

Appendix D

Additional Biodiversity Information

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Assessments of Significance

1.1 Flora

1.1.1 MacNutt's Wattle (*Acacia macnuttiana*)

- 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.*

Acacia macnuttiana (Vulnerable, TSC Act; Vulnerable, EPBC Act) is restricted to NSW where it occurs only on the New England Tablelands and the North West Slopes. The species is found in widely scattered locations in the Tenterfield area and west to around Torrington. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Acacia macnuttiana habitat includes dry forest or woodland and heath vegetation, usually on granite or metasediments and often near streams (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Acacia macnuttiana* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

No formal recovery plan has been developed for *Acacia macnuttiana*. In lieu of a formalised recovery plan, DEC (2005) has developed a series of recovery strategies for the species, of which the following are relevant to the Project:

- Manage fire to encourage regeneration of *Acacia macnuttiana*.
- Protect known populations and areas of potential habitat from clearing or disturbance.

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

The following key threatening process is considered relevant to *Acacia macnuttiana*, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation, some of which may constitute *Acacia macnuttiana* habitat.

Conclusion

The Project has the **potential** to have an adverse impact on *Acacia macnuttiana*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). MacNutt's Wattle – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.
<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10018>

1.1.2 Ooline (*Cadellia pentastylis*)

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.*

Cadellia pentastylis (Vulnerable, TSC Act; Vulnerable, EPBC Act) occurs along the western edge of the North West Slopes from north of Gunnedah to west of Tenterfield. Also occurs in Queensland (DEC, 2005). The species was detected during field surveys conducted within the study area, but does not occur within the easement. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- 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*
- 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, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Cadellia pentastylis forms a closed or open canopy mixing with eucalypt and cypress pine species. There appears to be a strong correlation between the presence of Ooline and low- to medium-nutrient soils of sandy clay or clayey consistencies, with a typical soil profile having a sandy loam surface layer, grading from a light clay to a medium clay with depth (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Cadellia pentastylis* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species..

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Cadellia pentastylis*. In lieu of a formal recovery plan, DEC (2005) has identified 12 priority actions to help recover this species. The following are related to the Project:

- Assist with the control weeds in habitat areas.
- Protect populations and areas of potential habitat from clearing or disturbance.
- Expand and reconnect isolated remnants of habitat.
- Enter into conservation agreements to protect Ooline populations.

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

The following key threatening process is considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation within the Project area, some of which may constitute habitat for this species.

Conclusion

The Project has the **potential** to have an adverse impact on *Cadellia pentastylis*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). Ooline – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10118>

1.1.3 Gibraltar Rock Apple (*Angophora exul*) and Sandstone Rough-barked Apple (*Angophora robur*)

- 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.*

Angophora exul (Endangered, TSC Act) is very rare, known only from a single small stand on Gibraltar Rock, west of Tenterfield. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Angophora robur (Vulnerable, TSC Act; Vulnerable, EPBC Act) occurs in a band from around Glenreagh, north-west of Coffs Harbour, to the Coaldale area north-west of Grafton, with an isolated occurrence farther west near Nymboida. It can be locally common. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Angophora exul is a rare species occurring only on open scree on a ridge of acid volcanic outcrops on Gibraltar Rock. The habitat is dry open woodland on the steep south-west slopes and crest of the outcrop, with skeletal to shallow loam soil (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Angophora exul* habitat. This clearing of

vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Angophora robur habitat includes dry open forest in sandy or skeletal soils on sandstone, or occasionally granite, with frequent outcrops of rock (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Angophora robur* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Angophora exul*. In lieu of a formal recovery plan, DEC (2005) has identified six strategies to help recover this threatened species. Each of these strategies has a number of priority actions within it. The following are related to the Project:

- Assist with the control of feral goats in areas of known and potential habitat.
- Protect areas of known or potential habitat from clearing or disturbance.
- Report any new records of Gibraltar Rock Apple to OEH.

To date, no formal recovery plan has been developed for *Angophora robur*. In lieu of a formal recovery plan, DEC (2005) has identified 17 priority actions to help recover this species. The following are related to the Project:

- Manage fire to promote regeneration.
- Identify populations and areas of habitat along roadsides and protect them during road works.
- Protect areas of habitat from clearing and development.

Additional recovery actions are identified within DECCW (2010) that are relevant to the species and the Project:

- Protect species and their habitats from the effects of clearing and fragmentation
- To protect vegetation communities, ecosystems and habitats from inappropriate fire regimes
- Minimise human-induced disturbance and mortality of species
- To engage the community and private landholders in biodiversity conservation
- To establish effective monitoring of biodiversity related projects.

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

The following key threatening process is considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation within the Project area, some of which may constitute habitat for these species.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Angophora exul* or *Angophora robur*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). Gibraltar Rock Apple – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10052>

DEC (2005). Sandstone Rough-barked Apple – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10054>

Department of Environment, Climate Change and Water NSW 2010, Northern Rivers Region Biodiversity Management Plan, National Recovery Plan for the Northern Rivers Region - NSW Department of Environment, Climate Change and Water NSW, Sydney. Viewed online 9/2/2012.
<http://www.environment.gov.au/biodiversity/threatened/publications/recovery/pubs/northern-rivers.pdf>

1.1.4 White Laceflower (*Archidendron hendersonii*) and Rusty Plum (*Niemeyera whitei*)

- 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.

Archidendron hendersonii (Vulnerable, TSC Act) is distributed from north Queensland south to the Richmond River in north-east NSW. This species is also considered likely to occur within the study area. Given the small size of known populations that exist and the small size of the stands of rainforest in which they are recorded by OEH, the Project has the potential to have an adverse effect on the life cycle of this species such that a viable local population is placed at risk of extinction.

Niemeyera whitei (Vulnerable, TSC Act) is found in the coast and adjacent ranges of northern NSW from the Macleay River into southern Queensland. Its distributional stronghold is on the mid north coast around Coffs Harbour. This species was not identified during survey however is considered likely to occur within the study area. The Project has the potential to have an adverse effect on the life cycle of this species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Archidendron hendersonii occurs in riverine and lowland subtropical rainforest and littoral rainforest. The Project will require the clearing of vegetation that may constitute potential *Archidendron hendersonii* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Loss of habitat through clearing and fragmentation is one of this species' main threats. Given that this species is likely to occur within the study area, the potential habitat to be removed is considered important to the long term survival of the species within the locality.

Niemeyera whitei is found in rainforest and the adjacent understorey of moist eucalypt forest. The Project will require the clearing of vegetation that may constitute potential *Niemeyera whitei* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Clearing of habitat for development is one of this species' main threats. Given that this species is likely to occur within the study area, the potential habitat to be removed is considered important to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

There are no existing recovery plans for the *Archidendron hendersonii* and *Niemeyera whitei*. However DECCW (2005) has defined several recovery actions for each species. The following are related to the Project:

Archidendron hendersonii:

- Ensure regional fire plans, hazard reduction burn guidelines include protocols for protecting rainforest habitats.
- Survey before road and track maintenance in the habitat of the species, protect road and trackside plants.
- Assess weed threats to populations, manage as necessary.
- Ensure that managers are aware of populations and habitat.
- Survey before road and track maintenance in the habitat of the species, protect road and trackside plants.

Niemeyera whitei:

- Provide map of known occurrences to Rural Fire Service and seek inclusion on Bush Fire Risk Management Plan(s), risk register and operation map(s).
- Ensure the species is considered in statutory plans relevant to its distribution.
- Protect areas of known habitat from timber harvesting and other land clearing.

- Ensure threats to the species are adequately considered in parks and reserves management planning, implement plans.
- Control weeds in known habitat for this species.
- Model habitat to identify sites for further survey.
- Survey before road and track maintenance in the habitat of the species. Assess need to protect trackside plants.

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

The following key threatening processes are considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation within the Project area, some of which may constitute habitat for *Archidendron hendersonii* and *Niemeyera whitei* species.
- Invasion, establishment and spread of *Lantana camara*; the Project will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of *Lantana camara* within the Project area. *Lantana camara* has the potential to compete with *Niemeyera whitei* species, and reduce their potential habitat within the locality.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Archidendron hendersonii* or *Niemeyera whitei*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Department of Climate Change and Water (2005) Threatened species - *Archidendron hendersonii*. Viewed online 25/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10062>

Department of Climate Change and Water (2005) Threatened species - *Niemeyera whitei*. Viewed online 25/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10044>

1.1.5 Native Jute (*Corchorus cunninghamii*)

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.*

Corchorus cunninghamii (Endangered, TSC Act; Endangered, EPBC Act) occurs from Richmond River in north east NSW to the Brisbane River in Queensland. Four distinct populations occur within Queensland between the Beenleigh district and the lower Brisbane River. *Corchorus cunninghamii* was not recorded during field surveys however has been recorded in NSW from foothill and range country north of the Richmond River between Lismore, Toonumbar and Mt Lindsay near the Queensland border. It has also been listed as likely to occur within the Project area according to previous research (EPBC Act Protected Matters Report, 2010). The works associated with the Project have the potential to have an adverse effect on the life cycle of this species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Corchorus cunninghamii occurs primarily in open forest in Queensland and tall wet sclerophyll forest and a hoop pine plantation in NSW. In NSW it occurs at low to mid elevation (150-450m) and may have originally extended to footslopes near the Richmond floodplain, which are now largely cleared. The Queensland sites have a similar topography with occupancy in hilly to steep country at altitudes of 140-350m.

The Project will require the clearing of vegetation that may constitute potential *Corchorus cunninghamii* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that this species is likely to occur within the study area, the potential habitat to be removed is considered important to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

- f) *whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.*

The draft NSW and National Recovery Plan for the *Corchorus cunninghamii* was developed in November 2004. This recovery plan considers the conservation requirements of the species within its known range across NSW and identifies the actions to be taken to ensure the long-term viability of *Corchorus cunninghamii* in nature and the parties who will undertake these actions.

It is likely that *Corchorus cunninghamii* currently exists in the Project area based on previous research. Given the presence of the existing 132kV easement and associated disturbances, it is considered likely that the Project would have a significant impact on any populations of *Corchorus*

cunninghamii that may exist. Given the existing disturbance regimes, the Project is considered likely to interfere substantially with the recovery of *Corchorus cunninghamii*.

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

The following key threatening processes are considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation within the Project area, some of which may constitute habitat for this species.
- Invasion, establishment and spread of *Lantana camara*; the Project will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of *Lantana camara* within the Project area. *Lantana camara* has the potential to compete with this species, and reduce their potential habitat within the locality.

Conclusion

The Project is likely to have an **adverse** impact on *Corchorus cunninghamii*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Department of Environment and Conservation (NSW) (2004) Draft NSW and National Recovery Plan *Corchorus cunninghamii* November 2004. Viewed online 23/11/2010
<http://www.environment.nsw.gov.au/resources/nature/recoveryplanDraftCorchorusCunninghamii.pdf>

Department of Climate Change and Water (2005) Threatened species. Viewed online 23/11/2010
<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10177>

Department of Environment, Water, Heritage and the Arts (2010) EPBC Act Protected Matters Report.

NSW National Parks and Wildlife Service (2010) Atlas of NSW Wildlife Viewed online 23/11/2010
<http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp>

1.1.6 Netted Bottlebrush (*Callistemon linearifolius*)

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.*

Callistemon linearifolius (TSC Act, Vulnerable) is known or predicted to occur in the Clarence Lowlands and Clarence Sandstones sub-regions of the Northern Rivers Catchment Management Region, growing in dry sclerophyll forest on the coast and adjacent ranges. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Callistemon linearifolius grows in dry sclerophyll forest on the coast and adjacent ranges (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Callistemon linearifolius* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Callistemon linearifolius*. In lieu of a formal recovery plan, DEC (2005) has identified 11 priority actions to help recover this species. The following are related to the Project:

- Search for the species in suitable habitat in areas that are proposed for development or management actions, protect any such site found.
- Protect known habitat from clearing or disturbance.
- Determine response of species to fire and develop and promote a recommended fire regime.

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

The following key threatening process is considered relevant to *Callistemon linearifolius*, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation, some of which may constitute *Callistemon linearifolius* habitat;

- Invasion, establishment and spread of *Lantana camara*; the Project will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of *Lantana camara* within the Project area. *Lantana camara* has the potential to compete with this species, and reduce its potential habitat within the locality.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Callistemon linearifolius*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). Netted Bottlebrush – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10129>

1.1.7 Rusty Rose Walnut (*Endiandra hayesii*), Rough-shelled Bush Nut (*Macadamia tetraphylla*) and Onion Cedar (*Owenia cepiodora*)

- 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.*

Endiandra hayesii has (Vulnerable, TSC Act; Vulnerable, EPBC Act) a restricted distribution from Burleigh Heads in Queensland to the Richmond River in north-east NSW, where it locally abundant in some locations. This species was not located however is listed as likely to occur within the Project area according to previous research (Atlas of NSW Wildlife, EPBC Act Protected Matter Report). The works associated with the Project have the potential to have an adverse effect on the life cycle of this species such that a viable local population is placed at risk of extinction.

Macadamia tetraphylla (Vulnerable, TSC Act; Vulnerable, EPBC Act) is largely confined to the Richmond and Tweed Rivers in north-east NSW, with a limited range extending across the border into Queensland. This species was not located however is also listed as likely to occur within the Project area. The works associated with the Project have the potential to have an adverse effect on the life cycle of this species such that a viable local population is placed at risk of extinction.

Owenia cepiodora (Vulnerable, TSC Act; Vulnerable, EPBC Act) is distributed north from the Richmond River in north-east NSW, extending just across the Queensland border. This species was not located however is listed as likely to occur within the Project area according to previous research (Atlas of NSW Wildlife, EPBC Act Protected Matter Report). The works associated with the Project have the potential to have an adverse effect on the life cycle of this species such that a viable local population is 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, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Endiandra hayesii occurs in subtropical and warm temperate rainforests and Brush Box forests. The altitude varies from near sea-level to 800m. The Project will require the clearing of vegetation that may constitute potential *Endiandra hayesii* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. This is important as fragmented populations of *Endiandra hayesii* are likely to suffer loss of genetic variation due to loss of individuals with unique genetic variants, inbreeding and genetic drift. Given that this species is likely to occur within the study area, the potential habitat to be removed is considered important to the long term survival of the species within the locality.

Macadamia tetraphylla is usually found in the subtropical rainforest near the coast, complex notophyll vineforest, at the margins of these forests and in mixed sclerophyll forest (DSEWPac, 2010a). The Project will require the clearing of vegetation that may constitute potential *Macadamia tetraphylla* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that this species is likely to occur within the study area, the potential habitat to be removed is considered important to the long term survival of the species within the locality.

Owenia cepiodora occurs in subtropical and dry rainforest on or near soils derived from basalt. The Project will require the clearing of vegetation that may constitute potential *Owenia cepiodora* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that this species is likely to occur within the study area, the potential habitat to be removed is considered important to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

A recovery plan currently exists for *Endiandra hayesii*. The overall objective of this recovery plan is to prevent the decline of populations of *Endiandra hayesii* in the wild, to ensure ongoing viability of wild populations, and to maintain the evolutionary potential of the taxa (Department of Environment and Conservation (NSW), 2004). Additional recovery actions are identified in DECCW (2010) that are relevant to the Project and the species:

- To protect rainforest, related vegetation and species from clearing
- To protect rainforest and related vegetation from fragmentation, modification and degradation
- To protect rainforest and related vegetation from the impact of weeds
- To protect rainforest from fire and to promote the implementation of appropriate fire regimes in related vegetation
- To minimise the impacts of human interference
- To control and minimise impacts of introduced pathogens and diseases
- To engage the community and private land-holders in biodiversity conservation
- To establish effective monitoring of biodiversity related projects.

A recovery plan has been developed that encompasses *Macadamia tetraphylla* which lists a number of recovery actions for the species (Costello et al., 2009).. The following are related to the Project:

- Identify and evaluate the extent and quality of southern macadamia species populations and their habitat.
- Reduce and manage the major threatening processes affecting southern macadamia species habitat.

DEC (2005) has also identified a number of recovery actions for *Macadamia tetraphylla*. Those relevant to the Project include:

- Undertake habitat assessments at known sites and ascertain threats, considering information from previous surveys.
- Ensure protection of population and its habitat is included in statutory planning in relevant shires.
- Ensure that land managers and other stakeholders are aware of populations and habitat.
- Prevent rainforest habitat loss, degradation and fragmentation.
- Exclude stock from rainforest.
- Undertake weed removal at priority sites.
- Determine current population size and demography, liaising with University of New England researchers and Australia Macadamia Society.

A recovery plan has been developed that encompasses *Owenia cepiodora* (DECCW 2010). This plan identifies the following recovery actions for the species:

- To protect rainforest, related vegetation and species from clearing
- To protect rainforest and related vegetation from fragmentation, modification and degradation
- To protect rainforest and related vegetation from the impact of weeds
- To protect rainforest from fire and to promote the implementation of appropriate fire regimes in related vegetation
- To protect rainforest and related vegetation from grazing and trampling by livestock
- To minimise the impacts of human interference
- To control and minimise impacts of introduced pathogens and diseases
- To engage the community and private land-holders in biodiversity conservation
- To establish effective monitoring of biodiversity related projects.

DEC (2005) has defined several recovery actions for *Owenia cepiodora*:

- All populations occurring on roadside areas will be marked in the field.
- Undertake site assessments and monitoring of existing and new populations as located.
- Investigate extent of distribution through targeted surveys.

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

The following key threatening processes are considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation within the Project area, some of which may constitute habitat for *Endiandra hayesii*, *Macadamia tetraphylla* and *Owenia cepiodora* species.
- Invasion, establishment and spread of *Lantana camara*; the Project will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of *Lantana camara* within the Project area. *Lantana camara* has the potential to compete with *Endiandra hayesii*, *Macadamia tetraphylla* and *Owenia cepiodora* species, and reduce their potential habitat within the locality.
- Invasion of native plant communities by exotic perennial grasses; the clearing of the required easement will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of exotic grasses within the Project area. Increased competition from exotic grasses has the potential to result in adverse effects to *Macadamia tetraphylla* species.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Endiandra hayesii*, *Macadamia tetraphylla* or *Owenia cepiodora*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Department of Climate Change and Water (2005) Threatened species - *Endiandra hayesii*.

Viewed online 25/11/2010

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10270>

Department of Climate Change and Water (2005) Threatened species - *Macadamia tetraphylla*.

Viewed online 25/11/2010

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10499>

Department of Climate Change and Water (2005) Threatened species - *Owenia cepiodora*.

Viewed online 25/11/2010

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10579>

Department of Environment and Conservation (NSW) (2004) Approved NSW Recovery Plan – *Endiandra muelleri* subsp. *bracteata* and *Endiandra hayesii*.

Department of Environment, Climate Change and Water NSW 2010, Border Ranges Rainforest Biodiversity Management Plan - NSW & Queensland, DECCW NSW. Viewed online 9/2/2012.

<http://www.environment.gov.au/biodiversity/threatened/publications/recovery/border-ranges/pubs/brrb-management-plan.pdf>

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC)

2010a. Species profile and threats database - *Macadamia tetraphylla*. Viewed online 25/11/2010

http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=6581

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC)

2010b. Species profile and threats database - *Endiandra hayesii*. Viewed online 25/11/2010

http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=13866

NSW National Parks and Wildlife Service (2010) Atlas of NSW Wildlife. Viewed online 24/11/2010

<http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp>

Costello, G., Gregory, M. and Donatiu, P. 2009. Southern Macadamia Species Recovery Plan. Report to DEWHA, Canberra by Horticulture Australia Ltd Sydney. Viewed online 9/2/2012.

<http://www.environment.gov.au/biodiversity/threatened/publications/recovery/pubs/southern-macadamia-species.pdf>

1.1.8 Ovenden's Ironbark (*Eucalyptus caleyi* subsp. *ovendenii*), Slaty Red Gum (*Eucalyptus glaucina*), Narrow-leaved Black Peppermint (*Eucalyptus nicholii*), Blackbutt Candlebark (*Eucalyptus rubida* subsp. *barbigerorum*), Wallangarra White Gum (*Eucalyptus scoparia*), Square-fruited Ironbark (*Eucalyptus tetrapleura*)

- 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.*

Eucalyptus caleyi subsp. *ovendenii* (Vulnerable, TSC Act; Vulnerable, EPBC Act) occurs from west of Guyra to west of Tenterfield on the New England Tablelands of NSW. Localities include 'Moorabinda' station. The taxon is said to be common in the western half of Torrington State Conservation Area, occasionally dominating woodland communities. The species was located during field surveys within the broader study area and not within the easement. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Eucalyptus glaucina (Vulnerable, TSC Act; Vulnerable, EPBC Act) is found only on the north coast of NSW and in separate districts: near Casino where it can be locally common and farther south, from Taree to Broke, west of Maitland. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Eucalyptus nicholii (Vulnerable, TSC Act; Vulnerable, EPBC Act) is widely planted as an urban street tree and in gardens but is quite rare in the wild. It is confined to the New England Tablelands of NSW, where it occurs from Nundle to north of Tenterfield, largely on private property. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Eucalyptus rubida subsp. *barbigerorum* (Vulnerable, TSC Act; Vulnerable, EPBC Act) is known from scattered populations on the New England Tablelands from Guyra to the Tenterfield area. Most populations occur on private property. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Eucalyptus scoparia (Endangered, TSC Act; Vulnerable, EPBC Act) occurs in Queensland and reaches its southern limit in NSW. In NSW it is known from only three locations near Tenterfield, including Bald Rock National Park. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Eucalyptus tetrapleura (Vulnerable, TSC Act; Vulnerable, EPBC Act) is restricted to the coastal lowlands and foothills of northern NSW around Casino and Grafton. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Eucalyptus caleyi subsp. *ovendenii* grows in grassy woodland on dry, shallow soils of moderate fertility. The species prefers altitudes of 610 to 820 m, on granitic substrates. The species is locally abundant within its grassy woodland habitat. Juveniles were present in about half the sampled sites within Torrington State Conservation Area, indicating good recruitment. The Project will require the clearing of vegetation that may constitute potential *Eucalyptus caleyi* subsp. *ovendenii* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

Eucalyptus glaucina grows in grassy woodland and dry eucalypt forest on deep, moderately fertile and well-watered soils. The Project will require the clearing of vegetation that may constitute potential *Eucalyptus glaucina* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

Eucalyptus nicholii grows in dry grassy woodland, on shallow and infertile soils, mainly on granite. The Project will require the clearing of vegetation that may constitute potential *Eucalyptus nicholii* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

Eucalyptus rubida subsp. *barbigerorum* occurs on woodland on medium or high fertility soils and often on cold flats. The Project will require the clearing of vegetation that may constitute potential *Eucalyptus rubida* subsp. *barbigerorum* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

Eucalyptus scoparia is found in open eucalypt forest and woodland on well-drained granite hilltops, slopes and rocky outcrops. The Project will require the clearing of vegetation that may constitute potential *Eucalyptus scoparia* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

Eucalyptus tetrapleura is found in dry or moist eucalypt forest on moderately fertile soil, often in low areas with poor drainage. The Project will require the clearing of vegetation that may constitute potential *Eucalyptus tetrapleura* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Eucalyptus caleyi* subsp. *ovendenii*. In lieu of a formal recovery plan, DEC (2005) has identified three priority actions to help recover this species. The following are related to the Project:

- Protect populations of Ovenden's Ironbark from frequent fire.
- Control invasive exotic grasses such as Coolatai Grass in areas of habitat.
- Protect known populations and areas of potential habitat from clearing fragmentation or disturbance.
- Expand and reconnect isolated remnants of habitat.
- Rehabilitate and protect degraded areas of habitat.
- Report any new records of the species to the OEH.

To date, no formal recovery plan has been developed for *Eucalyptus glaucina*. In lieu of a formal recovery plan, DEC (2005) has identified 14 priority actions to help recover this species. The following are related to the Project:

- Fence areas of known habitat to protect from grazing stock and to promote regeneration.
- Protect areas of habitat from timber harvesting activities.
- Protect known populations and areas of potential habitat from clearing and development.

To date, no formal recovery plan has been developed for *Eucalyptus nicholii*. In lieu of a formal recovery plan, DEC (2005) has identified 22 priority actions to help recover this species. The following are related to the Project:

- Manage fire to promote regeneration.
- Practice sustainable grazing in areas of habitat and protect regenerating trees from grazing stock.
- Limit firewood collection in areas of habitat.
- Identify roadside populations and protect during road-works.
- Protect dry grassy woodland from clearing and fragmentation.

To date, no formal recovery plan has been developed for *Eucalyptus rubida* subsp. *barbigerorum*. In lieu of a formal recovery plan, DEC (2005) has identified 22 priority actions to help recover this species. The following are related to the Project:

- Identify roadside and easement populations and protect during road-works.
- Protect known populations and areas of potential habitat from clearing and timber collection.
- Rehabilitate disturbed areas of habitat.

No formal recovery plan has been developed for *Eucalyptus scoparia*. In lieu of a formalised recovery plan, OEH has developed a series of recovery strategies for the species, of which the following are relevant to the Project:

- Protect known populations and areas of potential habitat from clearing and timber collection.
- Rehabilitate and protect disturbed areas of habitat.
- Notify OEH of any new records in NSW

A recovery plan has been developed that encompasses *Eucalyptus tetrapleura* (DECCW 2010). Recovery actions identified for the species which are relevant to the Project include:

- Protect species and their habitats from the effects of clearing and fragmentation
- Protect the Region from the impact of weeds
- Minimise human-induced disturbance and mortality of species
- Reduce the impacts of domestic livestock on the natural environment.
- To engage the community and private landholders in biodiversity conservation
- To establish effective monitoring of biodiversity related projects.

In addition, DEC (2005) has identified 22 priority actions to help recover this species. The following are related to the Project:

- Avoid frequent fire in areas of known habitat.
- Exclude stock by fencing habitat.
- Identify and protect populations in timber harvesting areas and along roadsides.
- Protect habitat from further clearing.
- Assist regeneration of habitat around isolated trees.

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

The following key threatening process is considered relevant to *Eucalyptus caleyi* subsp. *ovendenii*, *Eucalyptus glaucina*, *Eucalyptus nicholii*, *Eucalyptus rubida* subsp. *barbigerorum*, *Eucalyptus scoparia* and *Eucalyptus tetrapleura* based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation, some of which may constitute may constitute habitat for these species.

The following key threatening process is considered relevant to *Eucalyptus caleyi* subsp. *ovendenii* based on the likely impacts of the Project:

- Invasion, establishment and spread of *Lantana camara*; the Project will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of *Lantana camara* within the Project area. *Lantana camara* has the potential to compete with this species, and reduce its potential habitat within the locality.

Conclusion

The Project is likely to have an **adverse** impact on the Eucalypt species within this assessment. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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DEC (2005). Blackbutt Candlebark – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

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1.1.9 Lesser Creeping Fern (*Arthropteris palisotii*), Needle-leaf Fern (*Belvisia mucronata*), Narrow-leaf Finger Fern (*Grammitis stenophylla*) and Slender Screw Fern (*Lindsaea incisa*)

- 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.*

Arthropteris palisotii (Endangered, TSC Act) is thought to be found in north-eastern NSW and also in Queensland. This species may be extinct in NSW. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Belvisia mucronata (Endangered, TSC Act) is restricted to Queensland and NSW. In NSW, it is known from only five locations on the far north coast, north from Evans Head. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Grammitis stenophylla (Endangered, TSC Act) occurs in eastern Queensland and eastern NSW. In NSW it has been found on the south, central and north coasts and as far west as Mount Kaputar National Park near Narrabri. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Lindsaea incisa (Endangered, TSC Act) is known only from a few locations between Woombah and just south of Coffs Harbour in NSW. It also occurs in north and south-east Queensland. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Arthropteris palisotii occurs in rainforest, mainly on tree trunks. (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Arthropteris palisotii* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measure are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Belvisia mucronata forms small clumps on trees or rocks in dry rainforest or along creeks in moist open forest and occurs in low numbers at all sites. (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Belvisia mucronata* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measure are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Grammitis stenophylla occurs in moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Grammitis stenophylla* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measure are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Lindsaea incisa occurs in dry eucalypt forest on sandstone and moist shrubby eucalypt forest on metasediments. It is usually found in waterlogged or poorly drained sites along creeks, where ferns, sedges and shrubs grow thickly (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Lindsaea incisa* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Arthropteris palisotii*. In lieu of a formal recovery plan, DEC (2005) has identified five priority actions to help recover this species. The following are related to the Project:

- Protect areas of rainforest from clearing or disturbance.
- Report any records of Lesser Creeping Fern to OEH.
- Conduct targeted surveys in suitable habitat.

To date, no formal recovery plan has been developed for *Belvisia mucronata*. In lieu of a formal recovery plan, DEC (2005) has identified five priority actions to help recover this species. The following are related to the Project:

- Protect dry rainforest from fire.
- Protect areas of habitat during forestry activities.
- Assist with weed control activities in rainforest and moist open forest habitat.

To date, no formal recovery plan has been developed for *Grammitis stenophylla*. In lieu of a formal recovery plan, DEC (2005) have developed recovery actions relevant to the Project:

- Protect areas of habitat from clearing and development.
- Help to re-establish potential moist forest habitat, especially along streams.

To date, no formal recovery plan has been developed for *Lindsaea incisa*. In lieu of a formal recovery plan, DEC (2005) has identified 11 priority actions to help recover this species. The following are related to the Project:

- Maintain natural drainage conditions of creeks, including poorly drained areas.
- Protect areas of habitat from development.
- Report new occurrences of this fern to OEH.

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

The following key threatening process is considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation within the Project area, some of which may constitute habitat for these species.

The following key threatening process is considered relevant to *Belvisia mucronata* based on the likely impacts of the Project:

- Invasion, establishment and spread of *Lantana camara*; the Project will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of *Lantana camara* within the Project area. *Lantana camara* has the potential to compete with this species, and reduce its potential habitat within the locality.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Arthropteris palisotii*, *Belvisia mucronata*, *Grammitis stenophylla* or *Lindsaea incisa*. A number of measures have been

recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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1.1.10 Hairy Jointgrass (*Arthraxon hispidus*), Bluegrass (*Dichanthium setosum*) and Finger Panic Grass (*Digitaria porrecta*)

- 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.*

Arthraxon hispidus (Vulnerable, TSC Act; Vulnerable, EPBC Act) occurs over a wide area in south-east Queensland, and on the northern tablelands and north coast of NSW, but is never common. Also found from Japan to central Eurasia (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Dichanthium setosum (Vulnerable, TSC Act; Vulnerable, EPBC Act) occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, as well as in Queensland and Western Australia. It occurs widely on private property, including in the Inverell, Guyra, Armidale and Glen Innes areas (DEC, 2005). The species was detected during field surveys conducted within the broader study area and a small population was also found within the easement. Mitigation measures are recommended for this species; however the Project does have the potential to impact the life cycle of this species, where it occurs within the easement. Given the occurrences of this species within the easement are fragmented; it is possible that isolated populations are at an increased risk of extinction by works associated with the Project.

Digitaria porrecta (Endangered, TSC Act; Endangered, EPBC Act) occurs in NSW and Queensland. In NSW it is found on the North West Slopes and Plains, from near Moree south to Tambar Springs and from Tamworth to Coonabarabran. It largely occurs on private land (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Arthraxon hispidus is moisture and shade-loving grass, found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamp (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Arthraxon hispidus* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measure are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Dichanthium setosum is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. The species is often collected from disturbed open grassy woodlands on the northern tablelands, where the habitat has been variously grazed, nutrient-enriched and water-enriched. This species is associated with heavy basaltic black soils (DEC, 2005). The Project will require the clearing of vegetation that constitutes potential *Dichanthium setosum* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Although mitigation measures are recommended to assist in the protection of this species, disturbance and works associated with the Project have the potential to modify, remove or isolate potential habitat for this species. As such, it is considered that the Project has the potential to impact habitat that may be of importance to the long term survival of the species within the locality.

Digitaria porrecta is found in native grassland, woodlands or open forest with a grassy understorey, on richer soils. Often found along roadsides and travelling stock routes where there is light grazing and occasional fire. (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Digitaria porrecta* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Arthraxon hispidus*. In lieu of a formal recovery plan, DEC (2005) has identified 10 priority actions to help recover this species. The following are related to the Project:

- Avoid slashing or mowing around rainforest edges.
- Control introduced grasses in areas with known populations.
- Protect areas of rainforest, wet eucalypt forest and swamp from clearing and development.

To date, no formal recovery plan has been developed for *Dichanthium setosum*. In lieu of a formal recovery plan, DEC (2005) has identified 16 priority actions to help recover this species. The following are related to the Project:

- Control invasive exotic grasses in areas of habitat.
- Rehabilitate and protect degraded areas of potential habitat.
- Report any new records of Bluegrass to OEH.

To date, no formal recovery plan has been developed for *Digitaria porrecta*. In lieu of a formal recovery plan, DEC (2005) has identified 16 priority actions to help recover this species. The following are related to the Project:

- Identify roadside populations and areas of habitat and protect during roadside maintenance activities.
- Protect known populations and areas of potential habitat from clearing and disturbance.

