are clustered in two localities, both where the Wolgan Road bisects high rugged terrain and low lying rolling valley floor (**Figure 2**). The sites are described below.

3.3.1 Site 1

Isolated Find. Coordinates: 236193E 6318787N[2]

Grey fine-grained mudstone core. The piece exhibits multidirectional negative flake scars. There is no evidence of a blade technology or core preparation. This piece is visible in association with road gravel and leaf litter on the northern edge of Wolgan Road, near a set of stockyards. There has clearly been a good deal of disturbance to this area from both sheetwash erosion across the road from the higher southern side, and from road maintenance (grading). This artefact is at the western end of PAD 1A, described below.

[2] As outlined above, all co-ordinates are presented in AGD 84 format.

3.3.2 Site 2

Isolated Find. Coordinates: 235816E 6318824N

Red/brown fine-grained silcrete rock. This is a single flake with pronounced bulb and visible platform. It exhibits no evidence of retouch. It is in a disturbed context on the road verge, which has been subjected to heavy grading.

3.3.3 Site 3

Isolated Find. Coordinates: 235566E 6318898N

Light brown fine-grained chert flaked piece. This piece can best be classified as a flaked piece as it has no obvious bulb, platform, ringcrack or other diagnostic conchoidal flake feature. As with Site 2, it is in disturbed road gravel on the northern verge of Wolgan Road.

3.3.4 Site 4

Artefact Scatter. Coordinates: 233597E 6316909N

Artefact scatter consisting of a range of rock types, predominantly chert, quartz and silcrete. One of the most prominent artefacts is a hammerstone (pictured) with clear percussion marks at one end. Also present a number of very small (approx 20mm long) ridge blade flakes, including one with backing retouch. Some pieces have transverse fractures. The visible artefact scatter extends across 5m x 10m on the western verge above Wolgan Road, on a high point near a bend in the road. To the immediate southeast appears to be a creekline running toward Wolgan River. No topsoil is present and the artefacts rest on B Horizon. The number of counted surface artefacts is 13, but more are likely to be present.

3.3.5 Site 5

Artefact Scatter. Coordinates: 233687E 6317131N to 233762E 6317250N

Artefact scatter of chert, silcrete and quartz flaked pieces. Items include shatter and flakes with percussion bulbs. The proportion of quartz pieces appears to be greater in the southern end of the site. No retouched pieces or blade-like pieces were observed, providing a contrast with the nearby Site 4. Approximately 20 pieces were observed in this scatter, which extended in a 1-2m band for 20m along the eastern verge of Wolgan Road. Many more flaked pieces are likely to lie in this site, which has clearly been disturbed by road construction and subsequent maintenance. Flaked pieces are inter-mixed with road gravel and rest on an eroded B Horizon. None are in primary depositional context.

3.3.6 PAD 1A

PAD. Coordinates: 236193E 6318787N to 236240E 6318784N

This area has been identified as a PAD on the basis of a combination of the following:

- Presence of a core (Site 1)
- Presence of numerous pieces of non-flaked fine-grained sedimentary rock (silcrete and possibly chert) eroding from an area of scouring on the southern side of the road verge (pictured, where the vehicle is parked)
- Local information on the discovery of numerous flaked artefacts in this area, including retouched blades
- Proximity, but at higher elevation, to former wetland in alluvial area to the north

This PAD encompasses both sides of Wolgan Road and lies near a stockyard and abandoned corrugated iron hut, both adjacent to the road. The area has been subjected to erosion and disturbance. As well as stone, pieces of plastic, concrete and glass were evident eroding out of the area of scouring on the southern road verge. Nevertheless, the possibility remains that intact deposits may remain, especially a few metres back from the road easement where the grassland cover is more consolidated.

3.4 Significance Assessment

3.4.1 Scientific Significance

Usually archaeologists describe sites in terms of their relative scientific value, i.e. their ability to address timely and specific questions about the past. Sites may be assessed in terms of research potential, representativeness, and rarity. Archaeological sites, when examined within this framework, can be classed as possessing low significance, medium significance, or high significance. Highly significant sites are those that are exceptionally uncommon, or so well preserved that they hold the potential to address important questions about the human past. Sites of low significance may be extremely common across a landscape, or may be so disturbed or compromised that they hold little prospect of answering any questions about the past.