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

The following key threatening process is considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation within the Project area, some of which may constitute habitat for these species.

The following key threatening process is considered relevant to *Arthraxon hispidus* and *Dichanthium setosum* based on the likely impacts of the Project:

- Invasion of native plant communities by exotic perennial grasses; the clearing of the required easement will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of exotic grasses within the Project area. Increased competition from exotic grasses has the potential to result in adverse effects to these species.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Arthraxon hispidus* or *Digitaria porrecta*. The Project is likely to have an **adverse** impact on *Dichanthium setosum*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). Hairy Jointgrass – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

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DEC (2005). Finger Panic Grass – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

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1.1.11 Torrington Pea (*Almaleea cambagei*)

- 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.*

Almaleea cambagei (Endangered, TSC Act; Vulnerable, EPBC Act) occurs primarily within Torrington State Conservation Area on the New England Tablelands, with a few populations potentially occurring in the adjacent agricultural lands. The species is also reported from Girraween National Park in Queensland. It is known from fewer than 15 populations and has a highly restricted distribution with an extent of occurrence of approximately 88 square km (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Almaleea cambagei usually grows in wet heath and acid swamp areas and along watercourses on granite, above 900 m altitude (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Almaleea cambagei* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the

study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Almaleea cambagei*. In lieu of a formal recovery plan, DEC (2005) has identified 19 priority actions to help recover this species. The following are related to the Project:

- Protect known populations and areas of potential habitat from clearing or disturbance, including mining.
- Restoration of degraded areas of potential swamp habitat.
- Notify OEH of any new records of Torrington Pea.
- Identify roadside populations and mark on maps used for planning maintenance activities.

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

The following key threatening process is considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation within the Project area, some of which may constitute habitat for this species.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Almaleea cambagei*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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1.1.12 Swamp Foxglove (*Centranthera cochinchinensis*), Tenterfield Eyebright (*Euphrasia orthocheila* subsp. *peraspera*), Wandering Pepper Cress (*Lepidium peregrinum*), Sweet False Galium (*Oldenlandia galioides*), Tall Knotweed (*Persicaria elatior*), Native Milkwort (*Polygala linariifolia*), *Rotala tripartita* (*Rotala tripartita*), Heath Wrinklewort (*Rutidosia heterogama*), Austral Toadflax (*Thesium australe*)

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.*

Centranthera cochinchinensis (Endangered, TSC Act) occurs in northern Australia and south-east Asia and known from NSW north from Woolli (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would

result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Euphrasia orthocheila subsp. *peraspera* (Endangered, TSC Act) is probably extinct throughout much of its former range; this subspecies has been recorded from Dorrigo to Tenterfield and west to Torrington, although most records are very old. Currently only known from two swamps in the Tenterfield area (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Lepidium peregrinum (Endangered, TSC Act; Endangered, EPBC Act) was thought to be extinct until recently rediscovered in NSW and Queensland. Targeted searches conducted in 2001 confirmed the species occurs in scattered refugia in north-eastern NSW (near Tenterfield) and south-eastern Queensland. The largest site containing most of the known *Lepidium peregrinum* population is in a designated Travelling Stock Reserve (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Oldenlandia galioides (Endangered, TSC Act) is known to occur in north-east NSW, from Whiporie State Forest south of Casino and one location in the Tweed district. Also occurs on the north-west plains of NSW and in Queensland, Northern Territory and Western Australia (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Persicaria elatior (Vulnerable, TSC Act; Vulnerable, EPBC Act) has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). The species also occurs in Queensland (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Polygala linariifolia (Endangered, TSC Act) is found from north of Copeton Dam and the Warialda area to southern Queensland; also found on the NSW north coast near Casino and Kyogle, and there is an isolated population in far western NSW near Weebah Gate, west of Hungerford. This species also occurs in Western Australia (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Rotala tripartita (Endangered, TSC Act) occurs in New South Wales, Queensland and the Northern Territory. In New South Wales the species is currently known from only two locations, one in the Casino district and one in the South Grafton area, in the northern part of the North Coast bioregion. These locations are separated by a distance of less than c. 100 km. The geographic distribution of the species in New South Wales is therefore highly restricted (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Rutidosia heterogama (Vulnerable, TSC Act; Vulnerable, EPBC Act) is found in scattered coastal locations between Wyong and Evans Head, and on the New England Tablelands from Torrington and Ashford south to Wandsworth south-west of Glen Innes (DEC, 2005). The species was not

detected during field surveys conducted within the study area. However, it is considered to have the potential to occur within the Project area based on the presence of suitable habitat. Little is known of the life cycle of this species, and as a result, the Project has the potential to adversely impact on the life cycle of the species such that a viable local population is placed at risk of extinction.

Thesium australe (Vulnerable, TSC Act; Vulnerable, EPBC Act) is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Centranthera cochinchinensis is uncommon in swampy areas and other moist sites (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Centranthera cochinchinensis* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

Euphrasia orthocheila subsp. *peraspera* has been recorded from 'moist open situations' such as swamps, however little is known about the habitat and ecology of this subspecies. It is partly parasitic upon other plants and may only be able to grow in close proximity to such host plants (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Euphrasia orthocheila* subsp. *peraspera* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Lepidium peregrinum occurs in an open riparian forest on the banks of the Tenterfield creek at Clifton. Sandy alluvium is the main soil type at the site. Associated species at the Clifton site are dominated by *Eucalyptus camaldulensis* and *Casuarina cunninghamiana*, with a variably dense shrubby understorey of *Hymenanthera dentata*, *Bursaria spinosa*, *Acacia fimbriata*, *Acacia floribunda*, *Callistemon viminalis* and *Leptospermum brachyandrum*. *Lepidium peregrinum* was most abundant in the tussock grassland fringe of the riparian open forest, comprising *Poa* species, *Lomandra longifolia* and *Paspalum dilatatum* (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Lepidium peregrinum* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Oldenlandia galioides occurs in margins of seasonally inundated wetlands in paperbark swamps and Forest Red Gum *Eucalyptus tereticornis* woodlands (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Oldenlandia galioides* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Persicaria elatior normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Persicaria elatior* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

Polygala linariifolia occurs in sandy soils in dry eucalypt forest and woodland with a sparse understorey. The species has been recorded from the Inverell and Torrington districts growing in dark sandy loam on granite in shrubby forest of *Eucalyptus caleyi*, *Eucalyptus dealbata* and *Callitris*, and in yellow podsolic soil on granite in layered open forest (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Polygala linariifolia* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Rotala tripartita is a riparian species that grows in free-standing water with sedges. There appear to be extreme fluctuations in abundance of the species, with plants observed to germinate prolifically and establish in large numbers after substantial rainfall. Individuals disappear above-ground during dry periods and may only persist during these times in the soil seed-bank. Surveys in the South Grafton area located two populations of *Rotala tripartita* growing in exposed silty clay on the edges of farm dams that were about 150m apart. Also known from Melaleuca freshwater coastal wetland (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Rotala tripartita* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Rutidosia heterogama grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Rutidosia heterogama* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Consequently, the

Project has the potential to impact potential habitat that may be important to the long-term survival of this species within the locality.

Thesium australe occurs in grassland or grassy woodland. Often found in damp sites in association with Kangaroo Grass (*Themeda australis*) (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Thesium australe* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Centranthera cochinchinensis*. In lieu of a formal recovery plan, DEC (2005) have developed recovery actions relevant to the Project:

- Protect swamps and other moist sites from clearing, draining or disturbance.
- Report records of Swamp Foxglove to OEH.
- Conduct targeted surveys in suitable habitat.

To date, no formal recovery plan has been developed for *Euphrasia orthocheila subsp. peraspera*. In lieu of a formal recovery plan, DEC (2005) has identified 27 priority actions to help recover this species. The following are related to the Project:

- Maintain natural hydrology of swamp areas where this plant occurs.
- Prevent trampling of populations by humans.
- Study and monitor populations to determine this plant's biology.

To date, no formal recovery plan has been developed for *Lepidium peregrinum*. In lieu of a formal recovery plan, DEC (2005) has identified 14 priority actions to help recover this species. The following are related to the Project:

- Ensure familiarity with the species before undertaking works in areas of potential habitat.
- Manage weeds in areas of known and potential habitat.
- Be careful with use of herbicides near areas of known habitat.
- Rehabilitate and protect areas of disturbed habitat.
- Survey for species in potential habitat and report any new locations to OEH.

To date, no formal recovery plan has been developed for *Oldenlandia galioides*. In lieu of a formal recovery plan, DEC (2005) has identified 18 priority actions to help recover this species. The following are related to the Project:

- Ensure adequate buffers to development adjacent to wetlands and woodlands that provide habitat.
- Identify and protect populations during timber harvesting activities.
- Control introduced weeds.
- Protect seasonally inundated wetlands in paperbark swamps and Forest Red Gum *Eucalyptus tereticornis* woodlands from clearing or development.

To date, no formal recovery plan has been developed for *Persicaria elatior*. In lieu of a formal recovery plan, DEC (2005) has identified several priority actions to help recover this species. The following are related to the Project:

- Provide information to landholders in areas likely to contain this species to enable them to identify it.
- Ensure that adequate survey is done for this species in development and clearing proposals in suitable habitat within its range.
- Protect wetland habitat containing (or likely to contain) this species.

To date, no formal recovery plan has been developed for *Polygala linariifolia*. In lieu of a formal recovery plan, DEC (2005) has identified six priority actions to help recover this species. The following are related to the Project:

- Identify populations on roadsides and in logging areas, and protect them during works.
- Control invasive exotic grasses in areas of habitat.
- Protect areas of dry eucalypt forest and woodland on sandy soil from clearing.
- Notify OEH of any additional records of Native Milkwort.

To date, no formal recovery plan has been developed for *Rotala tripartite*. In lieu of a formal recovery plan, DEC (2005) have developed recovery actions relevant to the Project:

- Control and remove introduced weeds at known locations.
- Ensure the construction and maintenance of the access road, powerline and pipeline near Black Swamp are carried out in a manner which reduces erosion and sedimentation risk.

To date, no formal recovery plan has been developed for *Rutidosia heterogama*. In lieu of a formal recovery plan, DEC (2005) has identified seven priority actions to help recover this species. The following are related to the Project:

- Stay on formed tracks when visiting heath areas to avoid trampling plants.
- Identify roadside populations and protect during roadside maintenance works.
- Protect areas of heath and moist open forest from clearing and development.

To date, no formal recovery plan has been developed for *Thesium australe*. In lieu of a formal recovery plan, DEC (2005) has identified 15 priority actions to help recover this species. The following are related to the Project:

- Protect known populations from changes to land use.
- Do not undertake road works, pasture modification or other changes in land use that may affect populations.
- Undertake weed control in and adjacent to populations, taking care to spray or dig out only target weeds.
- Mark sites and potential habitat onto maps (of the farm, shire, region, etc) used for planning (e.g. road works, residential and infrastructure developments, remnant protection, rehabilitation).
- Search for new populations in potential habitat.

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

The following key threatening process is considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation within the Project area, some of which may constitute habitat for these species.

The following key threatening process is considered relevant to *Lepidium peregrinum*, *Oldenlandia galioides*, *Polygala linariifolia*, *Rotala tripartita*, *Rutidosia heterogama* and *Thesium australe* based on the likely impacts of the Project:

- Invasion, establishment and spread of *Lantana camara*; the Project will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of *Lantana camara* within the Project area. *Lantana camara* has the potential to compete with these species, and reduce its potential habitat within the locality.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Centranthera cochinchinensis*, *Euphrasia orthocheila* subsp. *peraspera*, *Oldenlandia galioides*, *Polygala linariifolia* or *Rotala tripartita*. The Project is likely to have an **adverse** impact on *Lepidium peregrinum*, *Persicaria elatior*, *Rutidosia heterogama* and *Thesium australe*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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1.1.13 *Acalypha* (*Acalypha eremorum*), Thorny Pea (*Desmodium acanthocladum*), Axe-Breaker (*Geijera paniculata*), Sweet Myrtle (*Gossia fragrantissima*), Ripple-leaf Muttonwood (*Myrsine richmondensis*), Rainforest Cassia (*Senna acclinis*) and Brush Sophora (*Sophora fraseri*)

- 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.*

Acalypha eremorum (Endangered, TSC Act) is widespread and moderately common in south-east Queensland, in NSW it occurs in only a few localities, including the Chaelundi, Lismore and Burringbar areas (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Desmodium acanthocladum (Vulnerable, TSC Act; Vulnerable, EPBC Act) occurs only in north-east NSW. It is found in the Lismore area, and there are also records from near Grafton, Coraki, Casino and the Mount Warning area (DEC, 2005). The species was not detected during field surveys conducted within the study area. However, there are records of this species within close proximity to the Project area. The Project will result in potential habitat for this species, which may result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Geijera paniculata (Endangered, TSC Act) is moderately common in restricted habitat in Queensland between the Brisbane River and the central Queensland coast, but very rare in north-east NSW, where it is known from the Tweed, Lismore and Wardell areas (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Gossia fragrantissima (Endangered, TSC Act; Endangered, EPBC Act) occurs in south-east Queensland and in north-east NSW south to the Richmond River. Mostly found on basalt-derived soils (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Myrsine richmondensis (Endangered, TSC Act; Endangered, EPBC Act) is known only from a few populations at Coraki, Boatharbour near Lismore, and the Cherry Tree area west of Casino (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Senna acclinis (Endangered, TSC Act) occurs in the Coastal districts and adjacent tablelands of NSW from the Illawarra in NSW to Queensland (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Sophora fraseri (Vulnerable, TSC Act; Vulnerable, EPBC Act) occurs north from the Casino district in north-east NSW, where it is very rare. Also found in south-east Queensland where it is widespread but not common (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Acalypha eremorum occurs in subtropical rainforest, dry rainforest and vine thickets (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Acalypha eremorum* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Desmodium acanthocladum occurs in dry rainforest and fringes of riverine subtropical rainforest on basalt-derived soils at low elevations (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Desmodium acanthocladum* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Consequently, there is potential for the Project to have an adverse impact on habitat important for this species.

Geijera paniculata is found in dry subtropical rainforest and vine scrub, often along rivers (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Geijera paniculata* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measure are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Gossia fragrantissima is found in dry subtropical and riverine rainforest. As it can coppice from roots left in the ground when rainforest is cleared, it is found at several sites as isolated plants in paddocks or regrowth (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Gossia fragrantissima* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

Myrsine richmondensis is found in subtropical and dry rainforest and swamp forest on creek flats and slopes on basalt derived soil (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Myrsine richmondensis* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

Senna acclinis grows in or on the edges of subtropical and dry rainforest (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Senna acclinis* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Sophora fraseri is usually found in moist situations, often near rainforest (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Sophora fraseri* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Acalypha eremorum*. In lieu of a formal recovery plan, DEC (2005) has identified 17 priority actions to help recover this species. The following are related to the Project:

- Stay on established tracks in rainforest areas to avoid trampling plants.
- Remove weeds where they threaten adult plants or regeneration.
- Protect areas of rainforest from clearing and development.

To date, no formal recovery plan has been developed for *Desmodium acanthocladum*. In lieu of a formal recovery plan, DEC (2005) has identified 10 priority actions to help recover this species. The following are related to the Project:

- Protect known populations during roadworks.
- Control weeds.
- Protect known and potential habitat from clearing or development.
- Rehabilitate and expand streamside habitat.
- Notify OEH of any new records of Thorny Pea.

To date, no formal recovery plan has been developed for *Geijera paniculata*. In lieu of a formal recovery plan, DEC (2005) have developed recovery actions relevant to the Project:

- Control weeds in rainforest areas.
- Protect areas of suitable habitat from clearing or development.
- Expand and connect remaining remnants of habitat.

A recovery plan has been developed that encompasses *Gossia fragrantissima*. A number of recovery actions are recommended for the species (DECCW 2010) that are relevant to the Project:

- To protect rainforest, related vegetation and species from clearing
- To protect rainforest and related vegetation from fragmentation, modification and degradation
- To protect rainforest and related vegetation from the impact of weeds

- To protect rainforest and related vegetation from grazing and trampling by livestock
- To control and minimise impacts of introduced pathogens and diseases
- To engage the community and private land-holders in biodiversity conservation
- To establish effective monitoring of biodiversity related projects

Additionally DEC (2005) has identified nine priority actions to help recover this species. The following are related to the Project:

- Fence rainforest remnants to protect them from cattle.
- Control weeds in dry subtropical and riverine rainforest.
- Protect areas of rainforest habitat.
- Expand and connect remaining remnants of habitat.

A recovery plan has been developed for *Myrsine richmondensis*; *Ripple-leaf Muttonwood* (*Rapanea species A Richmond River*) *Recovery Plan* (Department of Environment and Conservation (NSW) 2004). The plan lists a series of recovery objectives and actions aimed at recovering the species in NSW. The following are relevant to the Project:

- OEH will liaise with landowners and managers regarding the protection of any populations of Ripple-leaf Muttonwood occurring off OEH managed estate.
- Identify populations along roadsides and protect them during road-works.
- Control introduced weeds in rainforest and swamp forest areas.
- Protect moist forest habitats from further clearing or development.
- Notify OEH of additional occurrences of Ripple-leaf Muttonwood.

To date, no formal recovery plan has been developed for *Senna acclinis*. In lieu of a formal recovery plan, DEC (2005) has identified eight priority actions to help recover this species. The following are related to the Project:

- Control and remove introduced weeds.
- Ensure correct identification of Senna weed species before removal.
- Protect habitat from clearing and logging.
- Initiate and encourage bush regeneration in habitat areas.

To date, no formal recovery plan has been developed for *Sophora fraseri*. In lieu of a formal recovery plan, DEC (2005) has identified eight priority actions to help recover this species. The following are related to the Project:

- Protect areas of habitat during timber harvesting activities.
- Control weeds in and near habitat.
- Protect known and potential habitat from clearing and development.
- Report new records of Brush Sophora to OEH.

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

The following key threatening processes are considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation within the Project area, some of which may constitute habitat for these species.
- Invasion, establishment and spread of *Lantana camara*; the Project will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of *Lantana camara* within the Project area. *Lantana camara* has the potential to compete with these species, and reduce its potential habitat within the locality.
- Invasion of native plant communities by exotic perennial grasses; the clearing of the required easement will result in increased edge effect, which may increase the potential for the

invasion, establishment and spread of exotic grasses within the Project area. Increased competition from exotic grasses has the potential to result in adverse effects to these species.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Acalypha eremorum*, *Geijera paniculata* and *Senna acclinis*. The Project has the **potential** to have an adverse impact on *Gossia fragrantissima*, *Myrsine richmondensis* and *Sophora fraseri*. The Project is likely to have an adverse impact on *Desmodium acanthocladum*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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1.1.14 Brush Sauropus (*Phyllanthus microcladus*) and Creek Triplarina (*Triplarina imbricata*)

- 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.*

Phyllanthus microcladus (Endangered, TSC Act) in NSW is confined to a few locations in the Tweed, Brunswick, Richmond and Wilson River Valleys with an outlying population near Grafton. Also occurs in south-east Queensland (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Triplarina imbricata (Endangered, TSC Act; Endangered, EPBC Act) is only found only in a few locations in the ranges south-west of Glenreagh and near Tabulam in north-east NSW (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Phyllanthus microcladus is usually found on banks of creeks and rivers, in streamside rainforest (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Phyllanthus microcladus* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Triplarina imbricata occurs along watercourses in low open forest with Water Gum (*Tristaniopsis laurina*) (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Triplarina imbricata* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Phyllanthus microcladus*. In lieu of a formal recovery plan, DEC (2005) have developed recovery actions relevant to the Project:

- Remove weeds where they threaten adult plants or regeneration.
- Protect areas of streamside rainforest habitat from clearing or development.
- Expand and connect remaining fragments of streamside rainforest.
- Report new records of Brush Sauropus to OEH.

A recovery plan has been developed that encompasses *Triplarina imbricata* (DECCW 2010). Several recovery actions are recommended for the species which are relevant to the Project:

- Protect species and their habitats from the effects of clearing and fragmentation
- To protect vegetation communities, ecosystems and habitats from inappropriate fire regimes
- Protect the Region from the impact of weeds
- Minimise human-induced disturbance and mortality of species
- Reduce the impacts of domestic livestock on the natural environment
- To engage the community and private landholders in biodiversity conservation
- To establish effective monitoring of biodiversity related projects.

Additionally, DEC (2005) has identified 13 priority actions to help recover this species. The following are related to the Project:

- Take care to avoid damaging native vegetation at riverside recreation spots.
- Protect creekside habitat from fire.
- Protect creek-bank vegetation from disturbance.
- Assist with the control of introduced weeds in creekside habitats.
- Expand and connect remnants of creekside vegetation.
- Notify OEH of additional occurrences of Creek *Triplarina*.

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

The following key threatening process is considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation within the Project area, some of which may constitute habitat for these species.
- Invasion, establishment and spread of *Lantana camara*; the Project will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of *Lantana camara* within the Project area. *Lantana camara* has the potential to compete with these species, and reduce their potential habitat within the locality.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Phyllanthus microcladus*. The Project is likely to have an **adverse** impact on *Triplarina imbricata*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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1.1.15 **Bailey's Cypress Pine (*Callitris baileyi*), Pygmy Cypress Pine (*Callitris oblonga*) and Red Lilly Pilly (*Syzygium hodgkinsoniae*)**

- 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.*

Callitris baileyi (Endangered, TSC Act) is found sporadically in south-east Queensland. The only recent record in NSW is a small population in Koreelah National Park and adjacent private land on the NSW–Queensland border west of Woodenbong. Old records exist for Acacia Creek and Sandilands near Tabulam (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Callitris oblonga (Vulnerable, TSC Act; Vulnerable, EPBC Act) is represented by two subspecies in NSW and one in Tasmania. Subsp. *parva* occurs in northern NSW on the eastern edge of the New England Tablelands and subsp. *corangensis* is only known to occur naturally in the Corang River catchment (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Syzygium hodgkinsoniae (Vulnerable, TSC Act; Vulnerable, EPBC Act) has a restricted range from the Richmond River in north-east NSW to Gympie in Queensland. Locally common in some parts of its range, but otherwise sparsely distributed (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Callitris baileyi is found on rocky, hilly or mountainous areas, usually near creeks, and on shallow and often clay soils. In NSW the population occurs in open grassy eucalypt forest, near a creek (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Callitris baileyi* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

Callitris oblonga usually grows in sand along watercourses in shrubland and open woodland in granite country; it also occurs in drier sites, including exposed ridges (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Callitris oblonga* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

Syzygium hodgekinsoniae is usually found in riverine and subtropical rainforest on rich alluvial or basaltic soils (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Syzygium hodgekinsoniae* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

- f) *whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.*

To date, no formal recovery plan has been developed for *Callitris baileyi*. In lieu of a formal recovery plan, DEC (2005) has identified 15 priority actions to help recover this species. The following are related to the Project:

- Protect areas with cypress pines from clearing or development.

- Notify OEH of any new occurrences of Bailey's Cypress Pine.

To date, no formal recovery plan has been developed for *Callitris oblonga*. In lieu of a formal recovery plan, DEC (2005) has identified nine priority actions to help recover this species. The following are related to the Project:

- Identify and protect populations and areas of habitat along roadsides and illegal tracks.
- Control weeds in habitat areas.
- Protect areas of known and potential habitat from clearing, fragmentation or disturbance.
- Expand and reconnect isolated remnants of habitat.

To date, no formal recovery plan has been developed for *Syzygium hodgekinsoniae*. In lieu of a formal recovery plan, DEC (2005) have developed recovery actions relevant to the Project:

- Identify roadside trees and protect them during road-works.
- Remove weeds in rainforest environments.
- Protect areas of suitable rainforest habitat from clearing or development.
- Expand, connect and rehabilitate remnants of rainforest.

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

The following key threatening process is considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation within the Project area, some of which may constitute habitat for these species.

The following key threatening process is considered relevant to *Callitris oblonga* and *Syzygium hodgekinsoniae* based on the likely impacts of the Project:

- Invasion, establishment and spread of *Lantana camara*; the Project will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of *Lantana camara* within the Project area. *Lantana camara* has the potential to compete with these species, and reduce its potential habitat within the locality.

Conclusion

The Project is likely to have an **adverse** impact on *Callitris baileyi*, *Callitris oblonga* and *Syzygium hodgekinsoniae* due to habitat loss and fragmentation. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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1.1.16 Granite Babingtonia (*Kardomia granitica*), Granite Boronia (*Boronia granitica*), Beadle's Grevillea (*Grevillea beadleana*), Binghi Homoranthus (*Homoranthus binghiensis*), Crescent-leaved Homoranthus (*Homoranthus lunatus*), Torrington Beard-heath (*Leucopogon confertus*), Rusty Desert Phebalium (*Phebalium glandulosum* subsp. *eglandulosum*), Nightcap Plectranthus (*Plectranthus nitidus*), McPherson Range Pomaderris (*Pomaderris notata*), Torrington Mint-bush (*Prostanthera staurophylla sensu stricto*).

- 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.*

Kardomia granitica formerly *Babingtonia granitica* (Vulnerable, TSC Act; Vulnerable, EPBC Act) is restricted to three small populations in the tableland granite country around Stanthorpe, Queensland. There are no records of this species from NSW, but it is likely to occur in Bald Rock National Park, within the Stanthorpe Plateau sub region of the Northern Rivers CMA. It was not observed during URS field survey. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Boronia granitica (Vulnerable, TSC Act; Endangered, EPBC Act) occurs in scattered localities on the New England Tablelands and North West Slopes north from the Armidale area to the Stanthorpe district in southern Queensland. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Grevillea beadleana (Endangered, TSC Act; Endangered, EPBC Act) is known from four separate areas, all in north-east NSW: the Torrington area west of Tenterfield, Oxley Wild Rivers National Park, Guy Fawkes River National Park and at Shannon Creek south-west of Grafton. Historical records suggest it was also once found near Walcha. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Homoranthus binghiensis (Endangered, TSC Act) is restricted to the Torrington area south-west of Tenterfield, associated with isolated granitic outcrops in the far north-eastern tablelands region of NSW. It grows within sandy soil pockets in open and exposed situations on and around the margins of the outcrops. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Homoranthus lunatus (Vulnerable, TSC Act; Vulnerable, EPBC Act) occurs near Tenterfield and Torrington on the New England Tablelands of NSW, including Bald Rock and Boonoo Boonoo National Parks near Tenterfield. The species was not detected during field surveys conducted within the study area. However, this species has the potential to occur within the Project area, based on the presence of suitable habitat. The Project has the potential to impact upon the species and result in an adverse impact on the life cycle of the species such that a viable local population is placed at risk of extinction.

Leucopogon confertus (Endangered, TSC Act; Endangered, EPBC Act) is known only from an early record near Torrington on the New England Tablelands. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Phebalium glandulosum subsp. *eglandulosum* (Endangered, TSC Act; Vulnerable, EPBC Act) is found in the Torrington district and in Severn River Nature Reserve north-west of Glen Innes, on the New England Tablelands. The species also occurs in Queensland. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Plectranthus nitidus (Endangered, TSC Act; Endangered, EPBC Act) occurs within both NSW and Queensland. Previously known only from Nightcap National Park near Terania Creek in northern NSW, however, the species has now been collected from the Nullum and Richmond Range State Forests. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Pomaderris notata (Vulnerable, TSC Act) occurs mainly in Queensland. In NSW it is known from five sites in the McPherson and Tweed Range areas, including Mount Warning National Park, Mebbin National Park and Limpinwood Nature Reserve. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Prostanthera staurophylla sensu stricto (Endangered, TSC Act; Vulnerable, EPBC Act) is currently known from a single granite outcrop in the Tenterfield area of the New England Tablelands. The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Kardomia granitica grows in shallow peaty soil associated with crevices in extensive granite outcrops. The Project will require the clearing of vegetation that may constitute potential

Kardomia granitica habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Boronia granitica grows on granitic soils amongst rock outcrops, often in rock crevices, and in forests and woodlands on granite scree and shallow soils. Important site characteristics include low precipitation and high levels of solar radiation. This semi-arid soil environment will have selected the more xerophytic species from the available regional assemblage of rainforest species. The Project will require the clearing of vegetation that may constitute potential *Boronia granitica* habitat. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Grevillea beadleana occurs within open eucalypt forest with a shrubby understorey. It is usually found on steep granite slopes at high altitudes. The Project will require the clearing of vegetation that may constitute potential *Grevillea beadleana* habitat. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Homoranthus binghiensis grows within sandy soil pockets in open and exposed situations on and around the margins of the outcrops. The species appears to prefer heath and shrubland patches in shallow soils at altitudes of 700 to 950 m. Associated species include *Eucalyptus prava*, *Eucalyptus dealbata* and *Callitris endlicheri* in the overstorey. The Project will require the clearing of vegetation that may constitute potential *Homoranthus binghiensis*. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Homoranthus lunatus grows in heath, shrub and woodland communities in sandy soils on granite outcrops and slopes. The Project will require the clearing of vegetation that may constitute potential *Homoranthus lunatus* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given this, the Project has the potential to remove habitat important to the survival of the species within the locality. This species has very small and localised populations, so any impact to any population could impact the survival of the species.

Leucopogon confertus possibly occurs in open forest and woodland on rocky granite areas. The Project will require the clearing of vegetation that may constitute potential *Leucopogon confertus* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Phebalium glandulosum subsp. *eglandulosum* is restricted to granite outcrop country on the New England Tablelands. It favours exposed and heathy granite areas with cracks and depressions of skeletal sandy soil located amongst the boulders. The Project will require the clearing of vegetation that may constitute potential *Phebalium glandulosum* subsp. *eglandulosum* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Plectranthus nitidus grows on rocky cliff-faces and boulders, in the shelter and shade provided by the adjacent rainforest. The Project will require the clearing of vegetation that may constitute

potential *Plectranthus nitidus* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Pomaderris notata is known to occur within rocky basalt ranges in montane heaths and scrubs or in scrubby rainforest. The Project will require the clearing of vegetation that may constitute potential *Pomaderris notata* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Prostanthera staurophylla sensu stricto, within its only current known population, the species occurs in shallow skeletal soil in rock crevices. The site is an exposed granite outcrop near the mountain summit, with skeletal gritty loam soil. *Kunzea parvifolia* is dominant around the outcrop, with *Prostanthera staurophylla* and *Leptospermum variabile* scattered amongst the *Kunzea*. The Project may require the clearing of vegetation that may constitute potential *Prostanthera staurophylla sensu stricto* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Kardomia granitica*. In lieu of a formal recovery plan, DEC (2005) has identified three priority actions to help recover this species. The following are related to the Project:

- Protect areas of potential habitat from disturbance.
- Report any occurrences of *Granite Babingtonia* in NSW to OEH.
- Carry out surveys for *Granite Babingtonia* in likely habitat.

A Recovery Plan has been prepared for *Boronia granitica* (NSW NPWS, 2002). It outlines a range of long term and immediate objectives for this species. These include the maintenance of habitat value at key sites and throughout the former range by active participation in land-use planning processes and by active vegetation rehabilitation at strategic sites. Population monitoring objectives have also been set to allow assessment of the efficacy of management actions. Recovery actions outlined for *Boronia granitica* of relevance to this Project include:

- Retain bushrock in its natural setting and obtain rocks for gardens only from licensed dealers.
- Stay on established walking tracks when visiting national parks and other reserves.
- Enjoy viewing and photographing native wildflowers but leave them in the wild.
- Only buy plants from licensed nurseries.
- Assist with the control of feral goats in habitat areas.
- Manage fire to maintain populations. Liaise with OEH concerning appropriate fire management.
- Protect known populations and habitat areas from grazing stock.
- Protect known populations and areas of potential habitat from clearing or disturbance.
- Report any new records to OEH.

A Recovery Plan has been prepared for *Grevillea beadleana* (NSW NPWS, 2004). It outlines a range of long term and immediate objectives for this species. These include the maintenance of habitat value at key sites and throughout the former range by active participation in land-use planning processes and by active vegetation rehabilitation at strategic sites. Population monitoring objectives have also been set to allow assessment of the efficacy of management actions. Recovery actions outlined for *Grevillea beadleana* of relevance to this Project include:

- Keep to established paths in national parks to avoid damaging plants.
- Enjoy native wildflowers by photographing them, rather than collecting them.
- Assist with the control of feral herbivores.
- Manage fire to encourage regeneration. Liaise with OEH concerning appropriate fire management.
- Exclude stock from known and potential habitat.
- Prevent clearing or development of known or potential habitat.
- Encourage and support property agreements and voluntary conservation agreements.
- Report new records to OEH.

To date, no formal recovery plan has been developed for *Homoranthus binghiensis*. In lieu of a formal recovery plan, DEC (2005) has identified a number of priority actions to help recover this species. The following are related to the Project:

- Protect areas of habitat from frequent fire.
- Protect areas of known and potential habitat from clearing, disturbance and fragmentation.
- Control of feral goats in habitat areas.
- Report new records of *Homoranthus binghiensis* to OEH.

No formal recovery plan has been developed for *Homoranthus lunatus*. In lieu of a formalised recovery plan, OEH has developed a series of recovery strategies for the species, of which the following are relevant to the Project:

- Support local Landcare groups.
- Assist with the control of feral goats and pigs in habitat areas.
- Identify roadside populations and protect during roadworks.
- Protect areas of rocky heath habitat from clearing and development.
- Protection from frequent fires.
- Notify OEH of any new records of *Granite Homoranthus*.

To date, no formal recovery plan has been developed for *Leucopogon confertus*. In lieu of a formal recovery plan, DEC (2005) has identified a number of priority actions to help recover this species. The following are related to the Project:

- Observe hygiene protocols and track closure signs in national parks.
- Assist with the control of feral goats.
- Protect areas of potential habitat from heavy grazing by domestic stock.
- Protect areas of open forest and woodland in rocky areas from clearing and fragmentation.
- Report any new records of Torrington Beard-heath to OEH.

To date, no formal recovery plan has been developed for *Phebalium glandulosum* subsp. *eglandulosum*. In lieu of a formal recovery plan, DEC (2005) has identified a number of priority actions to help recover this species. The following are related to the Project:

- Assist with the control of feral goats.
- Protect habitat from frequent fire.
- Protect known populations and habitat areas from grazing stock.
- Protect areas of heath and shrubby open forest from clearing and disturbance.
- Rehabilitate and protect disturbed areas of potential habitat.

- Report new records of Rusty Desert Phebalium to OEH.

A recovery plan has been developed which encompasses *Plectranthus nitidus* (DECCW 2010). A number of recovery actions are recommended for the species, of which the following are relevant to the Project:

- To protect rainforest, related vegetation and species from clearing
- To protect rainforest and related vegetation from fragmentation, modification and degradation
- To protect rainforest and related vegetation from the impact of weeds
- To protect rainforest from fire and to promote the implementation of appropriate fire regimes in related vegetation
- To protect rainforest and related vegetation from the impact of pest animals
- To minimise the impacts of human interference
- To control and minimise impacts of introduced pathogens and diseases
- To engage the community and private land-holders in biodiversity conservation
- To establish effective monitoring of biodiversity related projects

Additionally DEC (2005) has identified a number of priority actions. The following are related to the Project:

- It is important that all land managers are made aware of the species and that appropriate measures are taken to protect the habitat.
- Searches for the species should be conducted prior to any logging operations.
- Control introduced weeds in potential habitat areas.
- Protect known habitat.

To date, no formal recovery plan has been developed for *Pomaderris notata*. In lieu of a formal recovery plan, DEC (2005) has identified a number of priority actions to help recover this species. The following are related to the Project:

- Protect from too frequent fire.
- Protect habitat from trampling.
- Report new occurrences of the species to OEH.
- Conduct searches for further populations in likely habitat.

To date, no formal recovery plan has been developed for *Prostanthera staurophylla sensu stricto*. In lieu of a formal recovery plan, DEC (2005) has identified a number of priority actions to help recover this species. The following are related to the Project:

- Enjoy viewing and photographing native wildflowers but leave them in the wild.
- Control feral goats in habitat areas.
- Protect areas of rocky woodland and heath habitat from grazing.
- Rehabilitate and protect native vegetation on disturbed granite outcrops.

For all rocky outcrop shrub species assessed, the proposed works are not inconsistent with any of the above recovery strategies outlined to assist in the recovery of these species. The priority actions and recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

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

The following key threatening processes (TSC Act) have been identified as being relevant to the shrub species included within this assessment:

- Clearing of native vegetation; the Project will require the clearing of native vegetation, some of which may constitute habitat for the species within this assessment;

- Invasion, establishment and spread of *Lantana camara*; the Project will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of *Lantana camara* within the Project area. *Lantana camara* has the potential to compete with these species, and reduce potential habitat within the locality.
- Bushrock removal; *Boronia granitica* in particular is identified as threatened by the process of bushrock removal from the environment through destruction and disturbance of habitat.

Conclusion

The Project is not considered likely to have an adverse impact on *Kardomia granitica*, *Boronia granitica*, *Grevillea beadleana*, *Homoranthus binghiensis*, *Leucopogon confertus*, *Phebalium glandulosum* subsp. *eglandulosum*, *Plectranthus nitidus*, *Pomaderris notata* or *Prostanthera staurophylla sensu stricto*.

The Project is likely to have an adverse impact on *Homoranthus lunatus*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report to mitigate the impact to ensure that biodiversity values within the Project area are maintained or improved.

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1.1.17 Northern Clematis (*Clematis fawcettii*), White-flowered Wax Plant (*Cynanchum elegans*), Slender Marsdenia (*Marsdenia longiloba*), Scrambling Lignum (*Muehlenbeckia costata*), Tinospora Vine (*Tinospora smilacina*), and Cryptic Forest Twiner (*Tylophora woollsii*).

- 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.*

Clematis fawcettii (Vulnerable, TSC Act; Vulnerable, EPBC Act) is widely dispersed areas in southern Queensland and in north-east NSW within the Northern Rivers CMA subregions: Clarence Lowlands, Woodenbong, Richmond-Tweed and Cataract (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Cynanchum elegans (Endangered, TSC Act; Endangered, EPBC Act) is restricted in NSW to Brunswick Heads in the north to Gerroa in the South and is found within the Northern Rivers CMA (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Marsdenia longiloba (Endangered, TSC Act; Vulnerable, EPBC Act) occurs in scattered sites on the north coast of NSW north from Barrington Tops. Also occurs in south-east Queensland (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Muehlenbeckia costata (Vulnerable, TSC Act) has a scattered distribution from Queensland to the Blue Mountains in NSW. Records on the New England Tablelands and North West Slopes include Bald Rock north of Tenterfield, Warra and Butterleaf National Parks near Glen Innes and Mt Kaputar. (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Tinospora smilacina (Endangered, TSC Act) is found north from the Coffs Harbour district in north-east NSW, where it is rare (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Tylophora woollsii (Endangered, TSC Act; Endangered, EPBC Act) is found from the NSW north coast and New England Tablelands to southern Queensland, but is very rare within that range. The species grows in moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins, and is thought to be wind-dispersed. Has been recorded from a number of locations including; Bald Rock National Park, Marengo State Forest, Sheas Nob State Forest, Clouds Creek State Forest, Ewingar State Forest, Kangaroo River State Forest, Boonoo State Forest, Gibraltar Range National Park and Barrington Tops National Park. (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Clematis fawcettii occurs in drier rainforest, usually near streams (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Clematis fawcettii* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Cynanchum elegans is found on the edge of dry rainforest vegetation (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Cynanchum elegans* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

Marsdenia longiloba is found in subtropical and warm temperate rainforest, lowland moist eucalypt forest adjoining rainforest and, sometimes, in areas with rock outcrops (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Marsdenia longiloba* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that the species was not found during field surveys conducted within the study

area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Muehlenbeckia costata occurs in coarse sandy soils and peat in heath, mallee and open eucalypt woodland on granite or acid volcanic outcrops at higher altitudes (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Muehlenbeckia costata* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Tinospora smilacina occurs in dry rainforest and along the boundaries of dry rainforest and dry eucalypt forest (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Tinospora smilacina* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Tylophora woollsii grows in moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins. The species is thought to be wind-dispersed. It has been recorded from a number of locations including; Bald Rock National Park, Marengo State Forest, Sheas Nob State Forest, Clouds Creek State Forest, Ewingar State Forest, Kangaroo River State Forest, Boonoo State Forest, Gibraltar Range National Park and Barrington Tops National Park (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Tylophora woollsii* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Clematis fawcettii*. In lieu of a formal recovery plan, DEC (2005) has identified the following priority actions to help recover this species. The following are related to the Project:

- Control weeds in rainforest habitat.
- Protect remaining habitat from further clearing.
- Report new occurrences of Northern Clematis, particularly adult vines, to OEH.

To date, no formal recovery plan has been developed for *Cynanchum elegans*. In lieu of a formal recovery plan, DEC (2005) has identified the following priority actions to help recover this species. The following are related to the Project:

- Consider off-site impacts in the assessment of nearby developments.
- Prevent inappropriate water run-off entering sites.
- Install fencing to exclude livestock and machinery, and control access where required.
- Protect areas of known and potential habitat from clearing and further fragmentation.

To date, no formal recovery plan has been developed for *Marsdenia longiloba*. In lieu of a formal recovery plan, DEC (2005) has identified the following priority actions to help recover this species. The following are related to the Project:

- Control weeds likely to spread into suitable habitat.

- Limit use of herbicides to areas away from significant native vegetation.
- Protect areas of habitat from clearing.

To date, no formal recovery plan has been developed for *Muehlenbeckia costata*. In lieu of a formal recovery plan, DEC (2005) has identified the following priority actions to help recover this species. The following are related to the Project:

- Keep to formed tracks when visiting national parks.
- Protect areas of potential habitat from clearing or fragmentation.
- Report any new records of Scrambling Lignum to OEH.

To date, no formal recovery plan has been developed for *Tinospora smilacina*. In lieu of a formal recovery plan, DEC (2005) has identified the following priority actions to help recover this species. The following are related to the Project:

- Identify populations near roads and harvesting areas and protect them during logging operations.
- Control weeds in and near known habitat, taking particular care when other species of vine require cutting.
- Protect areas of habitat from clearing.
- Expand and connect remaining areas of habitat.

A recovery plan has been developed that incorporates *Tylophora woollsii*. The following recovery actions are considered relevant to the Project:

- Protect species and their habitats from the effects of clearing and fragmentation
- To protect vegetation communities, ecosystems and habitats from inappropriate fire regimes
- Protect the Region from the impact of weeds
- Protect the Region from the impact of disease and Pathogens
- Minimise human-induced disturbance and mortality of species
- Reduce the impacts of domestic livestock on the natural environment
- To engage the community and private land-holders in biodiversity conservation
- To establish effective monitoring of biodiversity related projects

Additionally, DEC (2005) has identified the following priority actions to help recover this species. The following are related to the Project:

- Undertake weed control works.
- Protect known habitat from disturbance, clearing or spraying.

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

The following key threatening processes are considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation within the Project area, some of which may constitute habitat for these species.
- Invasion, establishment and spread of *Lantana camara*; the Project will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of *Lantana camara* within the Project area. *Lantana camara* has the potential to compete with these species, and reduce their potential habitat within the locality.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Clematis fawcettii*, *Marsdenia longiloba*, *Muehlenbeckia costata*, or *Tinospora smilacina*. The Project is likely to have an **adverse** impact on *Tylophora woollsii* and *Cynanchum elegans*. A number of measures have

been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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1.1.18 **Rod's Star Hair (*Astrotricha roddii*), Bordered Guinea Flower (*Hibbertia marginata*), Weeping Paperbark (*Melaleuca irbyana*) and *Tephrosia filipes***

- 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.*

Astrotricha roddii (Endangered, TSC Act; Endangered, EPBC Act) occurs in NSW in the Ashford area north of Inverell, including Kwiambal and Kings Plains National Parks, Severn River Nature Reserve and Severn River State Forest. Rod's Star Hair usually grows in low dry woodland and shrublands on granite and acid volcanic outcrops, often in rock crevices (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Hibbertia marginata (Vulnerable, TSC Act; Vulnerable, EPBC Act) is found in grassy or shrubby dry open eucalypt forest at low altitudes on sandstone. Occurs only in north-east NSW, where it is

restricted to the southern Richmond Range between Casino and Grafton (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Melaleuca irbyana (Endangered, TSC Act) is found in only a few places in north-east NSW, including near Coraki, Casino and Coutts Crossing south of Grafton. Also occurs in near Ipswich south-east Queensland (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Tephrosia filipes (Vulnerable, TSC Act) is relatively widespread in QLD but in NSW confined to the north-eastern section from Guy Fawkes River National Park in the south to the Tenterfield district in the north. LGAs for which the species is known to occur include Tenterfield, Northern Rivers and Glen Innes Severn (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Astrotricha roddii usually grows in low dry woodland and shrublands on granite and acid volcanic outcrops, often in rock crevices (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Astrotricha roddii* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Hibbertia marginate is found in grassy or shrubby dry open eucalypt forest at low altitudes on sandstone (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Hibbertia marginate* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Melaleuca irbyana is usually found in open eucalypt forest in poorly drained, usually clay, soils (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Melaleuca irbyana* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Tephrosia filipes occurs in a range of woodland and forest habitats on soils derived from granite, sandstone or metasediments (DEC, 2005). The Project will require the clearing of vegetation that may constitute potential *Tephrosia filipes* habitat. This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Astrotricha roddii*. In lieu of a formal recovery plan, DEC (2005) has identified the following priority actions to help recover this species. The following are related to the Project:

- Stay on established walking tracks when visiting National Parks and other reserves to avoid damage to vegetation.
- Assist with the control of feral goats in habitat areas.
- Protect known populations and areas of potential habitat from clearing or disturbance.
- Report any new records of Rod's Star Hair to OEH.

A recovery plan has been developed that incorporates *Hibbertia marginata* (DECCW 2010). The following recovery actions are considered relevant to the Project:

- Protect species and their habitats from the effects of clearing and fragmentation
- To protect vegetation communities, ecosystems and habitats from inappropriate fire regimes
- Protect the Region from the impact of pests
- Protect the Region from the impact of disease and pathogens
- Reduce the impacts of domestic livestock on the natural environment
- To engage the community and private land-holders in biodiversity conservation
- To establish effective monitoring of biodiversity related projects

Additionally, DEC (2005) has identified the following priority actions to help recover this species. The following are related to the Project:

- Identify roadside populations and protect them during road-works.
- Protect areas of known habitat during timber harvesting activities.
- Protect known and potential habitat from clearing or development.

To date, no formal recovery plan has been developed for *Melaleuca irbyana*. In lieu of a formal recovery plan, DEC (2005) has identified the following priority actions to help recover this species. The following are related to the Project:

- Protect known habitat from frequent fire.
- Identify plants on roadsides and protect during road works.
- Control weeds.
- Protect areas of known habitat from clearing and timber harvesting.

To date, no formal recovery plan has been developed for *Tephrosia filipes*. In lieu of a formal recovery plan, DEC (2005) has identified the following priority actions to help recover this species. The following are related to the Project:

- Avoid further clearing of habitat.
- Control weeds which directly compete with *Tephrosia filipes*.
- Ensure road-building activities do not impact on plants of *Tephrosia filipes* close to the road..

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

The following key threatening processes are considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation within the Project area, some of which may constitute habitat for these species.
- Invasion, establishment and spread of *Lantana camara*; the Project will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of *Lantana camara* within the Project area. *Lantana camara* has the potential to compete with these species, and reduce their potential habitat within the locality.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Astrotricha roddii*, *Hibbertia marginata*, *Melaleuca irbyana* or *Tephrosia filipes*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). Bordered Guinea Flower – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10400>

DEC (2005). Rod's Star Hair - profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

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NSW Scientific Committee (1999) *Melaleuca tamariscina* subsp. *irbyana* (a shrub). Endangered species determination - final. DEC (NSW), Sydney. Viewed online 11/11/2010.

<http://www.environment.nsw.gov.au/determinations/MelaleucaTamariscinaEndSpListing.htm>

DEC (2005). Weeping Paperbark – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10518>

DEC (2005). *Tephrosia filipes* – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=20113>

NSW Scientific Committee (2009) *Tephrosia filipes* - vulnerable species listing. Vulnerable species determination - final. DEC (NSW), Sydney. Viewed online 11/11/2010.
<http://www.environment.nsw.gov.au/determinations/tephrosiafilipesFD.htm>

Department of Environment, Climate Change and Water NSW 2010, Northern Rivers Region Biodiversity Management Plan, National Recovery Plan for the Northern Rivers Region - NSW Department of Environment, Climate Change and Water NSW, Sydney. Viewed online 9/2/2012.
<http://www.environment.gov.au/biodiversity/threatened/publications/recovery/pubs/northern-rivers.pdf>

1.1.19 Leafless Tongue-orchid (*Cryptostylis hunteriana*), Spider orchid (*Dendrobium melaleucaphilum*), Pink Nodding Orchid (*Geodorum densiflorum*) and Hartman's Sarcochilus (*Sarcochilus hartmannii*)

- 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.*

Cryptostylis hunteriana (Vulnerable, TSC Act; Vulnerable, EPBC Act) has been recorded from as far north as Gibraltar Range National Park south into Victoria around the coast as far as Orbost (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Dendrobium melaleucaphilum (Endangered, TSC Act) occurs in coastal districts and nearby ranges, extending from Queensland to its southern distributional limit in the lower Blue Mountains. In NSW, it is currently known from seven recent collections. There has been no subsequent confirmation from the locations of three earlier (pre-1922) collections and it is possible that these are now extinct (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Geodorum densiflorum (Endangered, TSC Act) is thought to be a small population, of less than 20 populations of Pink Nodding Orchid in NSW, all north of Bundjalung National Park, and including Tweed Shire. The species also occurs in Queensland (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Sarcochilus hartmannii (Vulnerable, TSC Act; Vulnerable, EPBC Act) is found from the Richmond River in northern NSW to Gympie in south-east Queensland (DEC, 2005). The species was not detected during field surveys conducted within the study area. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Cryptostylis hunteriana does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*) (DEC, 2005). This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Dendrobium melaleucaphilum grows frequently on *Melaleuca styphelioides*, less commonly on rainforest trees or on rocks in coastal districts (DEC, 2005). This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measure are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Geodorum densiflorum is found in dry eucalypt forest and coastal swamp forest at lower altitudes, often on sand (DEC, 2005). This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

Sarcochilus hartmannii favours cliff faces on steep narrow ridges supporting eucalypt forest and clefts in volcanic rock from 500 to 1,000 m in altitude. Also found occasionally at the bases of fibrous trunks of trees, including cycads and grass-trees (DEC, 2005). This clearing of vegetation may also result in the fragmentation of potential habitat for this species. Assuming mitigation measures are adopted, and given that the species was not found during field surveys conducted within the study area, the potential habitat to be removed is considered to be of low importance to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Cryptostylis hunteriana*. In lieu of a formal recovery plan, DEC (2005) has identified four priority actions to help recover this species. The following is related to the Project:

- Co-operatively develop (local governments and OEH) guidelines for survey and assessment, to be followed by developers, consultants and approval authorities.

No formal recovery plan has been developed for *Dendrobium melaleucaphilum*. In lieu of a formalised recovery plan, OEH has developed a series of recovery strategies for the species, of which the following are relevant to the Project:

- Establish and maintain ex-situ collection of seed and plants.
- Protect areas of known and potential habitat from fire.
- Protect areas of known and potential habitat from clearing and fragmentation.
- Maintain confidentiality of locations to minimise illegal collection.

To date, no formal recovery plan has been developed for *Geodorum densiflorum*. In lieu of a formal recovery plan, DEC (2005) has identified 18 priority actions to help recover this species. The following are related to the Project:

- Protect areas of coastal eucalypt and swamp forest from clearing or development.
- Report new records of Nodding Swamp Orchid to OEH.

To date, no formal recovery plan has been developed for *Sarcochilus hartmannii*. In lieu of a formal recovery plan, DEC (2005) has identified six priority actions to help recover this species. The following are related to the Project:

- Protect areas with known populations from disturbance.
- Assist with control of weeds near known populations.
- Report any records of *Sarcochilus hartmannii* to the OEH.

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

The following key threatening processes are considered relevant to the species included within this assessment, based on the likely impacts of the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation, some of which may constitute may constitute habitat for these species.

The following key threatening process is considered relevant to *Geodorum densiflorum* and *Sarcochilus hartmannii* based on the likely impacts of the Project:

- Invasion, establishment and spread of *Lantana camara*; the Project will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of *Lantana camara* within the Project area. *Lantana camara* has the potential to compete with these species, and reduce its potential habitat within the locality.
- Invasion of native plant communities by exotic perennial grasses; the clearing of the required easement will result in increased edge effect, which may increase the potential for the invasion, establishment and spread of exotic grasses within the Project area. Increased competition from exotic grasses has the potential to result in adverse effects to these species.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Cryptostylis hunteriana*, *Dendrobium melaleucaphilum*, *Geodorum densiflorum* or *Sarcochilus hartmannii*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). Leafless Tongue-orchid – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10187>

DEC (2005). Spider orchid – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10213>

DEC (2005). Pink Nodding Orchid – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10349>

DEC (2005). Hartman's Sarcochilus – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10745>

Assessments of Significance

2.1 Threatened Ecological Communities

2.1.1 *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast; Sydney Basin and South East Corner Bioregions (Swamp Sclerophyll Forest)*

- 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.*

Not applicable.

This factor refers to vulnerable species listed in Part 1 of Schedule 2 of the TSC Act, endangered species listed in Part 1 of Schedule 1 of the TSC Act, critically endangered species listed in Part 1 of Schedule 1A of the TSC Act, vulnerable species listed in Part 1 of Schedule 5 of the FM Act, endangered species listed in Part 1 of Schedule 4 of the FM Act and critically endangered species listed in Part 1 of Schedule 4A of the FM Act.

- 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.

This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

- c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*
- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
 - (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Swamp Sclerophyll Forest (Endangered Ecological Community, TSC Act) is found within a number of LGAs within NSW, within the following CMAs: Hawkesbury/Nepean, Hunter/Central Rivers, Northern Rivers, Southern Rivers and Sydney Metro.

The Project will require the clearing of vegetation that constitutes this community, in the order of 0.15 (minimum) to 1.64 Ha (maximum); refer to Submission response, **Attachment 3**. The composition of the community is primarily determined by the frequency and duration of waterlogging and the texture, salinity, nutrient and moisture content of the soil. The composition and structure of the understorey is influenced by grazing and fire history, changes to hydrology and soil salinity and other disturbance (DEC, 2005).

The Project will require the clearing of and disturbance to, Swamp Sclerophyll Forest and will result in increased edge effect within the Project area. The Project may result in the establishment or spread of exotic species which may result in increased competition for native species.

Given the distribution of Swamp Sclerophyll Forest within NSW, and the amount of this community that will be cleared as a result of the Project, it is considered unlikely that the Project would result in the local occurrence being placed at risk of extinction.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Swamp Sclerophyll Forest relies upon specific abiotic conditions within areas of occurrence. It is considered unlikely that the Project would modify these conditions to the extent that the community would be threatened in the locality. However the Project will result in clearing of vegetation which constitutes this community, which will result in the permanent removal of habitat of this community from within the Project area.

Swamp Sclerophyll Forest occurs within the Project area in a fragmented state, due to historical agricultural and land clearing activities. The Project will require clearing of vegetation that constitutes this community, which will result in further fragmentation of this community within the region.

Given the distribution of the community throughout NSW, and its reliance upon specific abiotic conditions, it is considered that the impacts of the Project are of low importance to the long term survival of the community within the locality.

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

Not applicable.

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no recovery plan has been developed for Swamp Sclerophyll Forest. In lieu of a formal recovery plan, DEC (2005) has developed a series of priority actions to assist in the recovery of the community within NSW. The following actions are relevant to the Project:

- Instigate pig, deer and goat control programs.
- Ensure that the fire sensitivity of the community is considered when planning hazard reduction and asset management burning.
- Protect habitat by minimising further clearing of the community. This requires recognition of the values of all remnants in the land use planning process.
- Promote regeneration by avoiding prolonged or heavy grazing.
- Undertake restoration including bush regeneration, revegetation and weed control, and promote public involvement in this restoration.

The Project will result in clearing of vegetation that constitutes this community, which will result in the permanent removal of habitat for this community. Despite the community's naturally widespread distribution within NSW, it is considered that the Project would reduce the amount of this community within the region, which though unlikely, may interfere with the recovery of Swamp Sclerophyll Forest within the region.

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

The following key threatening process (TSC Act) that may threaten Swamp Sclerophyll Forest is considered relevant to the Project:

- Clearing of native vegetation; the Project will require the removal of vegetation that constitutes Swamp Sclerophyll Forest.

The Project will result in the clearing of vegetation that constitutes this community.

Conclusion

The Project is considered likely to have an **adverse** impact on Swamp Sclerophyll Forest.

A number of mitigation measures have been recommended in **Section 7, Appendix D4** of this Report, that aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). Swamp sclerophyll forest on coastal floodplains - profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10786>

2.1.2 White box - yellow box - Blakely's red gum grassy woodland and derived native grassland (Box Gum Woodland)

- 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.*

Not applicable.

This factor refers to vulnerable species listed in Part 1 of Schedule 2 of the TSC Act, endangered species listed in Part 1 of Schedule 1 of the TSC Act, critically endangered species listed in Part 1 of Schedule 1A of the TSC Act, vulnerable species listed in Part 1 of Schedule 5 of the FM Act, endangered species listed in Part 1 of Schedule 4 of the FM Act and critically endangered species listed in Part 1 of Schedule 4A of the FM Act.

- 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.

This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Within NSW, Box Gum Woodland (Endangered Ecological Community, TSC Act; Critically Endangered Ecological Community, EPBC Act) is found from the Queensland border in the north, to the Victorian border in the south. It occurs in the tablelands and western slopes of NSW.

The Project will require the clearing of vegetation between 9.69 Ha (minimum) to 72.65 Ha (maximum) that comprise this community.

Given the widespread distribution of Box Gum Woodland within NSW, and the mapped extent of this community within the study area, it is considered unlikely that the Project would result in the local occurrence being placed at risk of extinction.

The species composition of Box Gum Woodland varies across the geographic distribution of the community, in response to changes in climate. Irrespective of the distribution, the ground layer of intact stands is usually characterised by Kangaroo Grass (*Themeda australis*), Snow Grass (*Poa sieberiana*) and/or River Tussock (*Poa labillardieri*). As Box-Gum Grassy Woodland becomes degraded the dominance of *Themeda australis* and *Poa* species declines and other native grasses become dominant. With further degradation, native grasses are replaced by annual and perennial introduced species (Threatened Species Scientific Committee, 2006).

The clearing of, and disturbance to, Box Gum Woodland will result in increased edge effect within the Project area. The Project may result in the establishment or spread of exotic grass species which may result in increased competition for native species. Assuming mitigation measures are adopted, it is not considered likely that the Project would result in a substantial change in the species composition of the Box Gum Woodland outside the Project area; however there will be clearing of vegetation that constitutes this community within the Project area.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Box Gum Woodland occurs within the Project area in a range of conditions, typically as a result of historical land uses within the area. The community has been historically cleared throughout much of its natural range due to its occurrence on fertile slopes that are highly suited to agricultural activities. Consequently, the Project will result in the disturbance to, and clearing of, the community, as well as disturbance to land that may (with assisted regeneration practices) constitute potential habitat for the community.

The Project will require the clearing of an easement to incorporate the alignment, which will result in fragmentation of areas of Box Gum Woodland.

Given the mapped extent of the community within the study area, and given the distribution of the community throughout NSW, it is considered that the impacts of the Project would not be significant to the long term survival of the community within the locality.

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

Not applicable.

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

A draft recovery plan for this community was placed on public exhibition for comment early in 2010; *Draft National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Department of Environment, Climate Change and Water NSW, 2010). This plan has not been finalised or gazetted.

The draft recovery plan outlines several recovery objectives and actions to assist in the recovery of the community. Several of these are relevant to the Project:

- Achieving no net loss in extent and condition of the ecological community throughout its geographic distribution.
- Increasing protection of sites in good condition.
- Increasing landscape functionality of the ecological community through management and restoration of degraded sites.

The Project will result in the clearing of areas of this community. Given the community's naturally widespread (although patchy) distribution, it is considered unlikely that the Project would significantly interfere in the recovery of the Box Gum Woodland community.

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

The following key threatening processes (TSC Act) that may threaten Box Gum Woodland are considered relevant to the Project:

- Clearing of native vegetation; the Project will require the removal of vegetation that constitutes Box Gum Woodland.
- Invasion of native plant communities by exotic perennial grasses; the increase in edge effect as a result of clearing of native vegetation by the Project will increase the potential for invasion by exotic species within the understorey of the community.
- Loss of hollow-bearing trees; the Project will require the removal of hollow-bearing trees to clear the required easement. Box Gum Woodland provides habitat for a number of threatened fauna species that utilise hollow-bearing trees typical of the community.
- Removal of dead wood and dead trees; the Project will require the removal of dead wood and dead trees to clear the required easement. Box Gum Woodland provides habitat for a number of threatened fauna species that utilise dead wood and dead trees typical of the community.

Conclusion

The Project is considered likely to have an **adverse** impact on Box Gum Woodland. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate and offset the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Threatened Species Scientific Committee (2006). Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Viewed online 23/11/2010.

<http://www.environment.gov.au/biodiversity/threatened/communities/pubs/box-gum.pdf>

Department of Environment, Climate Change and Water NSW (2010). Draft National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Department of Environment, Climate Change and Water NSW, Sydney.

DEC (2005). Box-Gum Woodland - profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10837>

2.1.3 Aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River (Darling River EEC)

- 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.*

Not applicable.

This factor refers to vulnerable species listed in Part 1 of Schedule 2 of the TSC Act, endangered species listed in Part 1 of Schedule 1 of the TSC Act, critically endangered species listed in Part 1 of Schedule 1A of the TSC Act, vulnerable species listed in Part 1 of Schedule 5 of the FM Act, endangered species listed in Part 1 of Schedule 4 of the FM Act and critically endangered species listed in Part 1 of Schedule 4A of the FM Act.

- 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.

This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

The aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River (Darling River EEC) includes all lowland areas of the natural waterways of the Darling River within NSW, including Menindee Lakes and the Barwon River. Also included are the main Barwon-Darling channel from Mungindi (Qld-NSW border) to the confluence with the Murray River, the arid zone intermittent intersections streams (Warrego, Culgoa, and Narran Rivers), Border Rivers (Macintyre, Severn and Dumaresq Rivers), and regulated tributaries (Gwydir, Namoi, Macquarie, Castlereagh, and Bogan Rivers) (Department of Industry and Investment, 2005).

The Project will require the upgrade and installation of three potential waterway crossings within the western half of the Project area that constitute the Darling River EEC.

The works associated with the Project will not have an impact on the extent of the community such that its local occurrence is placed at risk of extinction.

The Darling River EEC includes all native fish and aquatic invertebrates within all natural creeks, rivers, streams and associated lagoons, billabongs, lakes, anabranches, flow diversions to anabranches and the floodplains of the Darling River within NSW (Department of Industry and Investment, 2005). The project is considered unlikely to alter this composition, as the majority of waterways that will be subject to crossing installation or upgrades are already subject to some form of crossing. It is unlikely that additional disturbance associated with the

Project will substantially or adversely modify the composition of the community such that its local occurrence is placed at risk of extinction.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The Project would require modification to three potential waterway crossings that could affect the Darling River EEC to ensure necessary access throughout the Project area. Assuming recommended mitigation measures are adopted, the extent of habitat modification or removal is not considered to be significant.

Many of the waterways that will be subject to disturbance as a result of the Project already have some form of crossing in place. Project works will require the upgrade of many of these crossings as well as the installation of some new crossings to allow large plant, machinery and vehicles to access the Project area during the construction process.

Given the existence of existing crossings over many of the waterways, works are considered unlikely to result in further fragmentation or isolation of any areas of habitat within this community.

The Project will require works within and directly adjacent to numerous waterways in the west of the Project area that are part of the Darling River EEC. Disturbance associated with the Project will be limited to localised areas of waterways in the Project area, many of which already have some form of existing crossing. Taking these points into consideration it is considered that the habitat to be modified is of not significant to the survival of the community within the locality.

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

Not applicable.

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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 developed for the Darling River EEC. In lieu of a formal recovery plan, DPI has developed six primary recovery strategies aimed at helping to recover the community. Those relevant to the Project are:

- Remediate barriers to fish passage.
- Protect and reinstate large woody debris.
- Restore riparian vegetation.

Assuming the above measures are adopted through construction works, the Project is consistent with these recovery strategies.

- 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 key threatening process that is most relevant to the Darling River EEC is:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands.

The upgrade and construction of three potential waterway crossings within the Project area has the potential to alter the natural flow of rivers and streams throughout the locality, if works are not conducted in an appropriate manner. Assuming mitigation measures are implemented however, it is considered that the Project does not constitute a KTP, nor is it likely to increase the impact of any KTP.

Conclusion

The Project is considered likely to have an **adverse** impact on the Darling River EEC. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Department of Industry and Investment, (2005). Darling River EEC. Profiles for species, populations & ecological communities. Primary Industries Fishing and Aquaculture. Viewed online 17/11/2010.
http://pas.dpi.nsw.gov.au/Species/Species_Profile.aspx?SpeciesListingID=21

2.1.4 Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion (Sub-tropical Coastal Floodplain Forest)

- 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.*

Not applicable.

This factor refers to vulnerable species listed in Part 1 of Schedule 2 of the TSC Act, endangered species listed in Part 1 of Schedule 1 of the TSC Act, critically endangered species listed in Part 1 of Schedule 1A of the TSC Act, vulnerable species listed in Part 1 of Schedule 5 of the FM Act, endangered species listed in Part 1 of Schedule 4 of the FM Act and critically endangered species listed in Part 1 of Schedule 4A of the FM Act.