For the Wolgan Valley sites any comprehensive assessment of scientific significance is problematic as this region has had little archaeological research. We simply do not know the extent or depth of the archaeological resource, making any comparative judgements on relative site significance difficult to make. In this dearth of information, classing all sites as equally significant until proven otherwise may theoretically be an option, but would hardly allow the formulation of practical management solutions. Rather, we need to work with the available information, limited as it may be.

For this reason, the assessment of archaeological research potential will need to be the prime driver of significance assessment. And a major indicator of research potential will be the physical integrity of the site within its surrounding environment, as compromised sites will possess limited research potential. From the survey data it is clear that all recorded sites have been disturbed to a greater or lesser degree, perhaps inevitable given their proximity to the main transport route along Wolgan Valley. Nevertheless it is possible to make relative judgement on the potential of each site, in terms of high, medium and low scientific (i.e. research potential) significance.

- *High*: Site 4 - This site exhibits the greatest range of artefact types, on a variety of lithic materials. There is a potential for intact deposits westward of the disturbed area of the site;
- *Medium*: Site 1, Site 5 and PAD 1A - Site 5 displays a potentially high density of flaked artefacts, and possibly intact deposits further east of the road easement. Site 1 and PAD 1A are in the same locality, one that holds the promise of representing a prime occupation position; and
- *Low*: Site 2 and Site 3 - These two artefact finds are in disturbed contexts on the verge of Wolgan Road, holding little promise of research potential.

3.4.2 Cultural Significance

This pertains to the cultural significance present-day Aboriginal communities ascribe to their heritage objects and places. Generally, communities aim to protect and conserve for future generations as much of their heritage as possible. Social significance may rest outside the realm of archaeology and include dimensions which archaeologists are unable to assess, such as deeply embedded spiritual and cultural ties to land, landscape and group and family history. This section will be further developed upon receipt of comments from the Aboriginal communities in relation to this report.

4 IMPACT ASSESSMENT AND RECOMMENDATIONS

The Emirates proposal will be assessed as a Major Project under the *Environmental Planning and Assessment Act* 1979 (EP&A Act). Part 3A of the EP&A Act integrates the approvals of eight separate acts, including the *National Parks and Wildlife Act* 1974 (NPW Act), and provides for concept approvals for major projects. If the project is approved, Section 87 permits and Section 90 consents under the NPW Act will not be required for work undertaken as part of the project. Nevertheless, prior to granting approval the Department of Planning will consider cultural heritage and will consult with the Department of Environment and Conservation to ensure that cultural heritage issues are appropriately considered. The Department of Planning may also take into account whether guidelines issued by the Department of Environment and Conservation have been followed in respect of cultural heritage assessment, especially the *Draft Guidelines for Aboriginal Heritage Impact Assessment and Community Consultation* (2005). Management options offered by specialists will also be considered in framing what management requirements need to be implemented.

4.1 Potential Impacts

It is understood that the proposed electricity line will not involve the excavation of trenches through the Wolgan Road easement as the line will be strung between surface pylons. Consequently, major impacts will consist of the excavation of holes for the pylons. Machinery required for the transport of drilling equipment and construction materials will, with the exception of the erection of two to three pylons off-road in the southwestern part of the transect, utilise the existing Wolgan Road. There will be no requirement for major construction of access roads.

For most of the length of the electricity line transect, no archaeological evidence was identified. No impacts to archaeological sites are anticipated here. Assuming the interval between pylons is at least 10m, it may be a straightforward matter to strategically place pylons to avoid recorded sites. Recommendations for management of the archaeological sites are set out below.

4.2 Recommendations

Scenario 1: Avoidance of all recorded archaeological sites.
This is the preferred management option. Nevertheless, even if adopted it is suggested that this option may require heritage management action, in the form of the following recommendation:

- **Recommendation 1.1**: Monitoring should be undertaken by an appropriate Aboriginal representative(s) during the excavation of any electricity pylon holes within 100 m either side of the area encompassing Site 1 and PAD 1A, and within 100m either side of the areas encompassing Site 4 and Site 5. If artefactual material is discovered, consideration should be given to either re-locating the pole, or undertaking further subsurface investigation by a qualified professional prior to further impacts in that area. All artefactual material uncovered should be investigated, collected, and subsequent discussions held with the communities as to its eventual location.

This recommendation is made in light of the high to medium significance of these sites, and the acknowledgment that there is a possibility of the presence of subsurface material in these areas.