- 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.

This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Sub-tropical Coastal Floodplain Forest (Endangered Ecological Community, TSC Act) is found within a number of LGAs within NSW, and is found within the Hunter/Central Rivers and Northern Rivers CMAs (DEC, 2005). The Project will require the clearing of between 1.39 Ha and 10.37 Ha (maximum) (refer to Submission response, **Attachment 3**) that constitutes this community. Given the distribution of Sub-tropical Coastal Floodplain Forest within NSW, and the amount of this community that will be cleared as a result of the Project, it is considered unlikely that the Project would result in the local occurrence being placed at risk of extinction.

The composition and structure of the understorey is influenced by grazing and fire history, changes to hydrology and soil salinity and other disturbance (DEC, 2005). The Project will require the clearing of and disturbance to, Sub-tropical Coastal Floodplain Forest and will result in increased edge effect within the Project area. The Project may result in the establishment or spread of exotic species which may result in increased competition for native species. It is not considered likely that the Project would result in a substantial change in the species composition of the Swamp Sclerophyll Forest outside the Project area. However there will be clearing of vegetation that constitutes this community within the Project area.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Sub-tropical Coastal Floodplain Forest relies upon specific abiotic conditions within an area, including suitable hydrology and soil properties. It is considered unlikely that the Project would modify these conditions to the extent that the community would be threatened in the locality.

Sub-tropical Coastal Floodplain Forest occurs within the Project area in a fragmented state, due to historical agricultural and land clearing activities. Although the Project will require the clearing of vegetation that constitutes this community, it is considered that this additional clearing will not result in significantly increased fragmentation, due to the existing 132kV easement within the alignment east.

Given the distribution of the community throughout NSW, and the presence of the existing 132kV easement in the alignment east, it is considered that the impacts of the Project are of low importance to the long term survival of the community within the locality.

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

Not applicable.

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no recovery plan has been developed for Sub-tropical Coastal Floodplain Forest.

In lieu of a formal recovery plan, DEC (2005) has developed a series of priority actions to assist in the recovery of the community within NSW. The following are relevant to the Project:

- Instigate feral animal control programs.

- Ensure that the fire sensitivity of the community is considered when planning hazard reduction and asset management burning.
- Protect habitat by minimising further clearing of the community. This requires recognition of the values of all remnants in the land use planning process, particularly development consents, rezoning and regional planning.
- Promote regeneration by avoiding prolonged or heavy grazing.
- Weed control.
- Undertake restoration including bush regeneration and revegetation.

The Project will result in the clearing of areas of this community. Given the community's naturally widespread distribution, it is considered unlikely that the Project would significantly interfere in the recovery of Sub-tropical Coastal Floodplain Forest.

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

The following key threatening process (TSC Act) that may threaten Sub-tropical Coastal Floodplain Forest is considered relevant to the Project:

- Clearing of native vegetation; the Project will require the removal of vegetation that constitutes Sub-tropical Coastal Floodplain Forest.

Conclusion

The Project is considered likely to have an **adverse** impact on Sub-tropical Coastal Floodplain Forest. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). Sub-tropical Coastal Floodplain Forest – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10944>

Assessments of Significance

3.1 Fauna

3.1.1 Birds of Prey: Spotted Harrier (*Circus assimilis*); Red Goshawk (*Erythrotriorchis radiatus*); Little Eagle (*Hieraaetus morphnoides*); and Square-tailed Kite (*Lophoictinia isura*).

- 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.*

Circus assimilis (Vulnerable, TSC Act) is known within in all of the relevant sub-regions of the Northern Rivers CMA and the Tenterfield Plateau sub-region of the Border Rivers/ Gwydir CMA, and is also predicted to occur within the Nandewar Northern Complex of the latter CMA area. There are previous records of this species in proximity to the alignment near Casino (alignment east). No individuals of this species were observed during field surveys of the study area. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Erythrotriorchis radiatus (Critically Endangered, TSC Act) is known to occur within the Clarence Lowlands, Clarence Sandstones, Richmond - Tweed, Stanthorpe Plateau and Woodenbong sub-regions of the Northern Rivers CMA. There are recent records of this species near around Kyogle and Casino (alignment east). No individuals of this species were observed during field surveys of the study area. Given the presence of suitable habitat for this species within the Project area the Project has the potential to have an adverse effect on the lifecycle of the species such that a viable population is placed at risk of extinction.

Hieraaetus morphnoides (Vulnerable, TSC Act) is known within the Nandewar, Northern Complex and Tenterfield Plateau sub-regions of the Border Rivers/Gwydir CMA, and known within the Cataract, Clarence Lowlands, Clarence Sandstones, Richmond - Tweed, Rocky River Gorge, Stanthorpe Plateau and Woodenbong sub-regions of the Northern Rivers CMA. There are recent records of this species in proximity to the proposed alignment (study area west and east) to the west of Woodside, near Tenterfield, south of Mallanganee and Casino, and around Lismore. No individuals of this species were observed during field surveys of the study area. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Lophoictinia isura (Vulnerable, TSC Act) is known within relevant subregions of the Border Rivers/Gwydir CMA, and predicted and known within a number of sub-regions of the Northern Rivers CMA through which the study area passes. There are recent records of this species within Girard State Forest (between Sandy Hill and Drake), and south of Piora near Casino. No individuals of this species were observed during URS field surveys of the study area. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act.

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed;*
- (ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and*
- (iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Circus assimilis occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Circus assimilis* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east and the presence of suitable habitat outside of the Project area.

Erythrorhynchus radiatus occupies open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, *Melaleuca* swamp forest and riparian *Eucalyptus* forest of coastal rivers. These habitats are typical of some of the bushland found within the study area.

Hieraaetus morphnoides occurs within open eucalypt forest, woodland or open woodland. Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW are also used. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Hieraaetus morphnoides* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area. *Lophoictinia isura* occurs within a variety of timbered habitats including dry woodlands and open forests. This species shows a particular preference for timbered watercourses. In arid north-western NSW, *Lophoictinia isura* has been observed in stony country with a ground cover of chenopods and grasses, open *Acacia* scrub and patches of low open eucalypt woodland. Some of these habitats are typical of some of the bushland

types found within the study area. The clearing of vegetation, some of which is consistent with *Lophoictinia isura* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no recovery or threat abatement plans have been developed for *Circus assimilis* or *Hieraaetus morphnoides*. A Recovery Plan has been prepared for *Erythroriorchis radiatus* and *Lophoictinia isura*.

In lieu of a formalised recovery plan for *Circus assimilis*, OEH has developed a number of priority actions and strategies to assist species recovery. The two key recovery strategies relevant to the proposed development include:

- protect areas of habitat from development; and
- retain and protect nesting and foraging habitat.

In lieu of a formalised recovery plan for *Hieraaetus morphnoides*, OEH has developed a number of priority actions and strategies to assist species recovery. The two key recovery strategies relevant to the proposed development include:

- protect known populations and areas of potential habitat from clearing, fragmentation or disturbance; and
- retain and protect nesting and foraging habitat.

DECCW (2010a) includes recovery actions relevant to *Lophoictinia isura* which are relevant to the Project:

- protect species and their habitats from the effects of clearing and fragmentation;
- to protect vegetation communities, ecosystems and habitats from inappropriate fire regimes;
- minimise human-induced disturbance and mortality of species;
- protect non-target species from pest control;
- to engage the community and private landholders in biodiversity conservation; and
- to establish effective monitoring of biodiversity related projects.

OEH has also developed a number of priority actions and strategies to assist species recovery. The two key recovery strategies relevant to the proposed development include:

- minimise activities such as clearing, logging, burning, and grazing of habitats resulting in a reduction in nesting and feeding resources; and
- disturbance to or removal of potential nest trees near watercourses.

A Recovery Plan has been prepared for *Erythroriorchis radiatus* (NSW NPWS, 2002). It outlines a range of long term and immediate objectives for this species. These include the maintenance of habitat value at key sites and throughout the former range by active participation in land-use planning processes and by active vegetation rehabilitation at strategic sites. Population monitoring objectives have also been set to allow assessment of the efficacy of management actions. Recovery actions outlined for *Erythroriorchis radiatus* of relevance to this Project include:

- reduce use of pesticides;
- protect known or potential nesting sites with substantial buffer zones;
- identify and protect known and potential floodplain and riparian habitat from draining or clearing; and
- protect known habitat from logging.

Additional recovery actions relevant to the species and Project are outlined in DECCW (2010a and b):

- to reduce organisational-related impediments to biodiversity conservation;
- protect species and their habitats from the effects of clearing and fragmentation;
- to protect vegetation communities, ecosystems and habitats from inappropriate fire regimes;
- minimise human-induced disturbance and mortality of species;
- protect non-target species from pest control;
- to engage the community and private landholders in biodiversity conservation; and
- to establish effective monitoring of biodiversity related projects

For all birds of prey species assessed, the Project is not inconsistent with any of the above recovery strategies outlined to assist in the recovery of these species. The priority actions and recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

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

The following key threatening process (TSC Act) has been identified as being relevant to the birds of prey species included within this assessment:

- clearing of native vegetation; the clearing of native vegetation could reduce potential breeding, foraging and shelter habitat for all of these birds of prey species. Disturbance and removal of potential nest trees near watercourses is a particular threat for birds of prey. Clearing and fragmentation of riparian forests and woodlands potentially leaves nests vulnerable. In the case of *Erythrotriorchis radiatus*, which usually nests in the tallest trees, nests can be exposed to storm damage and other disturbances when surrounding vegetation is removed.
- alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; the loss or degradation of sources of permanent water through draining of wetlands has been identified as a threat for *Erythrotriorchis radiatus*.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Circus assimilis*; *Hieraaetus morphnoides* or *Lophoictinia isura*. The Project has the **potential** to have an adverse impact on *Erythrotriorchis radiatus*. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DECCW, (2010). Threatened Species Profile. Square-tailed Kite – profile. Viewed online 19/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10495>

Department of Environment, Climate Change and Water NSW 2010a, Northern Rivers Region Biodiversity Management Plan, National Recovery Plan for the Northern Rivers Region - NSW Department of Environment, Climate Change and Water NSW, Sydney. Viewed online

9/2/2012.

<http://www.environment.gov.au/biodiversity/threatened/publications/recovery/pubs/northern-rivers.pdf>

Department of Environment, Climate Change and Water NSW 2010b, Border Ranges Rainforest Biodiversity Management Plan - NSW & Queensland, Department of Environment, Climate Change and Water NSW, Sydney. Viewed online 9/2/2012.
<http://www.environment.gov.au/biodiversity/threatened/publications/recovery/border-ranges/pubs/brrb-management-plan.pdf>

NSW Scientific Committee, (2010) Final determination. Spotted Harrier *Circus assimilis* Jardine and Selby 1828 – vulnerable species listing. Viewed online 19/11/2010.

<http://www.environment.nsw.gov.au/determinations/spottedharrierFD.htm>

NSW National Parks & Wildlife Service (2002). *Approved Recovery Plan for the Red Goshawk* (*Erythrotriorchis radiatus*). NSW National Parks & Wildlife Service, Hurstville. Viewed online 19/11/2010.

<http://www.environment.nsw.gov.au/resources/nature/recoveryplanFinalRedGoshawk.pdf>

NSW Scientific Committee, (2010) Final determination. Little Eagle *Hieraaetus morphnoides* (Gould 1841) – vulnerable species listing. Viewed online 19/11/2010.

<http://www.environment.nsw.gov.au/determinations/littleeagleFD.htm>

3.1.2 Woodland Birds: Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*); Varied Sittella (*Daphoenositta chrysoptera*); Squatter Pigeon (*Geophaps scripta scripta*); Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*); Speckled Warbler (*Pyrrholaemus sagittatus*); and Diamond Firetail (*Stagonopleura guttata*).

- 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.*

Climacteris picumnus victoriae (Vulnerable, TSC Act) is known to occur within the Nandewar, Northern Complex and Tenterfield Plateau sub-regions of the Border Rivers/Gwydir CMA, as well as the Cataract, Clarence Lowlands, Clarence Sandstones, Richmond-Tweed, Rocky River Gorge, Stanthorpe Plateau and Woodenbong sub-regions of the Northern Rivers CMA. This species was observed during URS surveys of the study area and there are recent records of this species in the vicinity of the alignment near Tabulam. Given the presence of suitable habitat within the Project area, it is considered likely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Daphoenositta chrysoptera (Vulnerable, TSC Act) is endemic and widespread in mainland Australia. There are recent records of this species across study areas west and east. Records include a sighting in close proximity to Dumaresq substation and around Bald Rock National Park near Tenterfield. There are recent records of this species within state forests and national parks in close proximity to the alignment in study area east (within 5km). The species was recorded outside a reserve area in close proximity to the alignment near Mummulgum, however no individuals of this species were observed during field surveys of the study area. Given the presence of suitable habitat inside the Project area, it is considered likely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Geophaps scripta scripta (Endangered, TSC Act; Vulnerable, EPBC Act) is known to occur within the Nandewar, Northern Complex sub-region of the Border Rivers/Gwydir CMA. There is one record of this species from approximately 10km to the south of the Dumaresq substation. No individuals of this species were observed during field surveys of the study area. Suitable habitat for this species exists within the study area. As such, there is potential for the Project to have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction, should the Project disturb breeding or nesting habitat of the species.

Pomatostomus temporalis temporalis (Vulnerable, TSC Act) is known to occur within the Nandewar, Northern Complex sub-region of the Border Rivers/Gwydir CMA, and known within the Cataract, Clarence Lowlands, Clarence Sandstones, Richmond - Tweed, Stanthorpe Plateau and Woodenbong sub-regions of the Northern Rivers CMA. This species was observed during URS field surveys. Previous records of this species also exist for the area around Woodside (study area west), and south of Casino (study area east). Given the presence of suitable habitat inside the Project area it is considered likely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Pyrholaemus saggitatus (Vulnerable, TSC Act) is known and predicted to occur in the Nandewar, Northern Complex, and Tenterfield Plateau sub-regions of the Border Rivers/Gwydir CMA respectively. It is also known to occur within the following sub-regions of the Northern Rivers CMA: Cataract, Clarence Lowlands, Clarence Sandstones, Rocky River Gorge, Stanthorpe Plateau and Woodenbong. There are previous records of this species in the general vicinity of the alignment from near Dumaresq substation to Drake. This bird was not observed during URS field surveys. Given the presence of suitable habitat inside the Project area, it is considered that the Project could have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction, should the Project disturb breeding or nesting habitat of the species.

Stagonopleura guttata (Vulnerable, TSC Act) is known within the Nandewar, Northern Complex and Tenterfield Plateau sub-regions of the Border Rivers/Gwydir CMA and throughout relevant sub-regions of the Northern Rivers CMA; Cataract, Clarence Lowlands, Clarence Sandstones, Rocky River Gorge, Stanthorpe Plateau and Woodenbong sub-regions. This species has been recorded across study area west, including numerous records in proximity to the Mole River. This species was observed during URS field surveys. Given the presence of suitable habitat inside the Project area, it is considered likely that the Project could have an adverse effect on the life cycle of the species such that a viable population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Climacteris picumnus victoriae is found in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Climacteris picumnus victoriae* habitat, is considered likely to further fragment and isolate the species.

Daphoenositta chrysoptera is found in eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Daphoenositta chrysoptera* habitat, is considered likely to further fragment or isolate the species.

Geophaps scripta scripta is found across grassy woodlands and plains, preferring sandy areas that are usually close to water. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Geophaps scripta* habitat, is considered likely to further fragment or isolate the species.

Pomatostomus temporalis temporalis inhabits open Box-Gum woodlands on slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. The clearing of vegetation, some of which is consistent with *Pomatostomus temporalis temporalis* habitat, is considered likely to further fragment or isolate the species.

Pyrholaemus saggitatus is found across a wide range of *Eucalyptus* dominated communities that have a grassy understorey, often on rocky ridges or in gullies. The clearing of vegetation, some of which is consistent with *Pyrholaemus saggitatus* habitat, is considered likely to further fragment or isolate the species.

Stagonopleura guttata is found in grassy eucalypt woodlands, including Box-Gum woodlands and Snow Gum *Eucalyptus pauciflora* woodlands. They also occur in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Stagonopleura guttata* habitat, is considered likely to further fragment or isolate the species.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no recovery or threat abatement plans have been developed for the woodland bird species considered within this Biodiversity Assessment. As such, the proposed works are not inconsistent with any objectives or actions of a recovery plan or threat abatement plan.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist *Climacteris picumnus victoriae* species recovery. The recovery strategies relevant to the Project include:

- Do not allow further loss of dead standing or fallen timber from firewood collection or on-farm practices such as 'tidying up'; do not allow removal of hollow-bearing dead or living trees and stumps on private and public lands.

In lieu of a formalised recovery plan, the OEH has developed a number of priority actions and strategies to assist *Daphoenositta chrysoptera* in species recovery. The five key recovery strategies relevant to the Project include:

- Retain existing vegetation and remnant stands along roadsides and in paddocks;
- Increase the size of existing remnants by planting trees and establishing buffer zones;
- Where remnants have lost connective links, re-establish links by revegetating corridors or stepping stones;
- Limit firewood collection and retain dead timber in open forest and woodland areas; and
- Control weeds in areas of known habitat.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist *Geophaps scripta scripta* in species recovery. The five key recovery strategies relevant to the Project include:

- Assist with the control of feral rabbits, cats and foxes;
- Manage fire in areas of potential habitat to maintain native grass cover;
- Protect grassy woodland areas from clearing, fragmentation or development;
- Expand and reconnect smaller fragments of habitat; and
- Report any sightings of the Squatter Pigeon in NSW to the DEC.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist *Pomatostomus temporalis temporalis* in species recovery. The two key recovery strategies relevant to the Project include:

- Retain existing woodland vegetation; and
- Retain dead timber on the ground in open woodland areas.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist *Pyrrholaemus saggitatus* in species recovery. The six key recovery strategies relevant to the Project include:

- NPWS should be consulted when planning development to minimise impact on populations;
- Retain dead timber on the ground in open woodland areas;
- Retain existing vegetation along roadsides, in paddocks and remnant stands of native trees;
- Increase the size of existing remnants, planting trees and establishing buffer zones of unimproved uncultivated pasture around woodland remnants;
- Assess the importance of the site to the species' survival. Include the linkages the site provides for the species between ecological resources across the broader landscape; and
- Report any new sightings of the speckled warbler in NSW to OEH.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist *Stagonopleura guttata* in species recovery. The four key recovery strategies relevant to the Project include:

- Retain dead timber on the ground in open woodland areas;
- Control weeds in areas of known habitat, especially the exotic, winter-fruiting shrubs such as cotoneasters, hawthorns, firethorns and privets that support Pied Currawongs;
- Retain and protect woodland, open forest, grassland and mallee habitat from clearing, fragmentation and disturbance; and
- Ensure remnant populations remain connected or linked to each other; in cases where remnants have lost connective links, re-establish links by revegetating sites to act as stepping stones for dispersal.

For all woodland birds assessed, the proposed works are sometimes inconsistent with some of the above recovery strategies outlined to assist in the recovery of these species. The recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

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

The following key threatening processes (TSC Act) have been identified as being relevant to the woodland bird species included within this assessment:

- Clearing of native vegetation; the clearing of native vegetation could reduce potential breeding, foraging and nesting sites habitat for all of these woodland bird species. A common threat across these woodland bird species is fragmentation of woodland habitat and connectivity caused by vegetation clearing. Some species are also threatened by habitat simplification including reductions in tree species diversity, tree canopy cover, shrub cover, ground cover, logs, fallen branches and litter.
- Removal of dead wood and dead trees; some woodland bird species forage within the understory and rely ground habitat features such as fallen timber and leaf litter. The removal of such habitat during the Project could reduce potential habitat area within the study area.
- Invasion of native plant communities by exotic perennial grasses; a number of the woodland bird species are threatened by modification and destruction of ground- and shrub layers within habitat caused by removal of native plants, litter and fallen timber; introduction of exotic pasture grasses.
- Predation by feral cats; cats and other predators are known to use tracks, roads and easements as hunting grounds. The construction of the easement across alignment west as well as the augmentation of the existing 132kV easement across alignment east may increase potential hunting grounds for local cat populations and put greater predation pressure on woodland bird populations.
- Predation by the European red fox; foxes and other predators are known to use tracks, roads and easements as hunting grounds. The construction of the easement across alignment west as well as the augmentation of the existing 132kV easement across alignment east may increase potential hunting grounds for local fox populations and put greater predation pressure on local woodland bird populations.

Conclusion

The Project is likely to have an **adverse** impact on *Climacteris picumnus victoriae*; *Daphoenositta chrysoptera*; *Geophaps scripta scripta*; *Pomatostomus temporalis temporalis*; *Pyrrholaemus saggitatus*; and *Stagonopleura guttata*. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

- NSW Scientific Committee (2001). Final determination. Brown Treecreeper (eastern subspecies) - Vulnerable species listing. Viewed online 19/11/2010.
<http://www.environment.nsw.gov.au/determinations/BrownTreecreeperVulSpListing.htm>
- NSW Scientific Committee (2010) Final determination. Varied Sittella - vulnerable species listing. Viewed online 19/11/2010.
<http://www.environment.nsw.gov.au/determinations/variedsittellaFD.htm>
- DECCW (2010). Threatened Species Profile. Squatter Pigeon. Viewed online 19/11/2010.
<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10350>
- NSW Scientific Committee (2001) Final determination Grey-crowned babbler (eastern subspecies) – Vulnerable species listing. Viewed online 19/11/2010.
<http://www.environment.nsw.gov.au/determinations/GreycrownedBabblerVulSpListing.htm>
- NSW Scientific Committee (2001) Final determination. Speckled warbler - Vulnerable species listing. Viewed online 19/11/2010.
<http://www.environment.nsw.gov.au/determinations/SpeckledWarblerVulSpListing.htm>
- NSW Scientific Committee (2001) Final determination. Diamond firetail - Vulnerable species listing. Viewed online 19/11/2010.
<http://www.environment.nsw.gov.au/determinations/DiamondFiretailVulSpListing.htm>

3.1.3 Bitterns: Australasian Bittern (*Botaurus poiciloptilus*); and Black Bittern (*Ixobrychus flavicollis*).

- 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.*

Botaurus poiciloptilus (Endangered, TSC Act; Endangered, EPBC Act) is known to occur within the Clarence Lowlands and Richmond - Tweed sub-regions of the Northern Rivers CMA. No individuals of this species were observed during URS field surveys. There is a historical record of this species approximately 10km to the north of the alignment near Piora, and a more recent record in proximity to the Lismore Substation in Tatham. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Ixobrychus flavicollis (Vulnerable, TSC Act) is known to occur within the Clarence Lowlands, Clarence Sandstones, Richmond - Tweed and Woodenbong sub-regions of the Northern Rivers CMA. No individuals of this species were observed during field surveys of the area. There are recent records of this species in proximity to Casino and around Lismore (alignment east). The record from Casino shows close proximity to the Casino Substation. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

- c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*
- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
 - (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

- d) *In relation to the habitat of a threatened species, population or ecological community:*
- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
 - (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
 - (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Botaurus poiciloptilus favours permanent freshwater wetlands with tall, dense vegetation particularly bull rushes and spike rushes. The species breeds and foraging in emergent vegetation in freshwater or brackish waters. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Botaurus poiciloptilus* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

Ixobrychus flavicollis inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Ixobrychus flavicollis* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no recovery or threat abatement plans have been developed for the bitterns considered within this Biodiversity Assessment. As such, the proposed works are not inconsistent with any objectives or actions of a recovery plan or threat abatement plan.

In lieu of a formalised recovery plan for *Botaurus poiciloptilus*, DECCW (2010) has developed a number of priority actions and strategies to assist species recovery. The three key recovery strategies relevant to the proposed development include:

- Undertake fox and feral cat control in and nearby wetlands;
- Protect wetlands and water-courses from pollution; and
- Protect wetlands, ponds and associated marshy areas from clearing or disturbance.

In lieu of a formalised recovery plan for *Ixobrychus flavicollis* DECCW (2005) has developed a number of priority actions and strategies to assist species recovery. The two key recovery strategies relevant to the proposed development include:

- Control of feral animals, in particular foxes and cats; and
- Protect and manage habitat, including fencing of riparian vegetation to prevent trampling and grazing by cattle.

For the bitterns assessed, the proposed works are not inconsistent with any of the above recovery strategies outlined to assist in the recovery of these species. The recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

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

The following key threatening processes (TSC Act) have been identified as being relevant to the species included within this assessment:

- Clearing of native vegetation; the clearing of riparian vegetation would reduce potential breeding, foraging and shelter habitat for bittern species.
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; identified as a key threatening process for *Botaurus poiciloptilus*. This species is threatened by changes to natural river flows as well as to the clearing, filling and draining of wetlands and watercourses for various anthropogenic activities.
- Predation by feral cats; cats and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132kV easement across alignment east may increase potential hunting grounds for local cat populations and put greater predation pressure on bittern populations.
- Predation by the European red fox; foxes and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132kV easement across alignment east may increase potential hunting grounds for local fox populations and put greater predation pressure on local bittern populations.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Botaurus poiciloptilus* and *Ixobrychus flavicollis*. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DECCW, (2010). Threatened Species Profile. Australasian Bittern - profile. Viewed online 19/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10105>

DECCW, (2005). Threatened Species Profile. Black Bittern – profile. Viewed online 19/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10441>

3.1.4 Cockatoos: Red-tailed Black-Cockatoo (coastal subspecies) (*Calyptorhynchus banksii banksii*); and Glossy Black-Cockatoo (*Calyptorhynchus lathami*).

- 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*

Calyptorhynchus banksii banksii (Critically Endangered, TSC Act) is known in the Clarence Lowlands and Richmond - Tweed sub-regions of the Northern Rivers CMA (however only four apparently valid records between 1980 and July 2009 exist for this species, all in the far north-east of the state); in the Tweed and Richmond Valleys: at Bungawalbin Nature Reserve, Round Mountain (Bogangar), Wilsons Creek (north of Alstonville), and at Cabarita. No Atlas sightings are recorded for this species. *Calyptorhynchus banksii banksii* was not observed during URS surveys of the study area. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Calyptorhynchus lathami (Vulnerable, TSC Act) is endemic and widespread in mainland Australia. It is known to occur across all relevant sub-regions of the Northern Rivers and Border Rivers/Gwydir CMAs. There are numerous recent records of this species across study areas west and east. No individuals of this species were observed during URS survey. Given the presence of suitable habitat inside the Project area, it is considered likely that the Project would have an adverse effect on the life cycle of the species such that a viable population is 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.; This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Calyptorhynchus banksii banksii is found from dry open forest and mixed rainforest-eucalypt forest. These habitats are typical of some of the bushland found within the study area. The

clearing of vegetation, some of which is consistent with *Calyptorhynchus banksii banksii* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

Calyptorhynchus lathami inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak, Forest She-oak or Drooping She-oak occur. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Calyptorhynchus lathami* habitat, is considered likely to further fragment or isolate the species.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no recovery or threat abatement plans have been developed for the cockatoo species considered within this Biodiversity Assessment. As such, the proposed works are not inconsistent with any objectives or actions of a recovery plan or threat abatement plan.

In lieu of a formalised recovery plan, the NSW Scientific Committee (2009) has developed a number of priority actions and strategies to assist *Calyptorhynchus banksii banksii* species recovery. The three recovery strategies relevant to the Project include:

- Retain remaining suitable habitat, especially protecting and enhancing areas with hollow-bearing trees and with potential recruitment of future hollow-bearing trees;
- Protect identified nesting sites; and
- Increase connectivity and size of remnant patches of suitable habitat.

In lieu of a formalised recovery plan, DECCW (2005) has developed a number of priority actions and strategies to assist *Calyptorhynchus lathami* in species recovery. The five key recovery strategies relevant to the Project include:

- Protect existing and future hollow-bearing trees for nest sites;
- Retain and protect areas of native forest and woodland containing she-oaks; and
- Establish forested corridors linking remnant areas of habitat; include local she-oak species in bush revegetation works.

For both cockatoo species assessed, the proposed works are not inconsistent with any of the above recovery strategies outlined to assist in the recovery of these species. The recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

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

The following key threatening processes (TSC Act) have been identified as being relevant to the woodland bird species included within this assessment:

- Clearing of native vegetation; the clearing of native vegetation could degrade available habitat by reducing potential breeding, foraging and nesting sites for both cockatoo species.

- Removal of dead wood and dead trees; the loss of large trees and even dead trees or stags containing suitable hollows for breeding has been identified as a threat.

Conclusion

The Project has the **potential** to have an adverse impact on *Calyptorhynchus lathami* due to habitat loss. The Project is **not** considered likely to have an adverse impact on *Calyptorhynchus banksii banksii*. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

NSW Scientific Committee (2009) Final determination. Red-tailed Black-Cockatoo (coastal subspecies) *Calyptorhynchus banksii banksii* - critically endangered species listing <http://www.environment.nsw.gov.au/determinations/redtailedblackcocatoocostfd.htm>

DECCW, (2005). Threatened Species Profile. Glossy Black-cockatoo – profile. Viewed online 19/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10140>

3.1.5 Spotted-tailed Quoll (*Dasyurus maculatus maculatus*); Brush-tailed Phascogale (*Phascogale tapoatafa*) and Common Planigale (*Planigale maculata*).

- 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.*

Dasyurus maculatus maculatus (Vulnerable, TSC Act; Endangered, EPBC Act) is found on the east coast of NSW, Tasmania, eastern Victoria and north-east Queensland. The female of the species occupy home ranges up to about 750 hectares and the males up to 3,500 hectares. The species utilise den sites in habitat features such as hollow bearing trees, fallen timber and small caves (DEC, 2005). The Project has the potential to impact on potential habitat of the species, with the removal of vegetation and habitat features. However, considering the highly mobile nature of the species, and the large home range used, it is considered unlikely that the Project would have an adverse effect on the life cycle of *Dasyurus maculatus maculatus* such that a viable local population is placed at risk of extinction.

Phascogale tapoatafa (Vulnerable, TSC Act) has a patchy distribution around the coast of Australia. In NSW it is mainly found east of the Great Dividing Range although there are occasional records west of the divide. Females have exclusive territories of approximately 20 – 60 ha, while males have overlapping territories of up to 100 ha. The species use hollow bearing trees as nest and shelter sites. The Project has the potential to impact on potential habitat of the species, with the removal of vegetation and habitat features. However, considering the species utilises numerous trees within short periods of time, it is considered unlikely that the Project would have an adverse effect on the life cycle of *Phascogale tapoatafa* such that a viable local population is placed at risk of extinction.

Planigale maculata (Vulnerable, TSC Act) occur in coastal north-east NSW, coastal east Queensland and Arnhem Land. The species builds nests in crevices, hollow logs, beneath bark or under rocks. The Project has the potential to impact on potential habitat for this species through the removal of habitat features and vegetation clearing. The Project is unlikely to affect the life cycle of *Planigale maculata* such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i.) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii.) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Dasyurus maculatus maculatus is found across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. The Project may require the removal of potential habitat for this species, and will result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared as part of the Project is considered potentially important to the long term survival of the species within the locality.

Phascogale tapoatafa prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. The species also inhabit heath, swamps, rainforest and wet sclerophyll forest. The Project may require the removal of potential habitat for this species, and will result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared as part of the Project is considered potentially important to the long term survival of the species within the locality.

Planigale maculata inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, usually close to water. The Project may require the removal of potential habitat for this species, and will result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared as part of the Project is not considered important to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the

Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Dasyurus maculatus maculatus*. In lieu of a recovery plan, DEC (2005) has developed a series of recovery strategies for the species, relevant to the Project:

- Undertake cat and fox control using poison-baiting techniques least likely to affect quolls; and
- Retain and protect large, forested areas with hollow logs and rocky outcrops, particularly areas with thick understorey or dense vegetation along drainage lines.

To date, no formal recovery plan has been developed for *Phascogale tapoatafa*. In lieu of a recovery plan, DEC (2005) has developed a series of recovery strategies for the species, relevant to the Project:

- Undertake fox and feral cat control;
- Provide nest boxes in areas where tree-hollows have been removed;
- Retain and protect habitat, particularly mature or old growth forest containing hollow-bearing trees; and
- Retain nest trees and recruitment trees (future hollow-bearing trees).

To date, no formal recovery plan has been developed for *Planigale maculata*. In lieu of a recovery plan, DEC (2005) has developed a series of recovery strategies for the species, relevant to the Project:

- Reduce the impact of burning to retain diverse understorey species and cover, such as hollow logs and bark; and
- Protect areas of habitat from clearing and development.

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 Project may result in an increase to the following key threatening processes, which are considered relevant to all species included within this assessment:

- Bushrock removal; bushrock is a key habitat resource for these species, providing important den and shelter habitats. The Project will result in the removal of and disturbance to some bushrock from within the Project area.
- Clearing of native vegetation; the Project will require clearing of native vegetation, some of which constitutes habitat for the species included within this assessment.
- Loss of hollow-bearing trees; hollow bearing trees are a key habitat resource for these species, providing important den and shelter habitats. The Project will result in the removal of and disturbance to some hollow bearing trees from within the Project area.
- Removal of dead wood and dead trees; dead wood, trees and coarse woody debris is potential habitat for the species within this assessment. The Project will result in the reduction of dead wood and trees from within the easement, which will in turn reduce potential habitat for these species.

Conclusion

The Project has the **potential** to have an adverse impact on *Dasyurus maculatus maculatus* and *Phascogale tapoatafa* due to habitat loss. The Project is **not** considered likely to have an adverse impact on *Planigale maculata*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report outlines mitigation measures to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). Spotted-tailed Quoll – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10207>

DEC (2005). Brush-tailed Phascogale – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10613>

DEC (2005). Common Planigale – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10635>

3.1.6 Micro Bats: Large-eared Pied Bat (*Chalinolobus dwyeri*); Hoary Wattled Bat (*Chalinolobus nigrogriseus*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Golden-tipped Bat (*Kerivoula papuensis*), Large-footed Myotis (*Myotis macropus*), Eastern Long-eared Bat (*Nyctophilus bifax*), South-eastern Long-eared Bat (*Nyctophilus corbeni*), Greater Broad-nosed Bat (*Scoteanax rueppellii*), Eastern Cave Bat (*Vespadelus troughtoni*)

- 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*

Chalinolobus dwyeri (Vulnerable, TSC Act; Vulnerable, EPBC Act) is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes (DEC, 2005). This species was not recorded during field surveys conducted throughout the study area. Given the occurrence of suitable habitat within the Project area, the Project will potentially 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.

Chalinolobus nigrogriseus (Vulnerable, TSC Act) is widely distributed across northern Australia although absent from the arid centre. In north east NSW it reaches the lower Clarence and Richmond River areas, extending from near Murwillumbah in the north, south to between Grafton and Coffs Harbour (DEC, 2005). This species was not recorded during field surveys conducted throughout the study area. Given the occurrence of suitable habitat within the Project area, the Project will potentially 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.

Falsistrellus tasmaniensis (Vulnerable, TSC Act) is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania (DEC, 2005). This species was not recorded during field surveys conducted throughout the study area. Given the occurrence of suitable habitat within the Project area, the Project will potentially 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.

Kerivoula papuensis (Vulnerable, TSC Act) is distributed along the east coast of Australia in scattered locations from Cape York Peninsula in Queensland to Bega in southern NSW (DEC, 2005). This species was not recorded during field surveys conducted throughout the study area. Given the occurrence of suitable habitat within the Project area, the Project will

potentially 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.

Myotis macropus (Vulnerable, TSC Act) is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers (DEC, 2005). This species was not recorded during field surveys conducted throughout the study area. Given the occurrence of suitable habitat within the Project area, the Project will potentially 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.

Nyctophilus bifax (Vulnerable, TSC Act) is found from Cape York through eastern Queensland to the far north-east corner of NSW. In NSW they appear to be confined to the coastal plain and nearby coastal ranges, extending south to the Clarence River area, with a few records further south around Coffs Harbour. The species can be locally common within its restricted range (DEC, 2005). This species was not recorded during field surveys conducted throughout the study area. Given the occurrence of suitable habitat within the Project area, the Project will potentially 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.

*Nyctophilus corbeni*¹ (Vulnerable, TSC Act; Vulnerable, EPBC Act) has a distribution that coincides approximately with the Murray Darling Basin, with the Pilliga Scrub region being the distinct stronghold for this species (DEC, 2005). This species was not recorded during field surveys conducted throughout the study area. Given the occurrence of suitable habitat within the Project area, the Project will potentially 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.

Scoteanax rueppellii (Vulnerable, TSC Act) is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands. However, it does not occur at altitudes above 500 m (DEC, 2005). This species was not recorded during field surveys conducted throughout the study area. Given the occurrence of suitable habitat within the Project area, the Project will potentially 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.

Vespadelus trougtoni (Vulnerable, TSC Act) is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT (DEC, 2005). This species was recorded during field surveys conducted throughout the study area. Given the occurrence of suitable habitat within the Project area, the Project will potentially 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.

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

¹ Originally the South-eastern Long-eared Bat was considered a subspecies of the Greater Long-eared Bat, *Nyctophilus timoriensis*. Recent studies have described the bat as a separate species, *Nyctophilus corbeni* (Parnaby 2009).

Not applicable. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) 1. *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) 2. *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. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Chalinolobus dwyeri roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Hirundo ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features (DEC, 2005). The Project may require the removal of potential habitat for this species, and will result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared as part of the Project is considered important to the long term survival of the species within the locality.

Chalinolobus nigrogriseus occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common (DEC, 2005). The Project may require the removal of potential habitat for this species, and will result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared as part of the Project is considered important to the long term survival of the species within the locality.

Falsistrellus tasmaniensis prefers moist habitats, with trees taller than 20 m. They generally roost in eucalypt hollows, but have also been found under loose bark on trees or in buildings (DEC, 2005). The Project may require the removal of potential habitat for this species, and will result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared as part of the Project is considered important to the long term survival of the species within the locality.

Kerivoula papuensis is found in rainforest and adjacent sclerophyll forest. They roost in abandoned Yellow-throated Scrubwren and Brown Gerygone hanging nests located in rainforest gullies on small first- and second-order streams. The species will fly up to two km from roosts to forage in rainforest and sclerophyll forest on upper-slopes (DEC, 2005). The Project may require the removal of potential habitat for this species, and will result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared as

part of the Project is considered important to the long term survival of the species within the locality.

Myotis macropus generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. They forage over streams and pools catching insects and small fish by raking their feet across the water surface (DEC, 2005). The Project may require the removal of potential habitat for this species, and will result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared as part of the Project is considered important to the long term survival of the species within the locality.

Nyctophilus bifax inhabits lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest. Coastal rainforest and patches of coastal scrub are particularly favoured. They roost in hollows in trees and also in the hanging foliage of palms, in dense clumps of foliage of rainforest trees and under bark (DEC, 2005). The Project may require the removal of potential habitat for this species, and will result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared as part of the Project is considered important to the long term survival of the species within the locality.

Nyctophilus corbeni inhabits a variety of vegetation types, including mallee, bullocke (*Allocasuarina leuhmanni*) and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. They roost in tree hollows, crevices, and under loose bark (DEC, 2005). The Project may require the removal of potential habitat for this species, and will result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared as part of the Project is considered important to the long term survival of the species within the locality.

Scoteanax rueppellii utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings (DEC, 2005). The Project may require the removal of potential habitat for this species, and will result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared as part of the Project is considered important to the long term survival of the species within the locality.

Vespadelus troughtoni are a cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. It is occasionally found along cliff-lines in wet eucalypt forest and rainforest (DEC, 2005). The Project may require the removal of potential habitat for this species, and will result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared as part of the Project is considered important to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

No Recovery Plan or Threat Abatement Plan has been prepared to consider the requirements of these species. However, strategies that have been identified by (DEC,

2005) to help the recovery of this species, those which are relevant to the proposed activity include:

- Retain hollow-bearing trees and provide for hollow tree recruitment (future hollow-bearing trees).
- Identify priority roost and maternity sites for protection.
- Protect known and potential habitat from burning at too-frequent intervals.
- Protect known and potential forest and woodland habitat around cliffs, rock overhangs and old mine workings from clearing and isolation.
- Undertake fox and feral cat control programs.
- Surveys need to be conducted in suitable habitat with the species' range, and in suitable habitat in proposed development areas.
- Protect areas of dry, low-elevation, old-growth eucalypt forest, particularly those dominated by Spotted Gum, boxes and ironbarks, from clearing or fragmentation.
- Retain native vegetation that is floristically and structurally diverse.
- Protect roost sites from disturbance.
- Retain rainforest and wet sclerophyll forest in gullies for roosting.
- Retain dense patches of understorey in mid and upper-slope forest for foraging.
- OEH should be consulted when planning development/s to minimise impact/s on populations.
- Conduct searches for the species in suitable habitat in proposed development areas.
- Retain a buffer of vegetation around roost sites in vegetated areas.
- Assess the site's importance to the species' survival, including linkages provided between ecological resources across the broader landscape.

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 Project may result in an increase to the following key threatening processes, which are considered relevant to all species included within this assessment:

- Clearing of native vegetation; the Project will require clearing of native vegetation, some of which constitutes roosting and/or foraging habitat for the species included within this assessment.
- Loss of hollow-bearing trees; hollow bearing trees are a key habitat resource for these species, providing important roost and shelter habitats. The Project will result in the removal of and disturbance to some hollow bearing trees from within the Project area.

Conclusion

The Project is considered likely to have an **adverse** impact on *Chalinolobus dwyeri*, *Chalinolobus nigrogriseus*, *Falsistrellus tasmaniensis*, *Kerivoula papuensis*, *Myotis macropus*, *Nyctophilus corbeni*, *Scoteanax rueppellii*, and *Vespadelus troughtoni*. The Project has the **potential** to have an adverse impact on *Nyctophilus bifax*,

A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aims to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10829>

3.1.7 Micro Bats: Little Bentwing-bat (*Miniopterus australis*); Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) and Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*)

- 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.*

Miniopterus australis (Vulnerable, TSC Act) is distributed along the east coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW (DEC, 2005). Field surveys conducted throughout the study area using echolocation detection surveys noted a “probable” record of this species. The Project is unlikely 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.

Miniopterus schreibersii oceanensis (Vulnerable, TSC Act) occurs along the east and north-west coasts of Australia (DEC, 2005). Field surveys conducted throughout the study area using echolocation detection surveys noted a “possible” record of this species. The Project is unlikely 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.

Saccolaimus flaviventris (Vulnerable, TSC Act) is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes (DEC, 2005). Field surveys conducted throughout the study area using echolocation detection surveys noted a “possible” record of this species. The Project is unlikely 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.

- 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

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

Miniopterus australis inhabit moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, *Melaleuca* swamps, dense coastal forests and *Banksia* scrub. The species is generally found in well-timbered areas. The species roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats (DEC, 2005). The Project may require the removal of potential habitat for this species, and will potentially result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared is considered important to the long term survival of the specie within the locality.

Miniopterus schreibersii oceanensis use caves as their primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. The species hunt in forested areas, catching moths and other flying insects above the tree tops (DEC, 2005). The Project may require the removal of potential foraging habitat for this species, and will potentially result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared is considered important to the long term survival of the specie within the locality. *Saccolaimus flaviventris* typically roost in tree hollows and buildings. However, in treeless areas they are known to utilise mammal burrows. The species forages in most habitats across its very wide range (DEC, 2005). The Project may require the removal of potential foraging habitat for this species, and will potentially result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared is considered important to the long term survival of the specie within the locality..

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Miniopterus australis*. In lieu of a recovery plan, DEC (2005) has developed a series of recovery strategies for the species, relevant to the Project:

- Retain stands of native vegetation, particularly within 10km of roosts; and
- Protect known roosting and nursery sites and surrounding forest from disturbance by restricting and/or monitoring access.

To date, no formal recovery plan has been developed for *Miniopterus schreibersii oceanensis*. In lieu of a recovery plan, DEC (2005) has developed a series of recovery strategies for the species, relevant to the Project:

- Retain native vegetation around roost sites, particularly within 300 m of maternity caves;
- Minimise the use of pesticides in foraging areas; and
- Protect roosting sites from damage or disturbance.

To date, no formal recovery plan has been developed for *Saccolaimus flaviventris*. In lieu of a recovery plan, DEC (2005) has developed a series of recovery strategies for the species, relevant to the Project

- Conduct searches for the species in suitable habitat in proposed development areas;

- OEH should be consulted when planning development/s to minimise impact/s on populations;
- Retain stands of native vegetation, especially those with hollow-bearing trees (including dead trees), and retain other structures containing bats;
- Retain a buffer of vegetation around roost sites in vegetated areas;
- Protect hollow-bearing trees for breeding sites, including those on farmland; younger mature trees should also be retained to provide replacements for the older trees as they die and fall over;
- Encourage regeneration and replanting of local flora species to maintain bat foraging habitat; and
- Assess the site's importance to the species' survival, including linkages provided between ecological resources across the broader landscape.

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 Project may result in an increase to the following key threatening processes, which are considered relevant to all species included within this assessment:

- Clearing of native vegetation; the Project will require clearing of native vegetation, some of which constitutes roosting and/or foraging habitat for the species included within this assessment.
- Loss of hollow-bearing trees; hollow bearing trees are a key habitat resource for these species, providing important roost and shelter habitats. The Project will result in the removal of and disturbance to some hollow bearing trees from within the Project area.
- Removal of dead wood and dead trees; dead wood, trees and coarse woody debris is potential habitat for the species within this assessment. The Project will result in the reduction of dead wood and trees from within the easement, which will in turn reduce potential habitat for these species.

Conclusion

The Project has the **potential** to have an adverse impact on *Miniopterus australis*, *Miniopterus schreibersii oceanensis* and *Saccolaimus flaviventris*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). Little Bentwing-bat – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10533>

DEC (2005). Eastern Bentwing-bat – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10534>

DEC (2005). Yellow-bellied Sheath-tail-bat – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10741>

3.1.8 Freshwater Fish: Purple Spotted Gudgeon (*Mogurnda adspersa*) and Eastern Freshwater Cod (*Maccullochella ikei*)

- 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.*

Mogurnda adspersa (Endangered, FM Act) occur in inland drainages of the Murray-Darling basin as well as in coastal drainages of northern NSW and Queensland. Spawning occurs between December and February (Llewellyn 2006). Females can spawn several times, with adhesive eggs being deposited in a cluster on a hard surface in a waterway and hatching three to eight days later. The males guard and fan the eggs during this time, until hatching (Llewellyn 2006). Several records of this species exist within the Project area west within Tenterfield Creek (**Figure 2** series in **Appendix C** of this Report).

Maccullochella ikei (Endangered, FM Act; Endangered EPBC Act) was historically widely distributed in the Clarence, Richmond and Brisbane River systems of coastal north-eastern NSW and southern Queensland. However, the species suffered a dramatic decline, with the last authenticated capture of the species in 1971. Thus, an artificial breeding program was developed in the late 80's, and over 130, 000 artificially bred juveniles were released into the Clarence and Richmond River systems between 1996 and 1999 (DSEWPaC 2012).

Maccullochella ikei spawns in spring, when water temperatures reach to at least 16°C, and eggs are deposited onto hard surfaces including rocks and logs (DSEWPaC 2012). Stocking programs² have been initiated south (~6km) and south-west (~11km) of the proposed alignment. A third stocking site is understood to be considerably closer to the Project (~150m) around Yellow Creek (John E Purcy *pers. comm.*) (**Figure 2** series in **Appendix C** of this Report). Although the species is thought to be territorial and not undergo upstream or downstream migrations, limited movement is thought to occur prior to, and during the breeding season (DSEWPaC 2012).

The Project will require some disturbance to areas of watercourses that may provide potential suitable habitat for these species. However the disturbance will be short-term and only occur in areas requiring water-course crossings. Impacts will be limited to the construction and installation phases of waterway crossings within the proposed alignment. Consultation with Fisheries (NSW DPI 2012) will be ongoing to ensure fish-friendly crossings are installed, in order to minimise disturbance to fish habitat. However, the Project has the potential to have an adverse effect on the life-cycle of the species should works be undertaken in the spawning period (in Summer), in areas where the species are known to be locally present. However, it is not considered likely that the Project will have an adverse effect on the life cycle of the species to the extent 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

² Fish stocking is the practice of raising fish in a hatchery and releasing them into a river, lake, or the ocean to supplement existing populations, or to create a population where none exists. Stocking may be done for the benefit of commercial, recreational, or tribal fishing, but may also be done to restore or increase a population of threatened or endangered fish in a body of water closed to fishing.

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Mogurnda adspersa is found in slow-moving or still waters of rivers, creeks and billabongs, often amongst weeds, rocks or large woody debris. The species shows a preference for benthic structures in water up to 2 metres deep, and is generally associated with habitat features such as rocks, snags or aquatic vegetation at different sites (Wager and Jackson 1993).

Macculochella ikei prefer slow-flowing, clear rocky streams and rivers an abundance of in-stream rock cover, timber or tussocks. The species shows a preference for deeper parts of the river near cover, especially around rocky islands and large boulders in fast-flowing water. Habitat resources such as large woody debris are likely to provide shelter and important spawning sites for the species (DSEWPaC 2012).

The Project will require the upgrade or installation of water crossings throughout the Project area, which may result in some disturbance to potential *Mogurnda adspersa* and *Macculochella ikei* habitat. Several waterways within the Project area are already spanned by various crossings. Given the presence of existing crossings, and assuming mitigation measures are adopted for the construction of fish friendly passage, it is considered unlikely that the Project would result in significant fragmentation or isolation of *Mogurnda adspersa* or *Macculochella ikei* habitat from other areas of habitat.

Furthermore, the existing habitat that may be impacted by the Project is not considered to be of high importance to the long-term survival of either species in the locality, as the disturbance will be limited to waterway crossing construction, and impact likelihood reduced through adoption of mitigation measures recommended in **Section 7, Appendix D4** of this Report.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

No formal recovery plan exists for *Mogurnda adspersa*. In lieu of a recovery plan, DPI have developed the following recovery actions relevant to the Project:

- Promote appropriate land management practices to improve water quality and river health (NSW DII, 2005).
- Conduct intensive surveys in areas identified as supporting or potentially supporting purple spotted gudgeons, and map the species distribution and habitat associations.

A recovery plan exists for *Maccullochella ikei* (NSW Fisheries 2004), that outlines a number of habitat protection and restoration based recovery actions for the species, of which the following are relevant to the Project:

- Ensure that the risk of degradation of existing Eastern Cod habitat is minimised; and
- Protect and enhance identified sites.

In addition to these recovery plan actions, it has been recommended that waterway crossings be constructed to allow fish friendly passage, hence the Project will not conflict with the recovery strategies for 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 following key threatening processes (under the TSC Act) have been identified as being relevant to both *Mogurnda adspersa* and *Maccullochella ikei*:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; any changes to the natural flow of waterways within the Project area may limit the potential of these species to move throughout the locality.
- Predation by *Gambusia holbrooki*; the invasive species *Gambusia holbrooki* may pose a predation threat to these species.
- Removal of dead wood and dead trees; dead wood within rivers is likely to provide potential habitat for both of these species.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Mogurnda adspersa* or *Maccullochella ikei*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report which aim to minimise the potential impact of the Project, to ensure that biodiversity values within the Project area are maintained or improved. All access track works associated with the currently proposed 37 waterway crossing upgrades and 27 new waterway installations (**Table 7-4** of this Appendix) to be designed and constructed in accordance with the NSW DPI *Policy and Guidelines for Fish Friendly Waterway Crossings* and *Why Do Fish Need to Cross the Road?* (2003), and relevant TransGrid specifications. Furthermore, all works will be carried out in accordance with industry guidelines developed by Landcom (2008) *Managing Urban Stormwater: Soils and Construction* Volume 1, and (DECC, 2008) Volume 2, (The blue book Volumes 1 and 2).

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3.1.9 Forest Birds: Bush Stone-curlew (*Burhinus grallarius*); Barred Cuckoo-shrike (*Coracina lineata*); Eastern Bristlebird (*Dasyornis brachypterus*); Albert's Lyrebird (*Menura alberti*); White-eared Monarch (*Monarcha leucotis*); and Olive Whistler (*Pachycephala olivacea*).

- 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*

Burhinus grallarius (Endangered, TSC Act) is known to occur in the Stanthorpe Plateau and Clarence Lowlands sub-regions of the Northern Rivers CMA. It is also predicted to occur in the Nandewar Northern Complex sub-region of the Border Rivers/ Gwydir CMA. There is a historical record of this species approximately 25km to the south of the proposed alignment south of Drake, within Washpool National Park. A number of more recent records exist for this species outside of reserve areas south of Tatham and around Ruthven. No individuals of this species were observed during field surveys of the study area. Given the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Coracina lineata (Vulnerable, TSC Act) is known to occur within the Clarence Lowlands, Clarence Sandstones, Richmond - Tweed and Woodenbong sub-regions of the Northern Rivers CMA. There are historical records of this species in proximity to the proposed alignment within Mallanganee National Park and Richmond Range National Park (alignment east). The Project will not intersect either of these National Parks. No individuals of this species were observed during field surveys of the study area. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Dasyornis brachypterus (Endangered, TSC Act; Endangered, EPBC Act) is known in the Richmond - Tweed sub-region of the Northern Rivers CMA. There is one recent record of this species approximately 10km to the north of the proposed alignment near Black Swamp; within the Boodoo State Forest/ Basket Swamp National Park. The alignment will not transect this area, and no individuals of this species were observed during field surveys of the study area. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Menura alberti (Vulnerable, TSC Act) is known to occur within the region of the Clarence Lowlands relevant to the study area as well as the Richmond - Tweed and Woodenbong sub-regions of the Northern Rivers CMA. The species was recently recorded in close proximity to the proposed alignment within the Basket Swamp National Park (study area west). The

alignment will not transect the National Park, and no individuals of this species were observed during field surveys of the study area. Given the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Monarcha leucotis (Vulnerable, TSC Act) is known within the Clarence Lowlands, Richmond - Tweed and Woodenbong sub-regions of the Northern Rivers CMA. The species was recently recorded approximately 10km to the north of the proposed alignment adjacent to the Richmond national Park and near Casino (study area east). No individuals of this species were observed during field surveys of the study area. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Pachycephala olivacea (Vulnerable, TSC Act) is known to occur within the Richmond - Tweed sub-region of the Northern Rivers CMA. This species was observed during URS surveys. It has a disjunct distribution in NSW chiefly occupying the beech forests around Barrington Tops and the MacPherson Ranges in the north and wet forests from Illawarra south to Victoria. In the south it is found inland to the Snowy Mountains and the Brindabella Range. Given the presence of suitable habitat inside the Project area, it is considered that the Project would potentially have an adverse effect on the life cycle of the species such that a viable population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Burhinus grallarius is found in open forests and woodlands with a sparse grassy ground layer and fallen timber. The species breeds and forages in grassy woodland and fallen dead timber. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Burhinus grallarius* habitat, is not considered

likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

Coracina lineata occurs within rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Coracina lineata* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

Dasyornis brachypterus occurs within dense low vegetation including heath and open woodland with a heathy understorey. In northern NSW it occurs in open forest with tussocky grass understorey. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Dasyornis brachypterus* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

Menura alberti mainly occurs in the wettest rainforests or wet sclerophyll forests with a wet understorey, often of rainforest plants. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Menura alberti* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

Monarcha leucotis occurs in rainforest, especially drier types, such as littoral rainforest, as well as wet and dry sclerophyll forests, swamp forest and regrowth forest. They appear to prefer the ecotone between rainforest and other open vegetation types or the edges of rainforest, such as along roads. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Monarcha leucotis* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

Pachycephala olivacea inhabits wet forests above about 500m. These habitats are typical of some of the bushland found within study area east. The clearing of vegetation, some of which is consistent with *Pachycephala olivacea* is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no recovery or threat abatement plans have been developed for *Coracina lineata*, *Dasyornis brachypterus* or *Pachycephala olivacea*. A Recovery Plan has been prepared for *Burhinus grallarius*, *Menura alberti* and *Monarcha leucotis*.

In lieu of a formalised recovery plan for *Coracina lineata*, DECCW (2010) has developed a number of priority actions and strategies to assist species recovery. The three key recovery strategies relevant to the proposed development include:

- Retain areas of native forest;
- Retain forest corridors particularly along roads and watercourses; and
- Retain individual native fruit-bearing trees as feed trees.

In lieu of a formalised recovery plan for *Dasyornis brachypterus*, OEH has developed a number of priority actions and strategies to assist species recovery. The four key recovery strategies relevant to the proposed development include:

- Implement fire management strategies that enhances habitat for the Eastern Bristlebird. If hazard reduction burning is necessary it should be carried out in a mosaic pattern at a frequency of no less than 10-15 years. Hazard reduction burns may also be necessary to protect large amounts of habitat from too-frequent and intense fire events. Ensure that personnel planning and undertaking hazard reduction burns are able to identify the species and are aware of its habitat;
- Searches for the species should be conducted in suitable habitat in proposed development areas;
- Raise driver awareness through road signs about the presence of Eastern Bristlebirds; and
- Continue to control Bitou Bush, Lantana and other invasive weeds that pose a threat to Eastern Bristlebird habitats.

A recovery plan has been developed that encompasses *Menura alberti* (Garnett and Crowley, 2000). Recovery actions recommended for the species which are relevant to the Project include:

- Ensure principal sub-populations remain viable.
- Desist from clearing optimal habitat to create plantations.
- Ensure adequate fire protection is in place, particularly in dry years.

Additionally, OEH has developed a number of priority actions and strategies to assist species recovery. The three key recovery strategies relevant to the proposed development include:

- Rehabilitate and reconnect patches of known and potential habitat using wide corridors linking gullies and ridges;
- Protect all known and potential habitat from further clearing, disturbance and isolation close to potential or known habitat; and
- Control Red Foxes and feral and domestic Dogs and Cats.

A recovery plan has been developed that encompasses *Monarcha leucotis* (DECCW 2010a, 2010b). The following recovery actions are considered relevant to the species and the Project:

- To protect rainforest, related vegetation and species from clearing
- To protect rainforest and related vegetation from fragmentation, modification and degradation
- To protect rainforest and related vegetation from the impact of weeds
- To protect rainforest from fire and to promote the implementation of appropriate fire regimes in related vegetation
- To engage the community and private land-holders in biodiversity conservation
- To establish effective monitoring of biodiversity related projects
- Minimise human-induced disturbance and mortality of species

Additionally, OEH has developed a number of priority actions and strategies to assist species recovery. The three key recovery strategies relevant to the proposed development include:

- Control weeds in areas of known and potential habitat or on land bordering such habitat;
- Protect areas of known and potential habitat from clearing and further fragmentation and isolation, including patches on private land in collaboration with landholders; and

- Reconnect or enlarge patches of known and potential habitat, particularly using corridors along rivers and creeks.

In lieu of a formalised recovery plan for *Pachycephala olivacea*, OEH has developed a number of priority actions and strategies to assist species recovery. The two key recovery strategies relevant to the proposed development include:

- Undertake fox and feral cat control programs.
- Retain and protect known and likely habitat.

A Recovery Plan has been prepared for *Burhinus grallarius* (DEC 2006). It outlines a range of long term and immediate objectives for this species. These include the maintenance of habitat value at key sites and throughout the former range by active participation in land-use planning processes and by active vegetation rehabilitation at strategic sites. Population monitoring objectives have also been set to allow assessment of the efficacy of management actions. Recovery actions outlined for *Burhinus grallarius* of relevance to this project include:

- Undertake fox and feral cat control programs;
- Retain dead timber on the ground in open woodland areas;
- Retain existing vegetation along roadsides, in paddocks and remnant stands of native trees;
- Fence off nesting sites;
- Fence off suitable woodland habitats, particularly those with unimproved pasture and an intact native ground plant layer; and
- Increase the size of existing remnants, planting trees and establishing buffer zones of unimproved uncultivated pasture around woodland remnants.

For all forest birds assessed, the proposed works are not inconsistent with any of the above recovery strategies outlined to assist in the recovery of these species. The priority actions and recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

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

The following key threatening process (TSC Act) has been identified as being relevant to the forest bird species included within this assessment:

- Clearing of native vegetation; the clearing of native vegetation could reduce potential breeding, foraging and shelter habitat for all of these forest bird species. Vegetation clearing and increasing habitat fragmentation is a common threat to these forest birds. Fragmentation and isolation of populations may adversely affect the species because of their small size which makes them susceptible to catastrophic events and localised extinction.
- Predation by feral cats; cats and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132kV easement across alignment east may increase potential hunting grounds for local cat populations and put greater predation pressure on bittern populations.
- Predation by the European red fox; foxes and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132kV easement across alignment east may increase potential hunting grounds for local fox populations and put greater predation pressure on local bittern populations.
- Removal of dead wood and dead trees; this is identified as a key threat for *Burhinus grallarius* which relies on dead timber for habitat. Retaining dead timber is listed as a key recovery measure for this species.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Burhinus grallarius*; *Coracina lineata*; *Dasyornis brachypterus*; *Menura alberti* and *Monarcha leucotis*. Due to habitat loss the Project will **potentially** have an adverse impact on *Pachycephala olivacea*. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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3.1.10 Geese and Ducks: Magpie Goose (*Anseranas semipalmata*); and Freckled Duck (*Stictonetta naevosa*).

- 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*

Anseranas semipalmata (Vulnerable, TSC Act) is known to occur within the Clarence Lowlands, Clarence Sandstones, Richmond – Tweed and Woodenbong sub-regions of the Northern Rivers CMA. There is a previous record of this species approximately 5km to the south of the existing Tenterfield 132kV substation (alignment west) as well as a number of records from around Casino (alignment east). No individuals of this species were observed during URS field surveys. Given the presence of the existing 132kV easement and associated access tracks across alignment east as well as the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Stictonetta naevosa (Vulnerable, TSC Act) is predicted to occur within the Nandewar, Northern Complex sub-region of the Border Rivers/Gwydir CMA and known to occur within the Richmond - Tweed and Clarence Lowlands sub-regions of the Northern Rivers CMA. There are numerous records of this species in proximity to alignment east near Casino. No individuals of this species were observed during URS field surveys. Given the presence of the existing 132kV easement and associated access tracks across alignment east as well as the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (iii) *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. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Anseranas semipalmata are mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. The species is equally at home in aquatic or terrestrial habitats, and often seen walking and grazing on land. Their activities are centred on wetlands, mainly those on floodplains of rivers and large shallow wetlands formed by run-off. These habitats are typical of some found within study area east. Proposed project activities at locations consistent with *Anseranas semipalmata* habitat is not considered likely to further fragment or isolate the species given the mobility of the species, the presence of the existing 132kV easement and the preferential avoidance of activities to be carried out in sensitive wetland and riparian environments.

Stictonetta naevosa inhabits a variety of plankton-rich wetland types, as well as large open lakes, creeks, farm dams, sewage ponds and floodwaters. These habitats are typical of some found within study area east. Proposed project activities at locations consistent with *Stictonetta naevosa* habitat is not considered likely to further fragment or isolate the species, given the mobility of the species, the presence of the existing 132kV easement and the preferential avoidance of activities to be carried out in sensitive wetland and riparian environments.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery or threat abatement plans have been developed for the species considered within this assessment. As such, the proposed works are not inconsistent with any objectives or actions of a recovery plan or threat abatement plan.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist in the *Anseranas semipalmata* species recovery. The three key recovery strategies relevant to the Project include:

- Undertake predator control in known wetland breeding sites;
- Protect wetlands from water pollution by reducing the use of chemicals, monitoring of salinity levels and nutrient loading near wetlands; and
- Maintain or restore natural flow regimes in wetlands.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist in the *Stictonetta naevosa* species recovery. The two key recovery strategies relevant to the Project include:

- Retain and protect wetlands and maintain a natural density of riparian and wetland vegetation; and
- Retain or reintroduce ecologically sustainable water flows to swamp, wetland and creek habitat.

For the goose and duck species assessed, the proposed works are not inconsistent with any of the above recovery strategies outlined to assist in the recovery of these species. The recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

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

The following key threatening process (TSC Act) has been identified as being relevant to the geese and duck species included within this assessment:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands – this key threatening process is common across the two species assessed. Both are threatened by changes to natural river flows as well as to the clearing, filling and draining of wetlands and watercourses for various anthropogenic activities.

The Project would involve the upgrade and construction of a number of new watercourse crossings as identified within **Appendix C** of this Report.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Anseranas semipalmata* and *Stictonetta naevosa*. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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3.1.11 Honeyeaters: Painted Honeyeater (*Grantiella picta*); Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*); and Regent Honeyeater (*Anthochaera phrygia*).

- 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*

Grantiella picta (Vulnerable, TSC Act) is known within the Nandewar, Northern Complex and Tenterfield Plateau sub-regions of the Border Rivers/Gwydir CMA, known within the Rocky River Gorge sub region and predicted within the Stanthorpe Plateau sub-region of the Northern Rivers CMA. There is one record of this species from 1992 within the Girard State Forest in proximity of alignment east near Drake. No individuals of this species were observed during field surveys of the study area. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Melithreptus gularis gularis (Vulnerable, TSC Act) is known and predicted to occur within the Nandewar, Northern Complex and Tenterfield Plateau sub-regions of the Border Rivers/Gwydir CMA. It is predicted to occur within the Cataract, Rocky River Gorge and Stanthorpe Plateau sub-regions of the Northern Rivers CMA, as well as being known within the Clarence Lowlands, Clarence Sandstones and Woodenbong sub-regions. There are recent records of this species near Bonshaw and the Torrington State Forest within study area west, as well as a number of records for this species approximately 10km south of Tabulam and Casino (study area east). No individuals of this species were observed during field surveys of the study area. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Anthochaera phrygia (Critically Endangered, TSC Act; Endangered, EPBC Act) is known and predicted to occur within the Nandewar, Northern Complex and Tenterfield Plateau sub-regions of the Border Rivers/Gwydir CMA (respectively), as well as being known or predicted within the Cataract, Clarence Lowlands, Clarence Sandstones, Richmond - Tweed, Rocky River Gorge, Stanthorpe Plateau and Woodenbong sub-regions of the Northern Rivers CMA. There are no recent records of this species within study area west. The species was recently recorded in close proximity to the proposed alignment within the Mallanganee National Park (study area east). The alignment will not transect the National Park, and no individuals of this species were observed during field surveys of the study area. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

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

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

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
(ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
(iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Grantiella picta occurs within Dry Sclerophyll Forests and inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Grantiella picta* habitat, is considered likely to further fragment or isolate the species.