Scenario 2: Disturbance to any or all of Sites 1, 2, 3 and PAD 1A.
The following recommendations are made:

- **Recommendation 2.1**: Sites 1 and/or 2 and/or 3 should be recorded and collected in consultation with the Aboriginal communities prior to the

proposed development occurring. Discussions with the proponent and the Aboriginal communities should be undertaken prior to the collection, to identify an appropriate "keeping place" for the artefacts associated with Sites 1, 2, and 3; and

- **Recommendation 2.2**: Test excavation of PAD 1A by professional archaeologists, with assistance provided by Aboriginal community representatives.

Scenario 3: Disturbance to Site 4.
Given the high scientific significance given to this locality, the following recommendations are made:

- **Recommendation 3.1**: Archaeological recording of the surface distribution of artefacts. Discussions with the proponent and the Aboriginal communities should be undertaken prior to the collection, to identify an appropriate "keeping place" for all artefacts recovered; and
- **Recommendation 3.2**: Test excavation of Site 4 by professional archaeologists, with assistance provided by Aboriginal community representatives.

Scenario 4: Disturbance to Site 5.
Given the significance of this locality, the following recommendations are made:

- **Recommendation 4.1**: Site 5 should be recorded and collected in consultation with the Aboriginal communities prior to the proposed development occurring. Discussions with the proponent and the Aboriginal communities should be undertaken prior to the collection, to identify an appropriate "keeping place" for recovered artefacts; and
- **Recommendation 4.2**: Test excavation of Site 5 by professional archaeologists, with assistance provided by Aboriginal community representatives.

5 CONCLUSION

Five sites and one PAD were recorded in the transect of the proposed Emirates electricity line. Three are considered of medium to high scientific significance. The cultural significance of the sites and PAD might be differently weighted to their archaeological value, and ongoing consultation with Aboriginal community member will be undertaken to ascertain this measure of significance. The best management option – from cultural and scientific perspectives - would be to place the electricity pylons in locations that avoid all recorded sites. If this is not feasible then a set of recommendations for impact mitigation has been suggested.

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Appendix C: EPBC Protected Matters Report

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Australian Government
Department of the Environment and Heritage

Protected Matters Search Tool

You are here: DEH Home > EPBC Act > Search

8 November 2006 09:41

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

You may wish to print this report for reference before moving to other pages or websites.

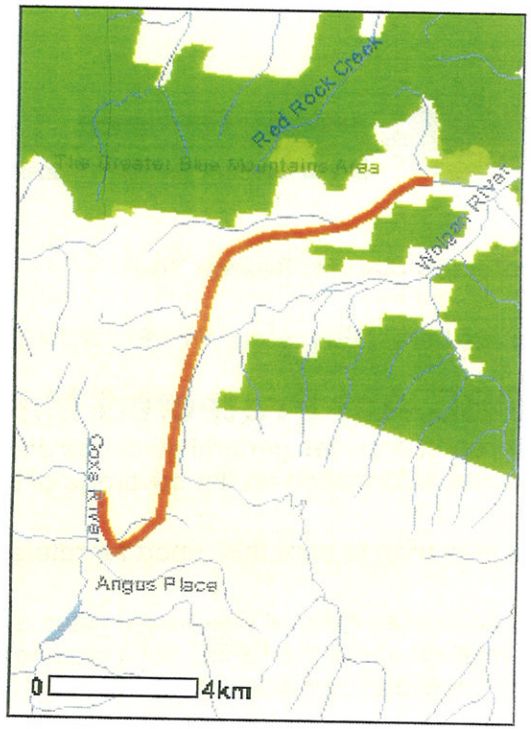
The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.deh.gov.au/epbc/assessmentsapprovals/index.html

Search Type: Line

Buffer: 2 km

Coordinates: -33.22470,150.19308, -33.22470,150.18842, -33.22858,150.18221, -33.23363,150.17677, -33.23790,150.16901, -33.23984,150.15891, -33.24140,150.14532, -33.24605,150.13562, -33.25032,150.13290, -33.25887,150.12980, -33.26779,150.12824, -33.27711,150.12514, -33.28915,150.12203, -33.29924,150.12048, -33.30895,150.11931, -33.31399,150.11854, -33.32176,150.11737, -33.32797,150.11038, -33.33107,150.10495, -33.32370,150.10146, -33.31477,150.10068, -33.3143,150.10068

Report Contents:



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.deh.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	1
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	None

Commonwealth Marine Areas:	None
Threatened Ecological Communities:	1
Threatened Species:	23
Migratory Species:	8

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.deh.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.deh.gov.au/epbc/permits/index.html.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Places on the RNE:	1
Listed Marine Species:	12
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

World Heritage Properties [Dataset Information]

The Greater Blue Mountains Area NSW

Threatened Ecological Communities [Dataset Information]	Status	Type of Presence
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Lathamus discolor * Swift Parrot	Endangered	Species or species habitat may occur within area
Rostratula australis * Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Xanthomyza phrygia * Regent Honeyeater	Endangered	Species or species habitat likely to occur within area
Frogs		
Heleioporus australiacus * Giant Burrowing Frog	Vulnerable	Species or species habitat likely to occur within area
Litoria littlejohni * Littlejohn's Tree Frog, Heath Frog	Vulnerable	Species or species habitat may occur within area
Insects		
Paralucia spinifera * Bathurst Copper Butterfly, Purple Copper Butterfly, Bathurst Copper, Bathurst Copper Wing, Bathurst-Lithgow Copper, Purple Copper	Vulnerable	Species or species habitat likely to occur within area
Mammals		

Chalinolobus dwyeri * Large-eared Pied Bat, Large Pied Bat	Vulnerable	Species or species habitat may occur within area
*Dasyurus maculatus maculatus (SE mainland population)** Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Endangered	Species or species habitat may occur within area
Nyctophilus timoriensis (South-eastern form) * Eastern Long-eared Bat	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata * Brush-tailed Rock-wallaby	Vulnerable	Species or species habitat may occur within area
*Potorous tridactylus tridactylus** Long-nosed Potoroo (SE mainland)	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus * Grey-headed Flying-fox	Vulnerable	Species or species habitat may occur within area
Ray-finned fishes		
*Maccullochella peelii peelii** Murray Cod, Cod, Goodoo	Vulnerable	Species or species habitat may occur within area
Macquaria australasica * Macquarie Perch	Endangered	Species or species habitat may occur within area
Prototroctes maraena * Australian Grayling	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Hoplocephalus bungaroides * Broad-headed Snake	Vulnerable	Species or species habitat likely to occur within area
Plants		
Boronia deanei * Deane's Boronia	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus cannonii * Cannons Stringybark	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus pulverulenta * Silver-leaved Mountain Gum, Silver-leaved Gum	Vulnerable	Species or species habitat likely to occur within area
Pomaderris brunnea * Rufous Pomaderris	Vulnerable	Species or species habitat likely to occur within area
Pultenaea glabra * Smooth Bush-pea, Swamp Bush-pea	Vulnerable	Species or species habitat likely to occur within area

Thesium australe * Austral Toadflax, Toadflax	Vulnerable	Species or species habitat likely to occur within area
Wollemia nobilis * Wollemi Pine	Endangered	Species or species habitat likely to occur within area
Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch	Migratory	Breeding may occur within area
Myiagra cyanoleuca Satin Flycatcher	Migratory	Breeding likely to occur within area
Rhipidura rufifrons Rufous Fantail	Migratory	Breeding may occur within area
Xanthomyza phrygia Regent Honeyeater	Migratory	Species or species habitat likely to occur within area
Migratory Wetland Species		
Birds		
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area

Ardea ibis Cattle Egret	Listed - overfly marine area Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Listed - overfly marine area Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Listed - overfly marine area Species or species habitat may occur within area
Lathamus discolor Swift Parrot	Listed - overfly marine area Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch	Listed - overfly marine area Breeding may occur within area
Myiagra cyanoleuca Satin Flycatcher	Listed - overfly marine area Breeding likely to occur within area
Rhipidura rufifrons Rufous Fantail	Listed - overfly marine area Breeding may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area Species or species habitat may occur within area

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Natural

Wollemi National Park (1980 boundary) NSW

Extra Information

State and Territory Reserves [Dataset information]

Gardens of Stone National Park, NSW

Wollemi National Park, NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the *Environment Protection and Biodiversity Conservation Act 1999*. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under "type of presence". For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgments

This database has been compiled from a range of data sources. Environment Australia acknowledges the following custodians who have contributed valuable

data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England
- Other groups and individuals

ANUCLIM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Last updated:

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Appendix D: Soil Landscapes of the Wolgan Valley