Melithreptus gularis gularis occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Melithreptus gularis gularis* habitat, is considered likely to further fragment or isolate the species.

Anthochaera phrygia occurs within box-ironbark eucalypt associations along creek flats, broad river valleys and lower slopes. Along streams in NSW, riparian forests of River She-oak *Casuarina cunninghamiana* are also important for feeding and breeding. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Anthochaera phrygia* habitat, is considered likely to further fragment or isolate the species.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no recovery or threat abatement plans have been developed for *Grantiella picta* or *Melithreptus gularis gularis*. A Recovery Plan has been prepared for *Anthochaera phrygia*.

In lieu of a formalised recovery plan for *Grantiella picta*, OEH has developed a number of priority actions and strategies to assist species recovery. The two key recovery strategies relevant to the proposed development include:

- Protect remnant woodland and open forest throughout the range of the species; and
- Regenerate and replant local flora species to maintain breeding and foraging habitat.

In lieu of a formalised recovery plan for *Melithreptus gularis gularis*, OEH has developed a number of priority actions and strategies to assist species recovery. The two key recovery strategies relevant to the proposed development include:

- Retain suitable woodland habitats, particularly those with unimproved pasture and an intact native ground plant layer; and
- Increase the size and connectivity of existing remnants, planting trees and establishing buffer zones of unimproved uncultivated pasture around woodland remnants.

A Recovery Plan has been prepared for *Anthochaera phrygia* (Menkhorst *et al.*, 1999). It outlines a range of long term and immediate objectives for this species. These include the maintenance of habitat value at key sites and throughout the former range by active participation in land-use planning processes and by active vegetation rehabilitation at strategic sites. Population monitoring objectives have also been set to allow assessment of the efficacy of management actions. Recovery actions outlined for *Anthochaera phrygia* of relevance to this project include:

- No loss of mature key nectar tree species. Minimise the removal of mistletoes at key sites.
- Protect and enhance key breeding and foraging habitats.
- Encourage natural regeneration and increase the remnant size of known and potential Regent Honeyeater habitats.
- No further loss of known woodland and forest habitat throughout the range of the Regent Honeyeater from developments.

For all of the honeyeaters assessed, the proposed works are not inconsistent with any of the above recovery strategies outlined to assist in the recovery of these species. The priority actions and recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

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

The following key threatening process (TSC Act) has been identified as being relevant to the honeyeater species included within this assessment:

- Clearing of native vegetation; the clearing of native vegetation could reduce potential breeding, foraging and shelter habitat for all of these honeyeater bird species. Removing important feed trees, in particular large, old trees with heavy mistletoe infestations, would limit the food resources available for these species. Vegetation clearing and increasing habitat fragmentation may increase competition from larger aggressive honeyeaters, particularly Noisy Miners, Noisy Friarbirds and Red Wattlebirds. *Grantiella picta*, *Melithreptus gularis gularis* and *Anthochaera phrygia* could potentially be excluded from smaller remnants.

Conclusion

The Project is considered likely to have an **adverse** impact on the *Grantiella picta*, *Melithreptus gularis gularis* and *Anthochaera phrygia*. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

- DECCW, (2010). Threatened Species Profile. Painted Honeyeater. Viewed online 19/11/2010. <http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10357>
- NSW Scientific Committee, (2001) Final determination. Black-chinned honeyeater (eastern subspecies) - Vulnerable species listing. Viewed online 19/11/2010. <http://www.environment.nsw.gov.au/determinations/BlackchinnedHoneyeaterVulSpListing.htm>
- Menkhorst, P., Schedvin, N. and Geering, D., (1999). Regent Honeyeater (*Anthochaera phrygia*) Recovery Plan 1999-2003. Viewed online 19/11/2010.

3.1.12 Hylidae: Tree Frogs: Green-thighed Frog (*Litoria brevipalmata*), Peppered Frog (*Litoria piperata*), and Glandular Frog (*Litoria subglandulosa*).

- 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*

Litoria brevipalmata (Vulnerable, TSC Act) is known to occur within the Clarence Lowlands, Cataract, Richmond – Tweed (QLD – Scenic Rim) (Part A) and Woodenbong sub-regions of the Northern Rivers CMA. No individuals of this species were observed during field surveys conducted throughout the study area, nor has this species been recorded historically within the Project area. Potential breeding habitat occurs in the flood prone grassy areas between Tabulam and Casino following heavy rainfall in late spring and summer. The proposed action may result in impacts including vegetation clearing and hydrological changes caused by the establishment of creek and swampy area crossings to gain access to structures. Given the presence of suitable habitat inside the Project area, the removal of *Litoria brevipalmata* habitat is considered to potentially place a viable local population at risk of extinction.

Litoria piperata (Critically Endangered, TSC Act; Vulnerable, EPBC Act) is predicted to occur in the Stanthorpe Plateau sub-region of the Northern Rivers CMA restricted to elevations above 800m ASL. No individuals of this species were observed during field surveys conducted throughout the study area, nor has this species been recorded historically within the Project area. The proposed action may result in environmental impacts including vegetation clearing and general habitat modification. However, given the lack of previous sightings of this species within the Project area, it is considered unlikely that works associated with the Project have the potential to impact potential *Litoria piperata* habitat to an extent that a viable local population is placed at risk of extinction.

Litoria subglandulosa (Vulnerable, TSC Act) is predicted to occur in the Stanthorpe Plateau and Rocky River Gorge sub-regions of the Northern Rivers CMA. No individuals of this species were observed during field surveys conducted throughout the study area, nor has this species been recorded historically within the Project area. The proposed action may result in environmental impacts including vegetation clearing and general habitat modification. Given the existing 132kV easement and associated access tracks and the presence of suitable habitat outside the Project area, the removal of potential *Litoria subglandulosa* habitat is not considered likely to place a viable local population 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

- c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*
- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
 - (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Litoria brevipalmata habitat includes rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. Breeding frogs gather around grassy semi-permanent ponds and flood-prone grassy areas (DEC, 2005). This species has the potential to occur within the following vegetation communities within the study area:

- Grey Gum/Grey Box/Grey Ironbark/Spotted Gum open forest and all variations of these communities;
- Swamp Box/Swamp Mahogany swamp forest, Cabbage Gum open forest or woodland;
- Forest Red Gum - Swamp Box;
- Spotted Gum - Brush Box moist forest; and
- Sydney Blue Gum open forest.

The clearing of vegetation, some of which is consistent with *Litoria brevipalmata* habitat, is considered to potentially further fragment or isolate the already fragmented vegetation (and hence *Litoria brevipalmata* habitat) that occurs within the Project area. This habitat is considered potentially important to the long-term survival of the species.

Litoria piperata habitat includes streamside vegetation and shelter sites under rocks and fallen timber along rocky streams flowing eastward from the Tablelands, at an altitude above 800m (NSW National Parks and Wildlife Service, 2001). Potential habitat for this species exists throughout the Project area, however the species has never been recorded within the Project area. Clearing a small amount of this potential habitat within the alignment is not considered to further fragment or isolate the already fragmented vegetation (and hence *Litoria piperata* habitat) that occurs within the Project area. Given that *Litoria piperata* has not been recorded historically throughout the Project area, the potential habitat within the Project area is not considered to be important to the long-term survival of the species.

Litoria subglandulosa habitat includes streams found within rainforest as well as moist and dry eucalypt forest. Breeding habitat comprises permanent streams or swamps with fringing vegetation such as ferns, tussocks, sedges, whilst foraging habitat includes emergent aquatic or streamside vegetation and vegetation within 100m of breeding habitat (DEC, 2005). Within the study area the River Oak riparian woodland vegetation community is likely to provide habitat for this species. Clearing of a small amount of this vegetation within the alignment is not considered to further fragment or isolate the already fragmented vegetation (and hence *Litoria subglandulosa* habitat) that occurs within the Project area. Given that *Litoria subglandulosa* has not been recorded historically throughout the Project area, the potential habitat within the Project area is not considered to be important to the long-term survival of the species.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, a recovery plan has been developed for *Litoria piperata* (NSW National Parks and Wildlife Service 2001). No recovery or threat abatement plans have been developed for the remaining Hylidae frog species included in this assessment. In lieu of formalised recovery plans, OEH has developed a number of priority actions and strategies to assist in the species recovery. As such, the proposed works are not inconsistent with any objectives or actions of a recovery plan or threat abatement plan.

Eleven priority action statements have been identified for *Litoria brevipalmata* (DEC 2005). Key recovery actions include:

- Maintain vegetation and leaf litter around ponds, dams, drainage lines and other moist areas;
- Conserve natural patterns of local flooding; and
- Protect water bodies from pollution.

Four recovery strategies have been identified for *Litoria piperata*, as part of the *Yellow-spotted Bell Frog (Litoria castanea) and Peppered Tree Frog (Litoria piperata) recovery plan* (NSW National Parks and Wildlife Service, 2001). Key recovery actions include:

- Protection of potential habitat;
- Encourage the location and identification of any remaining extant populations in the wild; and
- Protection of any extant populations identified.

Five priority action statements identified for *Litoria subglandulosa* (DEC 2005). Key recovery actions include:

- Protect streams from pollution;
- Maintain vegetation and leaf litter around ponds, dams, drainage lines and other moist areas;
- Conserve natural local patterns of flooding; and
- Control weeds.

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

The following key threatening processes (under the TSC Act) have been identified as being relevant to the species included within this assessment:

- Bushrock removal; several of these frog species are known to utilise bush rock as a habitat resource. Removal of such biotic elements may reduce local potential habitat.
- Clearing of native vegetation; the clearing of native vegetation could reduce potential breeding, foraging and shelter habitat for all of these frog species.
- Infection of frogs by amphibian chytrid causing the disease chytridiomycosis; the movement of vehicles and workers close to and across waterways may result in the spread of the disease to local populations of frogs.
- Predation by feral cats; cats and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132kV easement may

increase potential hunting grounds for local cat populations and put greater predation pressure on local frog populations.

- Predation by the European red fox; foxes and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132kV easement may increase potential hunting grounds for local fox populations and put greater predation pressure on local frog populations.
- Removal of dead wood and dead trees; some frog species shelter under fallen timber and leaves, therefore the removal of such habitat during the Project could reduce potential habitat area within the study area east.

Conclusion

The Project has the **potential** to have an adverse impact on *Litoria brevipalmata* due to habitat fragmentation and loss. The Project is **not** considered likely to have an adverse impact on *Litoria piperata* and *Litoria subglandulosa*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

NSW National Parks and Wildlife Service (2001). Yellow-spotted Bell Frog (*Litoria castanea*) and Peppered Tree Frog (*Litoria piperata*) recovery plan. NPWS, Hurstville, NSW.

DEC (2005). Glandular Frog – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10493>

DEC (2005). Green-thighed Frog – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10485>

3.1.13 Koala (*Phascolarctos cinereus*)

- 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*

Phascolarctos cinereus (Vulnerable, TSC Act; Vulnerable, EPBC Act) has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range (DEC, 2005). This species was not detected during field surveys conducted within the Project area. However, there are numerous historical records of the species from within the Project area. The Project will potentially have an adverse effect on the life cycle of the species such that a viable local population 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

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

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

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
(ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
(iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Phascolarctos cinereus habitat includes eucalypt woodlands and forests. The species feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species (DEC, 2005). The Project will require the removal and clearing of potential *Phascolarctos cinereus* habitat to make way for the required easement. This clearing may result in the isolation and fragmentation of potential habitat for the species. The habitat to be removed is considered to be of low importance to the long term survival of the species in the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

An approved recovery plan has been developed for *Phascolarctos cinereus*; *Recovery plan for the koala (Phascolarctos cinereus)* (DECC, 2008). This plan outlines a number of recovery objectives as well as specific recovery actions relevant to the Project:

- Identify and conserve habitat important for koala conservation;
- Assess the impact of habitat loss and fragmentation on koala populations;
- Integrate koala habitat conservation into local and state government planning processes;
- Rehabilitate and restore koala habitat and populations; and
- Manage captive, sick or injured koalas and orphaned wild koalas to ensure consistent and high standards of care.

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

The following key threatening process relevant to *Phascolarctos cinereus* may be increased by the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation, some of which constitutes habitat for the species.

Conclusion

The Project has the **potential** to have an adverse impact on *Phascolarctos cinereus*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report

which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). Koala – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10616>

DECC (2008). Recovery plan for the koala (*Phascolarctos cinereus*). Approved Recovery Plan, November 2008. Department of Environment and Climate Change NSW. Viewed online 24/11/2010. <http://www.environment.nsw.gov.au/resources/threatenedspecies/08450krp.pdf>

3.1.14 Freetail Bats: Beccari's Freetail-bat (*Mormopterus beccarii*); Hairy-nosed Freetail Bat (*Mormopterus eleryi*) and Eastern Freetail-bat (*Mormopterus norfolkensis*)

- 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*

Mormopterus beccarii (Vulnerable, TSC Act) is widely distributed across northern Australia from Western Australia to Queensland, extending south to the north-east corner of NSW. Records are patchy throughout northern NSW. This species was not recorded during field surveys conducted throughout the study area using echolocation detection survey techniques. Given the occurrence of suitable habitat within the Project area, the Project has the potential 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.

Mormopterus eleryi (Endangered, TSC Act) is found from the southern half of the Northern Territory to central Queensland and north-western NSW. In NSW, the species has been recently recorded from only three disjunct locations: thirteen individuals from Gundabooka National Park, south of Bourke; one individual from Dhinnia Dthinawan Nature Reserve (formerly Bebo State Forest), north of Warialda and two individuals from near Bonshaw. The Project is unlikely 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.

Mormopterus norfolkensis (Vulnerable, TSC Act) is found along the east coast from south Queensland to southern NSW. This species was not recorded during field surveys conducted throughout the study area using echolocation detection survey techniques. Given the occurrence of potential habitat within the Project area, the Project has the potential 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.

- 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

- c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*
- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
 - (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Mormopterus beccarii occurs in a range of vegetation types in northern Australia, from rainforests to open forests and woodlands, and are often recorded along watercourses. The species roosts mainly in tree hollows but relatively large colonies have been found under house roofs in urban areas in Queensland. The Project may require the removal of potential habitat for this species, and will result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared as part of the Project is considered potentially important to the long term survival of the species within the locality.

Mormopterus eleryi is distributed from the southern half of the Northern Territory to central Queensland and north-western NSW. The species is extremely rare throughout its range, having been identified in only 15 locations nationally. Knowledge of the ecology of the species is limited; however evidence suggests that the species depends on tree hollows and fissures for roosting sites. The Project will require the clearing of vegetation that may constitute potential *Mormopterus eleryi* habitat. DEC (2005) identifies that the threat to *Mormopterus eleryi* from loss of habitat is exacerbated by its apparent low numbers. For these reasons, the clearing of land has the potential to fragment important local habitat of *Mormopterus eleryi*, and so threaten the long term survival of the species in the locality.

Mormopterus norfolkensis is distributed along the east coast of Australia, from southern Queensland to southern NSW. The species occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. *Mormopterus norfolkensis* roosts mainly in tree hollows or under bark. The Project may require the removal of potential habitat for this species, and will result in habitat fragmentation as a result of clearing the required easement. The habitat that will be cleared as part of the Project is considered potentially important to the long term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Mormopterus beccarii*. In lieu of a recovery plan, DEC (2005) has developed a series of recovery strategies for the species, relevant to the Project:

- Reduce the frequency of burning forests and woodlands in areas of known habitat, particularly forests used for cattle grazing;
- Reduce the use of pesticides and consider the use of alternatives where available;

- Protect hollow-bearing trees, including those in agricultural and urbanised areas, and ensure a range of tree age classes are present in known habitat to sustain a supply of hollow-bearing trees; and
- Protect known and potential habitat from clearing.

To date, no formal recovery plan has been developed for *Mormopterus eleryi*. In lieu of a recovery plan, DEC (2005) has developed a series of recovery strategies for the species, relevant to the Project:

- Protect hollow bearing live and dead trees within the species' range;
- Discourage pesticide drift near species' habitat;
- Develop burning strategies that reduce impacts on preferred habitat in known foraging areas; and
- Report any sightings of the species to the NSW Department of Environment and Conservation.

To date, no formal recovery plan has been developed for *Mormopterus norfolkensis*. In lieu of a recovery plan, DEC (2005) has developed a series of recovery strategies for the species, relevant to the Project:

- Retain hollow-bearing trees and provide for hollow tree recruitment;
- Retain foraging habitat; and
- Minimise the use of pesticides in foraging areas.

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 Project may result in an increase to the following key threatening processes, which are considered relevant to all species included within this assessment:

- Clearing of native vegetation; the Project will require clearing of native vegetation, some of which constitutes potential roosting and/or foraging habitat for the species included within this assessment. Hollow bearing trees are a key habitat resource for these species, providing important roost and shelter habitats. The Project will result in the removal of and disturbance to some hollow bearing trees from within the Project area.
- Removal of dead wood and dead trees; dead wood, trees and coarse woody debris is potential habitat for the species within the area of assessment. The Project will result in the reduction of dead wood and trees from within the easement, which will in turn reduce potential habitat for these species.

Conclusion

The Project has the **potential** to have an adverse impact on *Mormopterus beccarii* and *Mormopterus norfolkensis* due to habitat loss. The Project is **not** considered likely to have an adverse impact on *Mormopterus eleryi*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). Beccari's Freetail-bat – profile. Threatened species, populations and ecological communities of NSW. Viewed online 26/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10543>

DEC (2005). Hairy-nosed Freetail Bat – profile. Threatened species, populations and ecological communities of NSW. Viewed online 26/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10923>

DEC (2005). Eastern Freetail-bat – profile. Threatened species, populations and ecological communities of NSW. Viewed online 26/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10544>

3.1.15 Muridae:- Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*) and Hastings River Mouse (*Pseudomys oralis*)

- 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*

Pseudomys gracilicaudatus (Vulnerable, TSC Act) mainly occurs north from the Hawkesbury River area as scattered records along to coast and eastern fall of the Great Dividing Range extending north into Queensland (DEC, 2005). The species is predicted to occur within the Project area east due to the presence of suitable habitat. The Project will require clearing of potential habitat for this species. However, the Project is unlikely 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.

Pseudomys oralis (Endangered, TSC Act; Endangered, EPBC Act) has a patchy distribution spanning the Great Dividing Range from the Hunter Valley, north to the Bunya Mountains near Kingaroy in south-east Queensland, at elevations between 300m and 1100m (DEC, 2005). This species is predicted to occur within the study area east, just east of Tenterfield, based on historical records and the presence of suitable habitat. The Project will require clearing of potential habitat for this species. However, the Project is unlikely 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.

- 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Pseudomys gracilicaudatus is mostly found in heath and is most common in dense, wet heath and swamps. The Project will result in the clearing of potential habitat for this species. This clearing will also result in some fragmentation of vegetation throughout the Project area. Given the existing fragmentation, the habitat to be removed is considered to be of low importance to the long term survival of the species in the locality.

Pseudomys oralis are found in a variety of dry open forest types with dense, low ground cover and a diverse mixture of ferns, grass, sedges and herbs. Access to seepage zones, creeks and gullies is important, as is permanent shelter such as rocky outcrops. Nests may be in either gully areas or ridges and slopes. The Project will result in the clearing of potential habitat for this species. This clearing will also result in some fragmentation of vegetation throughout the Project area. Given the existing fragmentation, the habitat to be removed is considered to be of low importance to the long term survival of the species in the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Pseudomys gracilicaudatus*. In lieu of a formal recovery plan, DEC (2005) have developed recovery actions relevant to the Project:

- Undertake fox and feral cat and dog control program targeting areas of known or high quality potential habitat;
- Control feral pigs;
- Apply mosaic pattern hazard burns to ensure that a range of age stands of heath is available to each population of Eastern Chestnut Mouse; and
- All vegetation within 200 m of heaths and swamps supporting the species should be retained and not disturbed.

A recovery plan has been developed for *Pseudomys oralis*; *Recovery Plan for the Hastings River Mouse (Pseudomys oralis)* (NSW Department of Environment and Conservation, 2005). The plan lists a series of recovery objectives and actions aimed at recovering the species in NSW. The following are relevant to the Project:

- Identify new *Pseudomys oralis* populations, particularly in areas with natural refuges and secure tenure; and
- Ensure that *Pseudomys oralis* populations and habitats are identified and managed to minimise impact from developments and activities.

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 Project may result in an increase to the following key threatening process relevant to *Pseudomys gracilicaudatus* and *Pseudomys oralis*:

- Clearing of native vegetation; the Project will require the clearing of native vegetation, some of which constitutes habitat for these species.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Pseudomys gracilicaudatus* and *Pseudomys oralis*. A number of measures have been recommended in **Section 7**,

Appendix D4 of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC (2005). Eastern Chestnut Mouse – profile. Threatened species, populations and ecological communities of NSW. Viewed online 11/11/2010.

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<http://www.environment.nsw.gov.au/resources/nature/recoveryplanHastingsrivmouseDec04.pdf>

3.1.16 Myobatrachidae:– Ground Frogs: Stuttering Frog (*Mixophyes balbus*); Giant Barred Frog (*Mixophyes iteratus*); Loveridge's Frog (*Phyllorhina loveridgei*); *Phyllorhina pughi*; and *Phyllorhina richmondensis*.

- 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*

Mixophyes balbus (Endangered, TSC Act; Vulnerable, EPBC Act) is known to occur within the Cataract, Stanthorpe and Rocky River Gorge sub-regions of the Northern Rivers CMA. No individuals of this species were observed during field surveys conducted throughout the study area. However, this species is known to occur within Girard State Forest, approximately 6 km from the proposed alignment. Environmental pressures from actions occurring in the Project area including vegetation clearing have the potential to contribute to the extinction of viable local populations.

Mixophyes iteratus (Endangered, TSC Act; Endangered, EPBC Act) is known to occur within the Cataract, Woodenbong, Clarence Lowlands, Clarence Sandstone and Rocky River Gorge sub-regions of the Northern Rivers CMA. No individuals of this species were observed during field surveys conducted throughout the study area. However, this species is known to occur within Girard State Forest, approximately 5 km from the proposed alignment. Environmental pressures from actions occurring in the Project area including vegetation clearing have the potential to contribute to the extinction of viable local populations.

Phyllorhina loveridgei (Endangered, TSC Act) is known to occur in both the Richmond – Tweed and Woodenbong sub-regions of the Northern Rivers CMA. No individuals of this species were observed during field surveys conducted throughout the study area. This species has not been recorded historically within the Project area. This frog is dependent on high moisture levels, occurring in the headwaters of small streams for breeding and nesting. Despite the lack of records in the Project area, there is suitable habitat for the species within the Project area. Environmental pressures from actions occurring in the Project area including vegetation clearing have the potential to contribute to the extinction of viable local populations.

Phyllorhina pughi (Endangered, TSC Act) is known to occur in the Rocky River Gorge and Cataract sub-regions of the Northern Rivers CMA. This species is known to occur within Girard State Forest in close proximity to the alignment; however no individuals of this species were observed during field surveys conducted throughout the study area. This species is likely

to use rock outcrops or cliff bases that hold surface moisture in wet eucalypt forests for breeding and nesting. Environmental pressures from actions occurring in the Project area including vegetation clearing have the potential to contribute to the extinction of viable local populations.

Philoria richmondensis (Endangered, TSC Act) is known to occur in the Woodenbong sub-region of the Northern Rivers CMA. No individuals of this species were observed during field surveys conducted throughout the study area, nor has this species been recorded historically within the Project area. This frog is usually only found in burrows in upper tributaries or along streams in highland areas. Despite the lack of records in the Project area there is potential habitat for this species within the Project area. Environmental pressures from actions occurring in the Project area including vegetation clearing have the potential to contribute to the extinction of viable local populations.

- 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Mixophyes balbus is found in rainforest, Antarctic Beech and wet sclerophyll forests. The species depends on freshwater streams and riparian vegetation for breeding and habitation (NSW Scientific Committee, 2002). These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Mixophyes balbus* habitat, will potentially further fragment or isolate the species.

Mixophyes iteratus is associated with permanent flowing drainages, from shallow rocky rainforest streams to slow moving rivers in lowland open forest. It is not restricted to particular vegetation communities, utilising rainforest, and to a lesser degree wet sclerophyll forest and cleared land (NSW Scientific Committee, 1999). These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Mixophyes iteratus* habitat, will potentially further fragment or isolate the species.

Philoria loveridgei is found in boggy upper tributaries of streams and soaks in Antarctic Beech forests, rainforests and wet sclerophyll forests above altitudes of approximately 550m (NSW Scientific Committee, 2005). *Philoria loveridgei* is considered to be a habitat specialist typically associated with mountain streams. The clearing of vegetation, some of which is consistent with *Philoria loveridgei* habitat, will potentially further fragment or isolate the species.

Philoria pughi is a habitat specialist associated with mountain streams. It inhabits boggy upper tributaries of streams and soaks in Antarctic Beech forests, rainforests and wet sclerophyll forests above altitudes of approximately 550m (NSW Scientific Committee, 2005). The clearing of vegetation, some of which is consistent with *Philoria pughi* habitat, will potentially further fragment or isolate the species.

Philoria richmondensis is associated with mountain streams. *Philoria richmondensis* inhabits boggy upper tributaries of streams and soaks in Antarctic Beech forests, rainforests and wet sclerophyll forests above altitudes of approximately 550m (NSW Scientific Committee, 2005). The clearing of vegetation, some of which is consistent with *Philoria richmondensis* habitat, will potentially further fragment or isolate the species.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

A draft recovery plan (currently on public exhibition) has been developed for *Mixophyes balbus*; *National Recovery Plan for the Stuttering Frog Mixophyes balbus* (Hunter and Gillespie, 2010). This plan outlines three recovery objectives and fifteen recovery actions for the species, of which the following are relevant to the Project:

- Implement effective hygiene protocols;
- Incorporate markers for site recognition; and
- Promote public education and awareness.

A recovery plan has been developed for *Mixophyes iteratus*; Hines and the South-east Queensland Threatened Frogs Recovery Team (2002) *Recovery plan for stream frogs of south-east Queensland 2001-2005*. This plan outlines a number of recovery actions for the species, or which the following are relevant to the Project:

- Monitor populations
- Assess the need for translocation experiments
- Determine habitat usage
- Protect populations and manage habitat
- Assess effectiveness of management prescriptions
- Control feral pigs
- Manage populations of the giant barred-frog on private land
- Reduce the impact of introduced fish
- Provide advice to land managers

Additional recovery recommendations have been made by OEH for this species. Those relevant to the Project include:

- Maintain vegetation and deep leaf-litter around streams; and
- Manage upstream developments to minimise changes in water quality and flow.

To date, no recovery or threat abatement plans have been developed for any of the other Myobatrachidae frog species included in this assessment. In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist in the species recovery. As such, the proposed works are not inconsistent with any objectives or actions of a recovery plan or threat abatement plan.

Four priority action statements have been identified for *Philoria loveridgei*, those relevant to the Project include:

- Protect known and potential habitat from activities that reduce moisture levels;
- Maintain vegetation and deep leaf-litter around streams; and
- Adopt the OEH frog hygiene protocol to prevent the spread of chytrid fungus in amphibian habitat.

Two priority action statements have been identified for *Philoria pughii*, those relevant to the Project include:

- Protect areas of known habitat from roading, logging and other disturbance; and
- Adopt the OEH frog hygiene protocol to prevent the spread of chytrid fungus in amphibian habitat.

Two priority action statements have been identified for *Philoria richmondensis*, those relevant to the Project include:

- Protection of areas of known habitat from roading, logging and other disturbance; and
- Adoption of the OEH frog hygiene protocol to prevent the spread of chytrid fungus in amphibian habitat.

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

The following key threatening processes (under the TSC Act) have been identified as being relevant to the species included within this assessment:

- Bushrock removal; several of these frog species are known to utilise bush rock as a habitat resource. Removal of such biotic elements may reduce local potential habitat.
- Clearing of native vegetation; the clearing of native vegetation could reduce potential breeding, foraging and shelter habitat for all of these frog species.
- Infection of frogs by amphibian chytrid causing the disease chytridiomycosis; the movement of vehicles and workers close to and across waterways may result in the spread of the disease to local populations of frogs.
- Predation by feral cats; cats and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132kV easement may increase potential hunting grounds for local cat populations and put greater predation pressure on local frog populations.
- Predation by the European red fox; foxes and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132kV easement may increase potential hunting grounds for local fox populations and put greater predation pressure on local frog populations.
- Removal of dead wood and dead trees; some frog species shelter under fallen timber and leaves, therefore the removal of such habitat during the Project could reduce potential habitat area within the study area east.

Conclusion

The Project has the **potential** to have an adverse impact on *Mixophyes balbus*, *Mixophyes iteratus*, *Philoria loveridgei*, *Philoria pughii*; and *Philoria richmondensis* species. A number of

measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Hunter, D. and Gillespie, G.R. (2010). National Recovery Plan for the Stuttering Frog *Mixophyes balbus*. Department of Sustainability and Environment, Melbourne. Viewed online 16/11/2010.

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NSW Scientific Committee (2002). Final determination. Stuttering frog - endangered species listing. Viewed online 11/11/2010.

<http://www.environment.nsw.gov.au/determinations/StutteringFrogEndSpListing.htm>

NSW Scientific Committee (1999). Final determination. Giant barred frog - endangered species listing. Viewed online 11/11/2010.

<http://www.environment.nsw.gov.au/determinations/GiantBarredFrogEndSpListing.htm>

NSW Scientific Committee (2005). Final determination. *Loveridge's frog* - endangered species listing. Viewed online 11/11/2010.

<http://www.environment.nsw.gov.au/determinations/LoveridgesFrogEndSpListing.htm>

NSW Scientific Committee (2005). Final determination. *Philoria pughii* (a frog) - endangered species listing Viewed online 11/11/2010.

<http://www.environment.nsw.gov.au/determinations/PhiloriaPughiEndSpListing.htm>

NSW Scientific Committee (2005). Final determination. *Philoria richmondensis* (a frog) - endangered species listing. Viewed online 11/11/2010.

<http://www.environment.nsw.gov.au/determinations/PhiloriaRichmondensisEndSpListing.htm>

3.1.17 Owls: Barking Owl (*Ninox connivens*); Powerful Owl (*Ninox strenua*); Grass Owl (*Tyto capensis*); Masked Owl (*Tyto novaehollandiae*); and Sooty Owl (*Tyto tenebricosa*).

h) *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*

Ninox connivens (Vulnerable, TSC Act) is known and predicted to occur within the Nandewar, Northern Complex and Tenterfield Plateau sub-regions of the Border Rivers/Gwydir CMA (respectively), and known or predicted to occur in the following Northern Rivers CMA sub-regions: Cataract, Clarence Lowlands, Clarence Sandstones, Richmond - Tweed, Rocky River Gorge, Stanthorpe Plateau and Woodenbong. *Ninox connivens* is found throughout continental Australia except for the central arid regions. The species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. No individuals of this species were observed during field surveys of the study area. Given that individual cases of mortality and nest loss are considered significant for this species (NPWS 2003), there is the potential for the Project to have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Ninox strenua (Vulnerable, TSC Act) is known within the Tenterfield Plateau sub-region of the Border Rivers/Gwydir CMA, and known within the Cataract, Clarence Lowlands, Clarence Sandstones, Richmond - Tweed, Rocky River Gorge, Stanthorpe Plateau and Woodenbong sub-regions of the Northern Rivers CMA. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered, mostly historical records on

the western slopes and plains. This species responded to call playback within the study area during URS field surveys, and as such, was considered to be present and active within the study area. Given the presence of suitable habitat inside the Project area the Project will potentially have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Tyto capensis (Vulnerable, TSC Act) is known to occur within the Northern Rivers CMA, within the Clarence Lowlands and Richmond - Tweed subregions, and is predicted to occur within the Clarence Sandstones sub-region. In NSW they are more likely to be resident in the north-east. No individuals of this species were observed during field surveys of the study area. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Tyto novaehollandiae (Vulnerable, TSC Act) is predicted to occur within the Nandewar, Northern Complex and Tenterfield Plateau sub-regions of the Border Rivers/Gwydir CMA and is known to occur within the following Northern Rivers CMA sub-regions: Cataract, Clarence Lowlands, Clarence Sandstones, Richmond - Tweed, Rocky River Gorge, Stanthorpe Plateau and Woodenbong. This species extends from the coast where it is most abundant to the western plains. No individuals of this species were observed during URS field surveys of the study area. Given the presence of suitable habitat inside the Project area, the Project has the potential to have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Tyto tenebricosa (Vulnerable, TSC Act) is known to occupy the following Northern Rivers CMA sub-regions; Cataract, Clarence Lowlands, Clarence Sandstones, Richmond - Tweed, Rocky River Gorge, Stanthorpe Plateau, and Woodenbong. This species occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. No individuals of this species were observed during URS field surveys of the study area. Given the presence of suitable habitat inside the Project area, the Project has the potential to have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

- i) *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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (iii) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (iv) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

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

- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

Ninox connivens inhabits diverse vegetation such as; woodland and open forest, including fragmented remnants and partly cleared farmland. The species is flexible in its habitat use and hunting can extend to closed forest and open areas. The species is also able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW). These habitats are typical of some of the vegetation found within the study area. The species is known to require large, permanent territories, and to use the same nest sites repeatedly over several years (OEH 2012). As such, the clearing of vegetation, some of which is consistent with *Ninox connivens* habitat, is considered to have the potential to fragment or isolate the species, given the species' nesting and territorial requirements.

Ninox strenua occupies a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Ninox strenua* habitat, will potentially further fragment or isolate the species.

Tyto capensis occurs in areas of tall grass including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Tyto capensis* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

Tyto novaehollandiae inhabits dry eucalypt forests and woodlands from sea level to 1100 m elevation. Some of these habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Tyto novaehollandiae* habitat, will potentially further fragment or isolate the species.

Tyto tenebricosa occurs within rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Some of these habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Tyto tenebricosa* habitat, will potentially further fragment or isolate the species.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

- m) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

To date, no recovery or threat abatement plans has been developed for *Tyto capensis*. A Recovery Plan has been prepared for the Large Forest Owls: Powerful Owl (*Ninox strenua*), Sooty Owl (*Tyto tenebricosa*) and Masked Owl (*Tyto novaehollandiae*) (DEC, 2006) A draft recovery plan has been prepared for the Barking Owl (*Ninox connivens*) (NPWS 2003).

A draft recovery plan has been developed for *Ninox connivens* (NPWS 2003) which outlines a number of recovery actions for the species. Actions relevant to the Project include:

- Increase education and awareness of and involvement in the conservation of the Barking Owl and its habitat in NSW.

- Undertake threat abatement and mitigation.
- Protect known Barking Owl nest sites and surrounding habitat.
- Assist with the protection of Barking Owl habitat from disturbance due to developments and activities..

OEH has also developed a number of priority actions and strategies to assist species recovery. The three key recovery strategies relevant to the proposed development include:

- Retain standing dead trees and large fallen logs;
- Protect woodland and open forest remnants, especially those containing hollow-bearing trees; and
- Retain and enhance vegetation along watercourses and surrounding areas to protect important habitat of the owls and their prey.

In lieu of a formalised recovery plan for *Tyto capensis*, OEH has developed a number of priority actions and strategies to assist species recovery. The two key recovery strategies relevant to the proposed development include:

- Reduce the use of pesticides where Grass Owls are known to be present; and
- Identify, retain and protect areas of suitable habitat.

Recovery actions outlined for the large forest owls: *Ninox strenua*, *Tyto tenebricosa* and *Tyto novaehollandiae* include the maintenance of habitat value at key sites and throughout the former range by active participation in land-use planning processes and by active vegetation rehabilitation at strategic sites. Population monitoring objectives have also been set to allow assessment of the efficacy of management actions. Specific recovery actions identified for these three species include:

- Reducing the use of pesticides;
- Identify, retain and protect areas of suitable habitat;
- Retain at least a 200 metre buffer of native vegetation around known nesting sites;
- Retain large stands of native vegetation, especially those containing hollow-bearing trees; and
- Protect riparian vegetation to preserve roosting areas. Protect hollow-bearing trees for nest sites. Younger recruitment trees should also be retained to replace older trees in the long-term.

For all owls assessed, the proposed works have some inconsistencies with the above recovery strategies outlined to assist in the recovery of these species. The priority actions and recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

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

The following key threatening process (TSC Act) has have been identified as being relevant to the owl species included within this assessment:

- Clearing of native vegetation; the clearing of native vegetation could reduce potential breeding, hunting and shelter habitat for all of these owl species. Vegetation clearing practices that remove old, hollow-bearing trees and change open forest structure to dense regrowth are particular threats.
- Removal of dead wood and dead trees; this is identified as a key threat for owl species which rely on stags and hollow bearing trees (including dead trees) for nesting habitat. Retaining dead timber and stags is listed as a key recovery measure for these species.

Conclusion

The Project will **not** have an adverse impact on *Tyto capensis*. The Project has the **potential** to have an adverse impact on *Ninox connivens*, *Ninox strenua*, *Tyto novaehollandiae* and *Tyto tenebricosa*.

A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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3.1.18 Parrots: Little Lorikeet (*Glossopsitta pusilla*); Swift Parrot (*Lathamus discolor*); and Turquoise Parrot (*Neophema pulchella*).

- 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*

Glossopsitta pusilla (Vulnerable, TSC Act) is known to occur within the Nandewar, Northern Complex and Tenterfield Plateau sub-region of the Border Rivers/Gwydir CMA, as well as the Clarence Lowlands, Clarence Sandstones, Cataract, Richmond - Tweed, Stanthorpe Plateau, Rocky River Gorge and Woodenbong sub-regions of the Northern Rivers CMA. This species was recorded during URS surveys. Given the presence of suitable habitat within the Project

area, it is considered likely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Lathamus discolor (Endangered, TSC Act; Endangered, EPBC Act) is predicted to occur within the Nandewar, Northern Complex and Tenterfield Plateau sub-regions of the Border Rivers/Gwydir CMA, and is known in the Clarence Lowlands, Clarence Sandstones, Richmond - Tweed and Stanthorpe Plateau sub-regions of the Northern Rivers CMA. In NSW, the species mostly occurs on the coast and south west slopes. Given the presence of suitable habitat within the Project area, it is considered that the Project could have an adverse effect on the life cycle of the species through actions such as habitat and vegetation clearing such that a viable population is placed at risk of extinction.

Neophema pulchella (Vulnerable, TSC Act) is known within the Nandewar, Northern Complex, sub-region of the Border Rivers/Gwydir CMA, and the Clarence Lowlands, Clarence Sandstones and Stanthorpe Plateau sub-regions of the Northern Rivers CMA. Its range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. This species was observed during field surveys by URS. Given the presence of suitable habitat within the Project area, it is considered likely that the Project would have an adverse effect on the life cycle of the species such that a viable population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Glossopsitta pusilla forages primarily in the canopy of open Eucalyptus forest and woodland, and also find food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used by this species. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Glossopsitta pusilla* habitat is considered likely to further fragment or isolate the species.

Lathamus discolor occur in areas where eucalypts are flowering profusely or where there are abundant lerp infestations. These habitats are typical of some of the vegetation found within the study area. The clearing of vegetation, some of which is consistent with *Lathamus discolor* habitat, is considered likely to further fragment or isolate the species and its habitat.

Neophema pulchella lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. These habitats are typical of some of the bushland found within the study area. Clearing vegetation, some of which is consistent with *Neophema pulchella* is considered likely to further fragment or isolate the species.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

A recovery plan has been developed for *Lathamus discolor*; *Swift Parrot Recovery Team (2001). Swift Parrot Recovery Plan*. The plan identifies a number of recovery actions recommended to assist with the species recovery throughout its range. Those actions relevant to the Project include:

- Identify the extent and quality of foraging habitat
- Identify the extent and quality of foraging habitat within the overwintering range.
- Mapping of foraging and breeding habitat
- Develop a strategy to provide for a continued supply of suitable nest hollows
- Management and protection of habitat
- Manage swift parrot habitat at a landscape scale
- Reduce the incidence of collisions
- Population and habitat monitoring

To date, no recovery or threat abatement plans have been developed for *Glossopsitta pusilla*, or *Neophema pulchella*. As such, the proposed works are not inconsistent with any objectives or actions of a recovery plan or threat abatement plan.

In lieu of a formalised recovery plan for *Glossopsitta pusilla*, OEH has developed a number of priority actions and strategies to assist species recovery. The three key recovery strategies relevant to the proposed development include:

- Retain large old trees, especially those that are hollow-bearing;
- Ensure recruitment of trees into the mature age class so that there is not a lag period of decades between the death of old trees and hollow formation in younger trees;
- Protect large flowering *Eucalyptus* trees throughout the habitats frequented by this species; and
- Manage remnant woodlands and forest for recovery of old-growth characteristics.

In lieu of a formalised recovery plan for *Neophema pulchella*, OEH has developed a number of priority actions and strategies to assist species recovery. The three key recovery strategies relevant to the proposed development include:

- Undertake fox and feral cat control programs in key habitat areas.;
- Retain areas of open woodland with grassy under-storey and adjoining grassland; and
- Protect hollow-bearing trees for nest sites. Younger mature trees should also be retained to provide replacements for the older trees when they eventually die and fall over.

For all parrots assessed, the proposed works are inconsistent with some of the above recovery strategies outlined to assist in the recovery of these species. The priority actions and recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

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

The following key threatening process (TSC Act) has been identified as being relevant to the parrot species included within this assessment:

- Clearing of native vegetation; the clearing of native vegetation could reduce potential breeding, foraging and shelter habitat for all of these parrot species. Small scale clearing, such as during roadworks and fence construction continues to destroy habitat and it will be decades before revegetated areas supply adequate forage sites. The loss of old hollow-bearing trees has reduced nest sites, and increased competition with other native and exotic species that need large hollows with small entrances to avoid predation.
- Predation by feral cats; cats and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132kV easement across alignment east may increase potential hunting grounds for local cat populations and put greater predation pressure on *Neophema pulchella* populations.
- Predation by the European red fox; foxes and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132kV easement across alignment east may increase potential hunting grounds for local fox populations and put greater predation pressure on local *Neophema pulchella* populations.

Conclusion

The Project is considered likely to have an **adverse** impact on *Glossopsitta pusilla*, *Lathamus discolor* and *Neophema pulchella*. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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3.1.19 Petauridae and Burramyoidae – Eastern Pygmy-possum (*Cercartetus nanus*); Yellow-bellied Glider (*Petaurus australis*) and Squirrel Glider (*Petaurus norfolcensis*)

- 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*

Cercartetus nanus (Vulnerable, TSC Act) is found in south east Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pillaga, Dubbo, Parkes and Wagga Wagga on the western slopes (DEC, 2005). This species was not observed during field surveys conducted in the study area, nor are there historical records within the Project area. Given the occurrence of potential habitat within the Project area it is considered likely that the Project would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Petaurus australis (Vulnerable, TSC Act) is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. This species was not observed during field surveys conducted within the study area. However, there are numerous historical records of the species throughout the locality. It is likely that the Project would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

Petaurus norfolcensis (Vulnerable, TSC Act) is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. This species was observed during field surveys conducted within the study area. There are also numerous historical records of the species throughout the locality. It is likely that the Project would have an adverse effect on the life cycle of the species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

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

Cercartetus nanus are found in a broad range of habitats from rainforest to sclerophyll forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. The species shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (*Pseudocheirus peregrinus*) dreys or thickets of vegetation (e.g. grass-tree skirts). Tree hollows are favoured as nesting sites. The Project will result in the clearing of potential habitat for this species. This clearing will also result in some fragmentation of vegetation throughout the Project area. Given the existing fragmentation the habitat to be removed is considered to be of importance to the long term survival of the species in the locality.

Petaurus australis occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. The species rely on large tree hollows for den sites. The species is very mobile and occupy large home ranges of between 20 and 85 ha to encompass dispersed and seasonally variable food resources. The Project will result in the clearing of potential habitat for this species. This clearing will also result in some fragmentation of vegetation throughout the Project area. Given the existing fragmentation the habitat to be removed is considered to be of importance to the long term survival of the species in the locality.

Petaurus norfolcensis inhabit mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. The species prefers mixed species stands with a shrub or *Acacia* midstory, and require abundant tree hollows for refuge and nest sites (DEC, 2005). The Project will result in the clearing of potential habitat for this species. This clearing will also result in some fragmentation of vegetation throughout the Project area. Given the existing fragmentation the habitat to be removed is considered to be of importance to the long term survival of the species in the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Cercartetus nanus*. In lieu of a formal recovery plan, DEC (2005) have developed recovery actions relevant to the Project:

- Control feral predators and rabbits;
- Avoid frequent burning of habitat; and
- Protect habitat in proposed development areas and retain linkages across the broader landscape.

A recovery plan has been developed for *Petaurus australis*; *Recovery Plan for the Yellow-bellied Glider (Petaurus australis)* (NSW National Parks and Wildlife Service, 2003). The plan lists a series of recovery objectives and actions aimed at recovering the species in NSW. The following are relevant to the Project:

- Identify and monitor significant populations of the species; and
- Encourage and assist in improving the protection and management of *Petaurus australis* and its habitat.

To date, no formal recovery plan has been developed for *Petaurus norfolcensis*. In lieu of a formal recovery plan, DEC (2005) have developed recovery actions relevant to the Project:

- Retain den trees and recruitment trees (future hollow-bearing trees);
- Retain food resources, particularly sap-feeding trees and understorey feed species such as Acacias and Banksias;
- Replace top one or two strands of barbed wire on fences with regular wire in and adjacent to habitat;
- Retain and protect areas of habitat, particularly mature or old growth forest containing hollow-bearing trees and sap-feeding trees; and
- In urban and rural areas retain and rehabilitate habitat to maintain or increase the total area of habitat available, reduce edge effects, minimise foraging distances and increase the types of resources available.

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 Project may result in an increase to the following key threatening process relevant to *Cercartetus nanus*, *Petaurus australis* and *Petaurus norfolcensis*:

- Clearing of native vegetation; the Project will require the clearing of native vegetation, some of which constitutes habitat for these species.
- Loss of hollow-bearing trees; the Project will require the clearing of hollow bearing trees, which may constitute habitat for these species.
- Removal of dead wood and dead trees; the Project will require the clearing of dead wood and dead trees, some of which may constitute habitat for these species.

Conclusion

The Project is considered likely to have an **adverse** impact on *Petaurus norfolcensis*. The Project has the **potential** to have an adverse impact on *Cercartetus nanus* and *Petaurus australis*.

A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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3.1.20 Pteropodidae: Eastern Tube-nosed Bat (*Nyctimene robinsoni*); Grey-headed Flying-fox (*Pteropus poliocephalus*) and Common Blossom-bat (*Syconycteris australis*)

- 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*

Nyctimene robinsoni (Vulnerable, TSC Act) occurs from north east Australia from Cape York south to the far north-east corner of NSW. There are few records from NSW, including the Nightcap, Tweed and Burringbar Ranges and Mt Warning. This species was not observed during field surveys conducted of the study area. However, there are historical records from Richmond Range National Park to the north of the Project area. Given the species' mobile nature the Project has the potential 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.

Pteropus poliocephalus (Vulnerable, TSC Act; Vulnerable, EPBC Act) is distributed through coastal and sub-coastal eastern Australia, from northern Queensland to Victoria. The species is highly mobile and the national population is fluid, moving up and down the east coast in search of food. This species roosts in defined "camps" typically in emergent trees close to water. It forages widely in search of fruit and nectar; up to 50 km from the roost site (*pers. com* Billie Roberts, *PhD Candidate, Griffith University*). **Attachment 7 Figure 1** shows the location of known roosts close to the Project area (Marcus Baseler, Environmental Resources Information Network, DSEWPaC).

Based on **Attachment 7 Figure 1**, there is evidence to suggest that an important population at Mallanganee is located in close proximity to the Project. As such, this particular population has the potential to be adversely affected by the Project, with the potential for the Project to disrupt the breeding cycle of the species, and the potential for electrocution of individuals occupying the Mallanganee camp. However, although there is considered to be a high likelihood for potential foraging habitat to occur within the Project area, due to the considerable distance of all other known camps from the Project, it is considered unlikely that the proposed action will have an adverse effect on the life cycle of the species within other populations as illustrated in **Attachment 7 Figure 1**, such that a viable local population of the species is likely to be placed at risk of extinction.

Syconycteris australis (Vulnerable, TSC Act) are distributed from coastal areas of eastern Australia from Hawks Nest in NSW to Cape York Peninsula in Queensland. The species also occurs in adjacent inland ranges in rainforest patches. The species was not observed during field surveys conducted of the study area. There are no historical records of the species within the Project area. Given the species mobile nature, the Project is unlikely 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.

- 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Nyctimene robinsoni favour streamside habitats within coastal subtropical rainforest and moist eucalypt forests with a well-developed rainforest understorey. They feed mainly on fruit and nectar from trees in the rainforest canopy and may come close to human settlement to visit flowering or fruiting trees (DEC, 2005). The Project will result in the clearing of potential habitat for this species, within the alignment east. The Project has the potential to further isolate and fragment this species habitat.

Pteropus poliocephalus is found in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. The species may travel up to 50km each night to feed (DEC, 2005). The Project will result in clearing of potential foraging habitat for this species, and as such has the potential to further isolate and fragment potential habitat for this species. However, the species undertakes both local and seasonal long range migrations, and as such is highly mobile in nature. Therefore, it is not considered likely that the Project will lead to the modification of habitat in the Project area, to the extent that the long-term survival of the species is at risk.

Syconycteris australis often roost in littoral rainforest and feed on nectar and pollen from flowers in adjacent heath and paperbark swamps. They have also been recorded in a range of subtropical forest types, rainforest, wet sclerophyll forest and coastal Eucalypt forest. They generally roost individually in dense foliage and vine thickets of the sub-canopy, staying in the same general area for a season. They change roost sites daily, but each roost site is generally only 50m or so away from other recent roosts (DEC, 2005). The Project will result in the clearing of potential habitat for this species within the alignment east. Given the species' mobile nature, it is considered unlikely that this clearing will represent significant habitat fragmentation. Given the lack of records of *Syconycteris australis* within the Project area, the habitat to be removed is considered to be of low importance to the long term survival of the species in the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no formal recovery plan has been developed for *Nyctimene robinsoni* and *Syconycteris australis*. In lieu of a formal recovery plan, DEC (2005) has developed a series of recovery actions for each species.

The recovery actions for *Nyctimene robinsoni* relevant to the Project are:

- Control and remove introduced weeds at known locations; and
- Protect and rehabilitate areas of rainforest and wet eucalypt forest, particularly rainforest along streams.

The recovery actions for *Syconycteris australis* relevant to the Project are:

- Protect areas of littoral rainforest, coastal heath and paperbark swamp; and
- Initiate and support rainforest and heath regeneration projects.

A national recovery plan has been prepared for *Pteropus poliocephalus*, identified recovery actions (DECCW 2010, DECCW 2009) are:

- Protect roost sites, particularly avoid disturbance September through November;
- An appropriate fire regime which protects the species from frequent fire;
- Identify and protect key foraging areas off areas supporting the species to preclude stock;
- Weed control;
- Identify powerline black spots and implement measures to reduce deaths;
- To sustainably reduce deliberate destruction of flying foxes in fruit crops;
- To reduce negative public attitudes and reduce conflict with humans;
- Monitor population trends and improve knowledge on demographics;
- Increase effectiveness and efficiency of recovery initiatives; and
- Provide long term economic benefits associated with the protection of the species

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

The following key threatening process relevant to *Nyctimene robinsoni*, *Pteropus poliocephalus* and *Syconycteris australis* may be increased by the Project:

- Clearing of native vegetation; the Project will require the clearing of native vegetation, some of which constitutes habitat for these species.

Conclusion

The Project has the **potential** to have an adverse impact on *Nyctimene robinsoni* and *Pteropus poliocephalus*. The Project is **not** considered likely to have an adverse impact on *Syconycteris australis*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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3.1.21 Rainforest Birds: Coxen's Fig-Parrot (*Cyclopsitta diophthalma coxeni*); Wompoo Fruit-Dove (*Ptilinopus magnificus*); Rose-crowned Fruit-Dove (*Ptilinopus regina*); and Superb Fruit-Dove (*Ptilinopus superb*).

- 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*

Cyclopsitta diophthalma coxeni (Critically Endangered, TSC Act; Endangered, EPBC Act) occurs in the Northern Rivers CMA. It is known and predicted to occur within the Richmond - Tweed subregions (Part A and B respectively) and known in the Woodenbong sub-region of the CMA. The species is believed to be limited to about five populations scattered between Bundaberg in Queensland and the Hastings River in NSW. No individuals of this species were observed during field surveys of the study area. Given the presence of suitable habitat within the Project area, and the limited population size of the species it is considered likely that the Project could have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Ptilinopus magnificus (Vulnerable, TSC Act) is known to occur within the following Northern Rivers CMA sub-regions: Cataract, Clarence Lowlands, Clarence Sandstones, Richmond - Tweed, Rocky River Gorge, Stanthorpe Plateau and Woodenbong. It occurs along the coast and coastal ranges from the Hunter River in NSW to Cape York Peninsula. No individuals of this species were observed during field surveys of the study area. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Ptilinopus regina (Vulnerable, TSC Act) is known to occur within the Cataract, Clarence Lowlands, Richmond - Tweed, Stanthorpe Plateau, Woodenbong sub-regions of the Northern Rivers CMA, as well as being predicted to occur within the Rocky River Gorge sub-region. This species occurs along the coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York. No individuals of this species were observed during field surveys of the study area. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Ptilinopus superb (Vulnerable, TSC Act) is known within the Northern Rivers CMA occurring within the Clarence Lowlands, Richmond - Tweed and Woodenbong sub-regions, and predicted to occur within the Clarence Sandstones sub-region. The species occurs principally from north-eastern in Queensland to north-eastern NSW. It is much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya. No individuals of this species were observed during field surveys of the study area. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Cyclopsitta diophthalma coxeni is usually recorded from drier rainforests and adjacent wetter eucalypt forest but rarely seen due to its small size and cryptic habits. The species is also found in the wetter lowland rainforests that are now largely cleared in NSW. These habitats are typical of some of the vegetation found within the study area. The clearing of vegetation, some of which is consistent with *Cyclopsitta diophthalma coxeni* habitat, is considered to have the potential to further fragment or isolate the species.

Ptilinopus magnificus occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests. These habitats are typical of some of the vegetation found within the study area. The clearing of vegetation, some of which is consistent with *Ptilinopus magnificus* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

Ptilinopus regina occurs mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Ptilinopus regina* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

Ptilinopus superbus is known within the Northern Rivers CMA - within the Clarence Lowlands, Richmond - Tweed and Woodenbong sub-regions. The species is predicted to occur within the Clarence Sandstones sub-region. This species inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Ptilinopus superbus* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no recovery or threat abatement plans have been developed for *Ptilinopus regina* or *Ptilinopus superbus*. A Recovery Plan has been prepared for *Cyclopsitta diophthalma coxeni* (NPWS 2002) and *Ptilinopus magnificus* (DECCW 2010a, 2010b).

Two recovery plans have been developed that encompass *Ptilinopus magnificus* (DECCW 2010a and b). Recovery actions relevant to the species and the Project include:

- To protect rainforest, related vegetation and species from clearing
- To protect rainforest and related vegetation from fragmentation, modification and degradation
- To protect rainforest and related vegetation from the impact of weeds
- To protect rainforest from fire and to promote the implementation of appropriate fire regimes in related vegetation
- To minimise the impacts of human interference
- To engage the community and private land-holders in biodiversity conservation
- To establish effective monitoring of biodiversity related projects
- Minimise human-induced disturbance and mortality of species

OEH has also developed a number of priority actions and strategies to assist species recovery. The four key recovery strategies relevant to the proposed development include:

- Retain forested corridors that link east to west migration routes;
- Encourage and initiate weed control programs;
- Protect known and potential food trees; and
- Protect rainforest and moist forest habitat.

In lieu of a formalised recovery plan for *Ptilinopus regina*, OEH has developed a number of priority actions and strategies to assist species recovery. The four key recovery strategies relevant to the proposed development include:

- Retain forested corridors that link north-south and east-west migration routes;
- Encourage and initiate weed control programs;
- Protect remnant stands of rainforest and moist forest from clearing or development; and
- Protect known and potential food trees.

In lieu of a formalised recovery plan for *Ptilinopus superbus*, OEH has developed a number of priority actions and strategies to assist species recovery. The main recovery strategy relevant to the proposed development is:

- Retain and protect rainforest remnants.

A Recovery Plan has been prepared for *Cyclopsitta diophthalma coxeni* (NPWS 2002). It outlines a range of long term and immediate objectives for this species. These include the maintenance of habitat value at key sites and throughout the former range by active participation in land-use planning processes and by active vegetation rehabilitation at strategic sites. Population monitoring objectives have also been set to allow assessment of the efficacy of management actions. The main recovery action of relevance to the project outlined for *Cyclopsitta diophthalma coxeni* is:

- Retain and protect areas of rainforest and adjoining wet eucalypt forest.

The proposed works are inconsistent with some of the above recovery strategies outlined to assist in the recovery of these species. The priority actions and recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

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

The following key threatening process (TSC Act) has been identified as being relevant to the rainforest bird species included within this assessment:

- Clearing of native vegetation; the clearing of native vegetation could reduce potential breeding, foraging and shelter habitat for all of these honeyeater bird species. Removing important feed trees (figs and other trees classified as rainforest species in particular) would limit the food resources available for these species. Vegetation clearing and increasing habitat fragmentation and dissection of habitat corridors is a threat to these species.

Conclusion

The Project is **not** considered likely to result in an adverse impact on *Ptilinopus magnificus*, *Ptilinopus regina* or *Ptilinopus superbus*. The Project is considered likely to have an **adverse** impact on *Cyclopsitta diophthalma coxeni*. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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3.1.22 Reptiles: White-crowned Snake (*Cacophis harriettae*); Three-toed Snake-tooth Skink (*Coeranoscincus reticulatus*); Pale-headed Snake (*Hoplocephalus bitorquatus*); Stephens' Banded Snake (*Hoplocephalus stephensii*) and Border Thick-tailed Gecko (*Underwoodisaurus sphyrurus*).

- 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*

Cacophis harriettae (Vulnerable, TSC Act) is known from the Northern Rivers CMA. Several historical records of this species exist within the study area east. *Cacophis harriettae* preys upon smaller reptiles, within a range of habitats (DEC, 2005). The Project may result in the disturbance to potential habitat for this species, and would have an adverse effect on the lifecycle of the species such that a viable local population is placed at risk of extinction.

Coeranoscincus reticulatus (Vulnerable, TSC Act; Vulnerable, EPBC Act) is infrequently observed due to its burrowing habits. The species is known from the Northern Rivers CMA (DEC, 2005). This species could be predicted to occur within the study area east, based on habitats present. The Project may result in the disturbance to potential habitat for this species which may have an adverse effect on the lifecycle of the species such that a viable local population is placed at risk of extinction.

Hoplocephalus bitorquatus (Vulnerable, TSC Act) occurs from south east Queensland to north east NSW. The species occurs in a range of habitats, but prefers stream side locations (DEC, 2005). This species is predicted to occur within the Project area, based on habitats present. The Project may result in the disturbance to potential habitat for this species and would have an adverse effect on the lifecycle of the species such that a viable local population is placed at risk of extinction.

Hoplocephalus stephensii (Vulnerable, TSC Act; Vulnerable, EPBC Act) occurs from Gosford in NSW to southern Queensland (DEC, 2005). Numerous historical records of this species exist within the study area. The Project may result in the disturbance to potential habitat for this species and would have an adverse effect on the lifecycle of the species such that a viable local population is placed at risk of extinction.

Underwoodisaurus sphyrurus (Vulnerable, TSC Act; Vulnerable, EPBC Act) is most commonly recorded in the granite country of the New England Tablelands. Historical records of this species exist in the study area west. The Project may result in the disturbance to potential habitat for this species and would have an adverse effect on the lifecycle of the species such that a viable local population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Cacophis harriettae occurs in dry eucalypt forest and woodland, particularly areas with a varied and well-developed litter layer, where small lizards are abundant. The species is also occasionally found in moist eucalypt forest and coastal heathland. The Project will require the clearing of potential *Cacophis harriettae* habitat in the form of vegetation clearing and potential movement of rock matter. It is considered possible that the Project would result in significant additional fragmentation of habitat for this species. Given the existing easement, the habitat to be removed is also considered to be of low importance to the long-term survival of the species within the locality.

Coeranoscincus reticulatus prefers rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. The species lives in loose soil, leaf litter and rotting logs, feeding on invertebrates. *Coeranoscincus reticulatus* is predicted to occur within the Project area east, based on habitats present. It is considered possible that works associated with the Project would result in significant disturbance to potential habitat for this species. Given the existing easement, the habitat to be removed is considered to be of importance to the long-term survival of the species within the locality.

Hoplocephalus bitorquatus is found in dry eucalypt forests and woodlands, cypress woodland and occasionally in rainforest or moist eucalypt forest. The species favours streamside areas, particularly in drier habitats. The Project has the potential to impact upon land that may be considered potential *Hoplocephalus bitorquatus* habitat. It is considered possible that the Project would result in significant additional fragmentation of habitat for this species. Given the existing easement, the habitat to be removed is also considered to be of low importance to the long-term survival of the species within the locality.

Hoplocephalus stephensii occurs in rainforest and eucalypt forests and rocky areas up to 950m in altitude. The Project has the potential to remove habitat that may be used by this species. It is considered possible that the Project would result in significant additional fragmentation of habitat for this species. Given the existing easement, the habitat to be removed is also considered to be of low importance to the long-term survival of the species within the locality.

Underwoodisaurus sphyrurus lives on steep rocky or scree slopes. The species prefers forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter. The Project may result in disturbance to potential habitat for this species. It is considered possible that the

Project would result in significant additional fragmentation of habitat for this species. Given the existing easement, the habitat to be removed is also considered to be of low importance to the long-term survival of the species within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

No formal recovery plan has been developed for the reptile species included within this assessment.

In lieu of a formal recovery plan, OEH has developed a series of recovery actions for *Cacophis harriettae* of which the following are relevant to the Project:

- Do not collect fallen timber for firewood or bush rock for gardens from bushland areas; and
- Protect known and potential habitat from clearing, fragmentation and isolation.

In lieu of a formal recovery plan, OEH has developed a series of recovery actions for *Coeranoscincus reticulatus*, of which the following are relevant to the Project:

- Retain and protect areas of rainforest and moist eucalypt forest; and
- Control pigs when they occur within potential habitat for this species

In lieu of a formal recovery plan, OEH has developed a series of recovery actions for *Hoplocephalus bitorquatus*, of which the following are relevant to the Project:

- Retain hollow-bearing trees as well as large, mature trees;
- Retain and protect stands of native vegetation, especially those with old and dead trees and along creeklines; and
- Establish and protect forested wildlife corridors.

In lieu of a formal recovery plan, OEH has developed a series of recovery actions for *Hoplocephalus stephensii*, of which the following are relevant to the Project:

- Retain and protect stands of native vegetation, especially those with old and dead trees; and
- Retain hollow bearing trees as well as large, mature trees.

In lieu of a formal recovery plan, OEH has developed a series of recovery actions for *Underwoodisaurus sphyrurus*, of which the following are relevant to the Project:

- Retain bushrock in its natural setting and obtain rocks for gardens only from licensed dealers;
- Assist with the control of foxes, feral cats and feral goats; and
- Retain and protect areas of rocky dry open forest and woodland from clearing, fragmentation and disturbance.

Works associated with the Project have the potential to be inconsistent with the recovery actions recommended above. While there is a lack of formal recovery plans for these species, the Project will involve potential habitat loss and disturbance for these reptile 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 following key threatening processes (KTPs) are relevant to the species included within this assessment:

- Bushrock removal; the Project may require the removal of bushrock from within potential habitat for each of these species.
- Clearing of native vegetation; the Project will require vegetation clearing along the entire alignment. The vegetation to be cleared may constitute habitat for these species.
- High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition; the reptile species included within this assessment are all threatened by inappropriate fire regimes. It is considered unlikely that the Project would result in significant changes to the current fire regime.
- Predation by the European red fox (*Vulpes vulpes*); *Vulpes vulpes* poses a risk to the reptile species in this assessment. *Vulpes vulpes* were observed throughout the Project area, and are known to utilise tracks and open areas for hunting. As such, the Project may result in increased pressures on native species within the Project area..
- Predation by the feral cat (*Felis catus*); *Felis catus* poses a risk to the reptile species in this assessment. *Felis catus* were observed throughout the Project area, so it is considered that the Project has the potential to increase to this KTP within the Project area through habitat disturbance to native species, and opening up of areas to invasive predators.
- Removal of dead wood and dead trees; the reptiles species included in this easement rely upon dead wood, dead trees and bark as a habitat resource. The Project may require the removal of some dead wood, coarse woody debris and dead trees from within the Project area.