Table D-1: Soil Landscapes of the Wolgan Valley

Soil Landscape	Formation	Characteristics	Soil Types	Location	Limitations
Long Swamp	Swamp	Level to very gently inclined swamps on recent alluvium overlying the Permian Illawarra Coal Measures Local relief to 20 m slopes <3 %	▪ Peaty Loams, Grey Earths and Humic Gleys	Isolated areas near the top of the escarpment	▪ High run-on ▪ Permanently high water tables ▪ Waterlogging ▪ High foundation hazard
Cullen Bullen	Erosional	Rolling low hills and rises on Illawarra Coal Measures and the Berry Formation. Local relief <50 m slopes 10-25 %	▪ Yellow Podzolic Soils and Yellow Earths on crests ▪ Yellow Podzolic Soils Soloths and Yellow Leached Earths on upper and mid slopes ▪ Yellow Solodic Soils and Yellow Podzolic Soils on lower slopes and drainage lines ▪ Yellow Earths and Lithosols associated with low scarps	Invincible Mine	▪ High water erosion hazard ▪ Mine subsidence district (localised) ▪ Rockfall hazard (localised) ▪ High run-on ▪ Rock outcrop (localised) ▪ High foundation hazard (localised)
Wollangambe	Erosional	Rounded convex crests and moderately to steeply inclined side slopes on Narrabeen Group Sandstone Local relief to 100 m slopes <35 %	▪ Siliceous Sands, Lithosols, Earthy Sands and Yellow Earths on crests ▪ Earthy Sands, Yellow Earths and Red Earths on side slopes ▪ Yellow Podzolic Soils	Invincible Mine and isolated areas of Wolgan Valley	▪ High water erosion hazard ▪ Steep slopes ▪ Rockfall hazard (localised) ▪ Shallow soils ▪ Rock outcrop (localised) ▪ High foundation hazard

Soil Landscape	Formation	Characteristics	Soil Types	Location	Limitations
			and Gleyed Podzolic Soils over shale lenses ▪ Siliceous Sands and Lithosols on rock ledges and low broken scarps		
Glen Alice	Erosional	Rolling rises and low hills on Shoalhaven Group sediment in the Wolgan and Capertee Valleys	▪ Red and Yellow Podzolic Soils on upper and mid slopes ▪ Red Podzolic Soils Soloths and Yellow Solodic Soils on lower slopes and poorly drained areas	Wolgan Valley	▪ Salinity (localised) ▪ High water erosion hazard ▪ Flood hazard (localised)
Hassans Walls	Colluvial	Cliffs derived from Narrabeen Group sandstone and steep Colluvial talus side slopes developed over the Illawarra Coal Measures and the Shoalhaven Group. Local relief >100m slopes mostly >40%	▪ Lithosols and Siliceous Sands on small rocky ledges, upper slopes and cliffs ▪ Yellow and Brown Podzolic Soils on lower slopes ▪ Sands / Lithosols along incised drainage channels and drainage flats	Wolgan Gap and Escarpment	▪ Severe rockfall hazard ▪ Mass movement hazard ▪ Steep slopes ▪ Severe foundation hazard ▪ Rock outcrop ▪ Extreme water erosion hazard ▪ Shallow soils (localised) ▪ Non-cohesive soils (localised) ▪ High run-on ▪ Mine subsidence district

Soil Landscape	Formation	Characteristics	Soil Types	Location	Limitations
Coco	Colluvial	Narrow crests and ridges and steep side slopes on mixed Devonian sediments. Local relief 80-180 m slopes <25 %	▪ Lithosols, Earthy Sands and Yellow Podzolic Soils on porphyries and some quartzite ▪ Yellow Podzolic Soils, Red Earths and Red Podzolic Soils on shales, some limestone and sandstones ▪ Terra Rosa / Red Podzolic Soil intergrades on some limestone ▪ Yellow Podzolic Soils and Lithosols on schists and some quartzite	Wolgan Valley	▪ Steep slopes ▪ Rock outcrop (localised) ▪ Shallow soils ▪ Mass movement hazard ▪ High foundation hazard
Wolgan River	Alluvial	Gently inclined alluvial flats and small terraces of the Wolgan River in the Wolgan Valley Local relief <20 m slopes <10%	▪ Alluvial Soils and Yellow Podzolic Soils on floodplains and stream banks ▪ Unconsolidated river sands and gravels in stream bed	Wolgan River	▪ Extreme water erosion hazard ▪ Non-cohesive soil (localised) ▪ Flood hazard ▪ High run-on

Source: Soil Landscapes of the Wallerawang 1:100 000 Sheet, (D. King, 1993)