Conclusion

The Project has the **potential** to have an adverse impact on *Cacophis harriettae*; *Hoplocephalus bitorquatus*, and *Hoplocephalus stephensii*. The Project is considered likely to have an **adverse** impact on *Coeranoscincus reticulatus* and *Underwoodisaurus sphyrurus*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report, which aim to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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3.1.23 Robins: Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*); Scarlet Robin (*Petroica boodang*); and Flame Robin (*Petroica phoenicea*).

- 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*

Melanodryas cucullata cucullata (Vulnerable, TSC Act) is known to occur within the Nandewar, Northern Complex and Tenterfield Plateau sub-regions of the Border Rivers/Gwydir CMA. It is also known within the Cataract, Clarence Lowlands, Clarence Sandstones, Stanthorpe Plateau sub-regions of the Northern Rivers CMA, and predicted to occur within the Rocky River Gorge sub-region. No individuals of this species were observed during URS field surveys. The closest record of this species is from approximately 35km to the south of Casino. Given the occurrence of suitable habitat within the Project area, it is considered likely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Petroica boodang (Vulnerable, TSC Act) is predicted to occur within the Nandewar, Northern Complex, and known within the Tenterfield Plateau sub-region of the Border Rivers/Gwydir CMA. It is also known within the Cataract, Clarence Lowlands, Clarence Sandstones, Richmond - Tweed, Rocky River Gorge, Stanthorpe Plateau and Woodenbong sub-regions of the Northern Rivers CMA. No individuals of this species were observed during field surveys of the area. There are recent records of this species across study area west and east. The species has been recorded in close proximity to Dumaresq substation and around Bald Rock National Park near Tenterfield. There are also records within Basket Swamp National Park and Timbarra National Park near Black Swamp, and Richmond Range National Park near Kyogle. Given the occurrence of suitable habitat within the Project area, it is considered likely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Petroica phoenicea (Vulnerable, TSC Act) is known to occur within the Nandewar, Northern Complex and Tenterfield Plateau sub-regions of the Border Rivers/Gwydir CMA. It is known or predicted to occur within the Cataract, Clarence Lowlands, Clarence Sandstones, Richmond - Tweed, Rocky River Gorge, Stanthorpe Plateau and Woodenbong sub-regions of the Northern Rivers CMA. No individuals of this species were observed during field surveys of the area. The closest record of this species is from the Malara State Forest approximately 15km to the south of the proposed alignment (study area east). Given the occurrence of suitable habitat within the Project area, it is considered likely that the Project would have an adverse effect on the life cycle of the species such that a viable population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Melanodryas cucullata cucullata are found in lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee communities; often in, or near clearings or open areas. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Melanodryas cucullata cucullata* habitat, is considered likely to further fragment or isolate the species.

Petroica boodang are found in dry eucalypt forests and woodlands. They usually occur where the understorey is open and grassy with few scattered shrubs. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Petroica boodang* habitat, is considered likely to further fragment or isolate the species.

Petroica phoenicea occurs in upland moist eucalypt forests and woodlands, often on ridges and slopes in areas of open understorey. It migrates in winter to more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains. The clearing of vegetation, some of which is consistent with *Petroica phoenicea* habitat is considered likely to further fragment or isolate the species.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no recovery or threat abatement plans have been developed for the Robins considered within this Biodiversity Assessment. As such, the proposed works are not inconsistent with any objectives or actions of a recovery plan or threat abatement plan.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist *Melanodryas cucullata cucullata*, *Petroica boodang* and *Petroica phoenicea* species recovery. The key recovery strategies relevant to the Project are common across these robin species and out detailed below:

- Retain existing forest, woodland and remnant grassland vegetation, including paddock trees;
- Retain dead timber on the ground in open woodland areas; and
- Increase the size of existing remnants, by planting trees and establishing buffer zones of un-modified, uncultivated pasture around woodland remnants.

For the three robins assessed, the proposed works are not inconsistent with any of the above recovery strategies outlined to assist in the recovery of these species. The recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

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

The following key threatening processes (TSC Act) have been identified as being relevant to the species included within this assessment:

- Clearing of native vegetation; the clearing of native vegetation could reduce potential breeding, foraging and nesting sites habitat for all of these robin bird species. A common threat across these bird species is fragmentation of habitat caused by vegetation clearing. Robins are also threatened by high rates of vegetation regrowth which occurs after disturbance events.
- Removal of dead wood and dead trees; reduction in the structural complexity of habitat, including reductions in canopy cover, shrub cover, ground cover, logs, fallen branches and leaf litter. Robins are threatened by degradation and simplification of habitat by the removal of standing dead timber, logs and coarse woody debris.
- Invasion of native plant communities by exotic perennial grasses; Robins are threatened by modification and destruction of ground- and shrub layers within habitat caused by removal of native plants, litter and fallen timber and the introduction of exotic pasture grasses.
- Predation by feral cats; cats and other predators are known to use tracks, roads and easements as hunting grounds. The construction of the easement across alignment west as well as the augmentation of the existing 132kV easement across alignment east may increase potential hunting grounds for local cat populations and put greater predation pressure on Robin bird populations. *Petroica phoenicea* is also threatened by the robbing of nests and predation of fledglings by rats.

Conclusion

The Project is considered likely to have an **adverse** impact on *Melanodryas cucullata cucullata*, *Petroica boodang* and *Petroica phoenicea*. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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3.1.24 Waterbirds: Bush-hen (*Amaurornis olivaceus*); Black-necked Stork (*Ephippiorhynchus asiaticus*); Brolga (*Grus rubicunda*); Comb-crested Jacana (*Irediparra gallinacea*); Black-tailed Godwit (*Limosa limosa*);

Red-backed Button-quail (*Turnix maculosa*); and Australian Painted Snipe (*Rostratula benghalensis australis*).

- 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*

Amaurornis olivaceus (Vulnerable, TSC Act) is known to occur within the Clarence Lowlands, Richmond – Tweed and Woodenbong sub-regions of the Northern Rivers CMA. The closest previous record of this species in proximity to the proposed Project is a historical record approximately 15km to the South of Piora. This distance is considered a sufficient buffer from any direct Project impacts including all pre-construction, construction and post-construction activities. No individuals of this species were observed during URS field surveys. Given the presence of the existing 132kV easement and associated access tracks across alignment east as well as the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Ephippiorhynchus asiaticus (Endangered, TSC Act) is known to occur within the Nandewar, Northern Complex subregion of the Border Rivers/Gwydir CMA and known to occur across relevant sub-regions of the Northern Rivers CMA. There are numerous records of this species in proximity to the project area between Drake and Lismore. No individuals of this species were observed during URS field surveys. Given the presence of potential habitat for this species within the Project area, the Project will potentially have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Grus rubicunda (Vulnerable, TSC Act) is known to occur within the Clarence Lowlands, Clarence Sandstones and Richmond - Tweed sub-regions of the Northern Rivers CMA. The closest previous record of this species to the proposed Project area is approximately 20km to the south of Tatham. This distance is considered a sufficient buffer from any direct Project impacts including all pre-construction, construction and post-construction activities. No individuals of this species were observed during URS field surveys. Given the presence of the existing 132kV easement and associated access tracks across alignment east as well as the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Irediparra gallinacea (Vulnerable, TSC Act) is known to occur within in the Clarence Lowlands, Clarence Sandstones, Richmond - Tweed and Woodenbong sub-regions of the Northern Rivers CMA. There are a number of previous records of this species around Casino (alignment east). No individuals of this species were observed during URS field surveys. Given the presence of the existing 132kV easement and associated access tracks across alignment east as well as the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Limosa limosa (Vulnerable, TSC Act) is known to occur within the Clarence Lowlands sub-region of the Northern Rivers CMA with no known geographic restrictions. There is one historic record of this species in close proximity to the proposed Project at Casino. No individuals of this species were observed during URS field surveys. Given the presence of the existing 132kV easement and associated access tracks across alignment east as well as the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Turnix maculosa (Vulnerable, TSC Act) is known to occur within the Clarence Lowlands, Clarence Sandstones and Richmond - Tweed sub-regions of the Northern Rivers CMA. There are previous records of this species between Casino and Lismore. No individuals of this species were observed during URS field surveys. Given the presence of the existing 132kV easement and associated access tracks across alignment east as well as the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Rostratula benghalensis australis (Endangered, TSC Act; Vulnerable, EPBC Act) is known to occur within the Northern Rivers CMA, it is known to occur within the Clarence Lowlands and Clarence Sandstones sub-regions, and is predicted to occur within the Richmond - Tweed. There is one previous record of this species approximately 15km to the South of Lismore substation. No individuals of this species were observed during URS field surveys. Given the presence of the existing 132kV easement and associated access tracks across alignment east as well as the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Amaurornis olivaceus inhabits tall dense understorey or ground-layer vegetation on the margins of freshwater streams and natural or artificial wetlands, usually within or bordering rainforest, rainforest remnants or forests. These habitats are typical of some found within the study area east. Proposed project activities at locations consistent with *Amaurornis olivaceus* habitat is not considered likely to further fragment or isolate the species, given the mobility of the species, the presence of the existing 132kV easement and the preferential avoidance of activities to be carried out in sensitive wetland and riparian environments.

Ephippiorhynchus asiaticus are mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. These habitats are typical of some found within study area east. Proposed Project activities at locations consistent with *Ephippiorhynchus asiaticus* habitat are considered to potentially further fragment or isolate the species.

Grus rubicunda occur in shallow wetland areas. Their main habitat is freshwater meadows or shallow freshwater marshes, although they have been known to nest in deep freshwater marshes and in the shallows of permanent open water in association with vegetation. These habitats are typical of some found within the study area east. Proposed project activities at locations consistent with *Grus rubicunda* habitat is not considered likely to further fragment or isolate the species, given the mobility of the species, the presence of the existing 132kV easement and the preferential avoidance of activities to be carried out in sensitive wetland and riparian environments.

Irediparra gallinacea inhabits permanent freshwater wetlands, either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies, or fringing and aquatic vegetation. Proposed project activities at locations consistent with *Irediparra gallinacea* habitat is not considered likely to further fragment or isolate the species, given the mobility of the species, the presence of the existing 132kV easement and the preferential avoidance of activities to be carried out in sensitive wetland and riparian environments.

In inland areas, *Limosa limosa* occurs on mudflats and in those portions of large muddy lakes and swamps (freshwater or brackish) where the water is less than 10 cm deep. Proposed project activities at locations consistent with *Limosa limosa* habitat is not considered likely to further fragment or isolate the species, given the mobility of the species, the presence of the existing 132kV easement and the preferential avoidance of activities to be carried out in sensitive wetland areas.

Turnix maculosa inhabit grasslands, open and savannah woodlands with grassy ground layer, pastures and crops of warm temperate areas, typically only in regions subject to annual summer rainfall greater than 400 mm. Observations of populations suggest the species prefers sites near water, including grasslands and sedgeland near creeks, swamps and springs, and wetlands. Proposed project activities at locations consistent with *Turnix maculosa* habitat is not considered likely to further fragment or isolate the species, given the mobility of the species, the presence of the existing 132kV easement and the preferential avoidance of activities to be carried out in sensitive wetland and riparian areas.

Rostratula benghalensis australis prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Proposed project activities at locations consistent with *Rostratula benghalensis australis* habitat is not considered likely to further fragment or isolate the species, given the mobility of the species, the presence of the existing 132kV easement and the preferential avoidance of activities to be carried out in sensitive wetland areas.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

To date, no recovery or threat abatement plans have been developed for the waterbird species considered within this Biodiversity Assessment. As such, the proposed works are not inconsistent with any objectives or actions of a recovery plan or threat abatement plan.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist in the *Amaurornis olivaceus* species recovery. The four key recovery strategies relevant to the Project include:

- Control introduced predators, such as Red Foxes and feral Pigs, and restrain domestic Cats, particularly at night;
- Protect wetlands from clearing, filling, draining, sedimentation and pollution;
- Avoid use of herbicides and pesticides near wetlands; and
- Control weeds in and next to wetlands.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist in the *Ephippiorhynchus asiaticus* species recovery. The five key recovery strategies relevant to the Project include:

- Avoid modification and degradation of wetland habitats or any reduction of levels of Black-necked Stork prey within them, as a result of grazing by stock (though strategic grazing may be used to enhance surrounding habitat), urban and agricultural run-off and pollution, including pesticides and herbicides. Although artificial water sources can provide foraging habitat, such wetlands are often suboptimal habitat;
- Manage wetlands and their catchments to ensure natural hydrological regimes are maintained to provide suitable habitat for Storks seasonally and annually, including during periods of drought;
- The most important management action for Black-necked Storks in NSW is to prevent them flying into powerlines, by routing or re-routing powerlines away from wetlands and floodplains and potential nesting areas on floodplains, and by attaching discs to existing powerlines where Storks, and other birds, regularly fly;
- Prevent loss and degradation of wetlands within the range of the species;
- Prevent widespread clearance of tall isolated paddock trees that provide or potentially provide suitable nesting sites for the species, and also avoid widespread clearance of floodplain vegetation; and
- Minimise human disturbance around known and potential nesting sites and preferred wetlands.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist in the *Grus rubicunda* species recovery. The key recovery strategy relevant to the Project is:

- Retain or reintroduce ecologically sustainable water flows to wetland habitat.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist in the *Irediparra gallinacea* species recovery. The three key recovery strategies relevant to the Project include:

- Retain or reintroduce ecologically sustainable water flows to known or potential wetland habitats;
- Protect all known or potential wetland habitats from flood mitigation works, clearing or development close to wetlands, including a vegetated buffer of at least 200 metres around the perimeter of the wetland; and
- Control Red Foxes (*Vulpes vulpes*) and other potential introduced predators.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist in the *Limosa limosa* species recovery. The three key recovery strategies relevant to the Project include:

- Searches for the species should be conducted in suitable habitat in proposed development areas in appropriate time of the year;
- Manage estuaries and inland water-bodies and the surrounding landscape, to ensure the natural hydrological regimes are maintained; and
- Protect and maintain known or potential habitats; implement protection zones around known habitat sites and recent records.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist in the *Turnix maculosa* species recovery. The three key recovery strategies relevant to the Project include:

- Reduce habitat destruction pressures from agriculture and urban development;
- Control introduced predators, especially Red Foxes; and
- Protect and restore Red-backed Button-quail habitats, especially preventing drainage or destruction of key wetlands and habitats, as the species shows some preference for nesting near water.

In lieu of a formalised recovery plan, OEH has developed a number of priority actions and strategies to assist in the *Rostratula benghalensis australis* species recovery. The four key recovery strategies relevant to the Project include:

- Control foxes, feral dogs and cats;
- Protect wetlands and watercourses from pollution;
- Limit the use of pesticides and other chemicals near wetlands and consider alternatives where available; and
- Protect wetlands and associated marshy areas from clearing or disturbance.

For all waterbirds assessed, the proposed works are not inconsistent with any of the above recovery strategies outlined to assist in the recovery of these species. The recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

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

The following key threatening processes (TSC Act) have been identified as being relevant to the waterbird species included within this assessment:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands – this key threatening process is common across the waterbirds assessed. These species are threatened by the clearing, filling and draining of wetlands and watercourse for various anthropogenic activities. Waterbirds are threatened by the modification or degradation of wetland environments which provide foraging, breeding and nesting habitat. The Project would involve the upgrade and construction of a number of new watercourse crossings as identified within **Appendix C** of this Report
- Clearing of native vegetation - Black-necked Storks in particular are threatened by the potential loss/ clearing of paddock trees which they rely on for nesting sites.
- Predation by feral cats – cats and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132kV easement may increase potential hunting grounds for local cat populations and put greater predation pressure on local waterbird populations.

- Predation by the European red fox – foxes and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132kV easement may increase potential hunting grounds for local fox populations and put greater predation pressure on local waterbird populations.
- Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) – This is an identified Key Threatening Process for both *Amaurornis olivaceus* and *Turnix maculosa*.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Amaurornis olivaceus*, *Grus rubicunda*, *Irediparra gallinacea*, *Limosa limosa*, *Turnix maculosa* and *Rostratula benghalensis australis*. The Project has the **potential** to have an adverse impact on *Ephippiorhynchus asiaticus*. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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3.1.25 Macropods: Rufous Bettong (*Aepyprymnus rufescens*); Black-Striped Wallaby (*Macropus dorsalis*); Parma Wallaby (*Macropus parma*), Brush-tailed Rock Wallaby (*Petrogale penicillata*), Long-nosed Potoroo (*Potorous tridactylus tridactylus*), and Red-legged Pademelon (*Thylogale stigmatica*).

- 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*

Aepyprymnus rufescens (Vulnerable, TSC Act) has largely vanished from inland NSW areas but there are sporadic, unconfirmed records from the Pilliga and Torrington districts. This

species was recorded during URS surveys. Given the presence of suitable habitat within the Project area, it is considered possible that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Macropus dorsalis (Endangered, TSC Act) occurs from the Townsville area in Queensland to northern NSW where it occurs on both sides of the Great Divide. On the north-west slopes of NSW it occurs in Brigalow remnants to south of Narrabri. On the north coast it is confined to the upper catchments of the Clarence and Richmond Rivers. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Macropus parma (Vulnerable, TSC Act) once occurred from north-eastern NSW to the Bega area in the southeast. Their range is now confined to the coast and ranges of central and northern NSW from the Gosford district to the Queensland border. This species was not observed during field surveys by URS. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Petrogale penicillata (Endangered, TSC Act; Vulnerable, EPBC Act) have a range which extends from south-east Queensland to the Grampians in western Victoria, roughly following the line of the Great Dividing Range. In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. This species was not recorded during URS surveys. Given the mobile nature of this species, the existing 132kV easement and the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Potorous tridactylus (Vulnerable, TSC Act; Vulnerable, EPBC Act) is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania, including some of the Bass Strait islands. It is known to occur within the following sub-regions of the Northern Rivers CMA: Cataract, Clarence Lowlands, Richmond - Tweed, Rocky River Gorge, Stanthorpe Plateau and Woodenbong. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is placed at risk of extinction.

Thylogale stigmatica (Vulnerable, TSC Act) has a patchy distribution along coastal and sub-coastal eastern Australia from Cape York to the Hunter Valley in NSW. This species was not observed during field surveys by URS. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, it is considered unlikely that the Project would have an adverse effect on the life cycle of the species such that a viable population is 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. This factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

Aepyprymnus rufescens inhabits a variety of forests from tall, moist eucalypt forest to open woodland, with a tussock grass understorey. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Aepyprymnus rufescens* habitat, is considered to potentially further fragment or isolate the species.

Macropus dorsalis habitat is characterised by dense woody or shrubby vegetation occurring near a more open, grassy area to provide suitable feeding habitat. The clearing of vegetation, some of which is consistent with *Macropus dorsalis* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

Macropus parma habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Macropus parma* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

Petrogale penicillata occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. These habitats are typical of some of the areas found within the study area. The clearing of vegetation, some of which is consistent with *Petrogale penicillata* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east and the presence of suitable habitat outside of the Project area.

Potorous tridactylus inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Potorous tridactylus* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

Thylogale stigmatica inhabit forest with a dense understorey and ground cover, including rainforest, moist eucalypt forest and vine scrub. These habitats are typical of some of the bushland found within the study area. The clearing of vegetation, some of which is consistent with *Thylogale stigmatica* habitat, is not considered likely to further fragment or isolate the species, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

Two recovery plans exist for the Brush-tailed rock-wallaby *Petrogale penicillata* (NSW National Parks and Wildlife Service 2003; NSW Department of Environment, Climate Change and Water (NSW DECCW), 2008). The NSW National Parks and Wildlife Service Recovery Plan is for the Warrumbungle Brush-tailed Rock-wallaby population. Key recovery actions identified of relevance to the Project include management of feral predators, retention of rocky habitat and adjacent open forest or grassland areas; retention of habitat corridors between colony sites and protection of colony sites from human interference or disturbance. The proposed works are not inconsistent with any of the above recovery strategies outlined to assist in the recovery of this species. The recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

To date, no recovery or threat abatement plans have been developed for *Aepyprymnus rufescens*, *Macropus dorsalis*, *Macropus parma*, *Potorous tridactylus*, or *Thylogale stigmatica*. As such, the proposed works are not inconsistent with any objectives or actions of a recovery plan or threat abatement plan.

In lieu of formalised recovery plans, OEH has developed a number of priority actions and strategies to assist in the recovery of these species, those that are relevant to the proposed activity include:

- Control weeds in areas of known and potential habitat;
- Reconnect patches of known and potential habitat with wide, densely vegetated corridors;
- Monitor populations with shelter or feeding habitat occurring on private land;
- Undertake fox, feral cat, feral dog and rabbit control program targeting areas of known or high quality potential habitat;
- Apply mosaic pattern hazard burns to ensure that a range of age stands of heath is available;
- Manage burning to maintain the diversity and density of the understorey;
- Retain and protect stands of native vegetation, especially those known to contain populations of Red-legged Pademelons;
- Protect known and potential habitat from clearing, fragmentation and isolation;
- Retain rocky habitat and adjacent open forest or grassland areas;
- Retain habitat corridors between colony sites; and
- Protect *Petrogale penicillata* colony sites from human interference or disturbance (DEC 2005).

For all Macropods assessed, the proposed works are not inconsistent with any of the above recovery strategies outlined to assist in the recovery of these species. The priority actions and

recovery strategies have been considered as part of the proposed mitigation measures addressed in **Section 7, Appendix D4** of this Report.

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

The following key threatening processes (TSC Act) have been identified as being relevant to the species included within this assessment:

- Clearing of native vegetation and land clearing; the clearing of native vegetation could reduce potential breeding, foraging and shelter habitat for this species.
- Predation by feral cats; cats and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132 kV easement may increase potential hunting grounds for local cat populations and put greater predation pressure on local populations of small mammals by feral cats.
- Predation by the European red fox (TSC Act); foxes and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132 kV easement may increase potential hunting grounds for local fox populations and put greater predation pressure on local populations of small mammals by foxes.
- Competition and grazing by the feral European rabbit (TSC); rabbit populations are known to occur within the vicinity of the alignment, and the proposed actions will increase the area of cleared grassy sections within the study area. Providing greater feeding potential for local rabbit populations and potentially reducing foraging areas for the small mammals.

Conclusion

The Project is **not** considered likely to have an adverse impact on *Macropus dorsalis*, *Macropus parma*, *Petrogale penicillata*, *Potorous tridactylus tridactylus*, and *Thylogale stigmatica*. The Project has the **potential** to have an adverse impact on *Aepyprymnus rufescens*. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

NSW DECCW (2008) Recovery plan for the brush-tailed rock-wallaby (*Petrogale penicillata*)
NSW Department of Environment, Climate Change and Water (NSW DECCW) May 2008
Viewed online 10/02/2012

<http://www.environment.nsw.gov.au/resources/threatenedspecies/08138btrw.pdf>

NSW National Parks and Wildlife Service (2003) Brush-tailed rock-wallaby (endangered Warrumbungles population) Recovery Plan. NSW NPWS, Hurstville NSW. Viewed online 19/11/2010

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10605>

NSW Scientific Committee (2003) Brush-tailed rock wallaby - Endangered species determination - final. DEC (NSW), Sydney. Viewed online 19/11/2010

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10605>

Assessments of Significance

4.1 Populations

4.1.1 Tusked Frog (*Adelotus brevis*) Endangered Population in the Nandewar and New England Tableland Bioregions

- 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.*

Not applicable.

This refers to vulnerable species listed in Part 1 of Schedule 2 of the TSC Act, endangered species listed in Part 1 of Schedule 1 of the TSC Act, critically endangered species listed in Part 1 of Schedule 1A of the TSC Act, vulnerable species listed in Part 1 of Schedule 5 of the FM Act, endangered species listed in Part 1 of Schedule 4 of the FM Act and critically endangered species listed in Part 1 of Schedule 4A of the FM Act.

- 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*

Adelotus brevis (Endangered Population, TSC Act) is found from central Queensland to southern NSW. The Project may require the removal of habitat in which *Adelotus brevis* (DEC, 2005) may occur. However, the nearest records of the species are from locations at some distance from the Project area.

If the species were present, the Project may have a potential adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

- c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*
- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
 - (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

- d) *In relation to the habitat of a threatened species, population or ecological community:*
- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
 - (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
 - (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Adelotus brevis occurs within Wet Sclerophyll Forests (**Submission Response Attachment 3**) and pasture. It is usually found near creeks, ditches and ponds and calls while hidden amongst vegetation or debris.

The clearing of vegetation, some of which is consistent with potential *Adelotus brevis* habitat, would potentially fragment or isolate the some populations of the species.

Given that numerous records of the species have been recorded in to the east of the proposed alignment, albeit within study area east, the potential for habitat of this species to be adversely impacted as a result of the proposed works is not considered to pose a threat to the the long term survival of the population within the locality.

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

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

No formal recovery plan has been developed for *Adelotus brevis*. In lieu of a formal recovery plan, DEC (2005) has developed a series of recovery actions for the threatened frog species that are relevant to the Project. These recommend that:

- Frogs only be handled when absolutely necessary;
- Care be taken with the use of pesticides and other chemicals near wetlands, ponds and streams;
- Native vegetation be protected from clearing or disturbance when bordering streams and ponds;
- Footwear, equipment and tyres be cleaned before and after visiting frog sites; and
- Any records of threatened frog species are reported to DEC (now OEH).

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

The following key threatening processes (under the TSC Act) have been identified as being relevant to *Adelotus brevis*:

- Clearing of native vegetation; the clearing of native vegetation could reduce potential breeding, foraging and shelter habitat for this species.
- Infection of frogs by amphibian chytrid causing the disease chytridiomycosis; the movement of vehicles and workers close to and across waterways may result in the spread of the disease to local populations of frogs.
- Predation by feral cats; cats and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132kV easement may increase potential hunting grounds for local cat populations and put greater predation pressure on local frog populations.
- Predation by the European red fox; foxes and other predators are known to use tracks, roads and easements as hunting grounds. The augmentation of the existing 132kV easement may increase potential hunting grounds for local fox populations and put greater predation pressure on local frog populations.
- Removal of dead wood and dead trees; some frog species shelter under fallen timber and leaves, therefore the removal of such habitat during the Project could reduce potential habitat area within the study area east.

Conclusion

The Project has the **potential** to have an adverse impact on a population of *Adelotus brevis*. A number of measures have been recommended (See **Section 7, Appendix D4** of this Report) to

mitigate the impact so as to ensure that biodiversity values within the Project area are maintained or improved.

References

DEC, (2005). Tusked Frog population in the Nandewar and New England Tableland Bioregions – profile. Viewed online 19/11/2010.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=103032>

4.1.2 Olive Perchlet (*Ambassis agassizii*) Endangered Population

- 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.*

Not applicable.

This refers to vulnerable species listed in Part 1 of Schedule 2 of the TSC Act, endangered species listed in Part 1 of Schedule 1 of the TSC Act, critically endangered species listed in Part 1 of Schedule 1A of the TSC Act, vulnerable species listed in Part 1 of Schedule 5 of the FM Act, endangered species listed in Part 1 of Schedule 4 of the FM Act and critically endangered species listed in Part 1 of Schedule 4A of the FM Act.

- 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.*

Ambassis agassizii (Endangered Population, FM Act) occurs in the Murray-Darling drainage system. Female *Ambassis agassizii* may have at least 2000 eggs. Spawning occurs in November and December when the water temperature reaches 23°C. The eggs are scattered among vegetation. Both sexes reach maturity in one year, with some males surviving and breeding for two years and some females breeding in their third year. Records of this species exist within the Project area west. The Project will require the installation and upgrade of a number of waterway crossings as part of the access tracks required for the Project. These waterway crossings will be designed and constructed in accordance with the NSW DPI *Policy and Guidelines for Fish Friendly Waterway Crossings* and *Why Do Fish Need to Cross the Road?* (2003), and relevant TransGrid specifications. Furthermore, all works will be carried out in accordance with industry guidelines developed by Landcom (2008) *Managing Urban Stormwater: Soils and Construction Volume 1*, and (DECC, 2008) Volume 2, (The blue book Volumes 1 and 2). As such, it is considered unlikely that the Project would have an adverse impact on the species such that a viable local population is placed at risk of extinction.

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. This relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Ambassis agassizii inhabit rivers, creeks, ponds and swamps. They are usually found in slow-flowing or still waters, often near overhanging vegetation or amongst logs, dead branches and boulders. They often congregate around shelter sites (e.g. large woody debris (snags) and vegetation) during the day and disperse during the night to feed.

The Project will require the upgrade and installation of water crossings throughout the Project area, which may result in some disturbance to potential *Ambassis agassizii* habitat. Many waterways within the Project area are already spanned by various crossings. Given the presence of existing crossings, and assuming mitigation measures are adopted for the construction of fish friendly passage, it is considered unlikely that the Project would result in significant fragmentation, isolation, removal or modification of *Ambassis agassizii* habitat from other areas of habitat.

The habitat that may be impacted by the Project is not considered to be of high importance to the long-term survival of the species in the locality, as the disturbance will be limited to waterway crossing construction, and impact likelihood reduced through adoption of mitigation measures recommended in **Section 7, Appendix D4** of this Report.

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

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

- f) *whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.*

No recovery plan exists for *Ambassis agassizii*. In lieu of a recovery plan, the DII has developed a series of recovery actions for threatened fish species, of which the following are relevant to the Project:

- Remove barriers and reinstate large woody debris; and
- Promote appropriate land management practices to improve water quality and river health (NSW DII, 2005).

In addition to these recovery plan actions, any waterway crossings within the Project area will be designed and constructed in accordance with the NSW DPI *Policy and Guidelines for Fish Friendly Waterway Crossings* and *Why Do Fish Need to Cross the Road?* (2003), and relevant TransGrid specifications. Furthermore, all works will be carried out in accordance with industry guidelines developed by Landcom (2008) *Managing Urban Stormwater: Soils and Construction Volume 1*, and (DECC, 2008) Volume 2, (The blue book Volumes 1 and 2).

- g) *whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,*

The following key threatening processes (under the TSC Act) have been identified as being relevant to *Ambassis agassizii*:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; any changes to the natural flow of waterways within the Project area may limit the potential of this species from moving throughout the locality.

- Predation by *Gambusia holbrooki*; this species is threatened by predation by the invasive species *Gambusia holbrooki*.
- Removal of dead wood and dead trees; dead wood within rivers is likely to provide potential habitat for this species.

Works associated with the Project are considered unlikely to increase any of the relevant key threatening processes for this population.

Conclusion

The Project is **not** considered likely to have an adverse impact on a population of *Ambassis agassizii*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report which aim to minimise the potential impact of the Project, to ensure that biodiversity values within the Project area are maintained or improved. For this reason, all access track works associated with the currently proposed 37 waterway crossing upgrades and 27 new waterway installations (**Table 7-4** of this Appendix) to be designed and constructed in accordance with the NSW DPI *Policy and Guidelines for Fish Friendly Waterway Crossings* and *Why Do Fish Need to Cross the Road?* (2003), and relevant TransGrid specifications. Furthermore, all works will be carried out in accordance with industry guidelines developed by Landcom (2008) *Managing Urban Stormwater: Soils and Construction* Volume 1, and (DECC, 2008) Volume 2, (The blue book Volumes 1 and 2). Taking these measures and guidelines into consideration, it is not considered likely that the Project will have an adverse impact on the Endangered population of western Olive Perchlet *Ambassis agassizii*.

References

NSW DII, (2005). Olive perchlet. Profiles for species, populations & ecological communities. Primary Industries, Fishing and Aquaculture. Viewed online 19/11/2010.
http://pas.dpi.nsw.gov.au/Species/Species_Profile.aspx?SpeciesListingID=19

4.1.3 Eel-tailed Catfish (*Tandanus tandanus*) Endangered Population

- 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.*

Not applicable. This factor refers to vulnerable species listed in Part 1 of Schedule 2 of the TSC Act, endangered species listed in Part 1 of Schedule 1 of the TSC Act, critically endangered species listed in Part 1 of Schedule 1A of the TSC Act, vulnerable species listed in Part 1 of Schedule 5 of the FM Act, endangered species listed in Part 1 of Schedule 4 of the FM Act and critically endangered species listed in Part 1 of Schedule 4A of the FM Act.

- 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.*

Eel-tailed Catfish *Tandadnus tandanus* in the Murray/Darling Basin (Endangered Population, FM Act) is widely distributed throughout the Murray-Darling River System in NSW, Queensland, Victoria and South Australia (NSW Fisheries Scientific Committee 2008).

The life cycle of the species involves a spawning period from November to March. Males build circular nests of coarse sand or gravel with central sandy depressions up to a fortnight prior to spawning. Females are then forced into the nest for courtship to induce spawning, involving weaving and circling. Nests are then tended by males, whom fan and protect eggs from potential predators (Clunie and Koehn 2001a). The species has been historically recorded in close proximity to the proposed alignment (**Figure 2** series in **Appendix C** of this Report).

The Project will require some disturbance to watercourses that may provide potential suitable habitat for the species. However the disturbance will be short-term and only occur in areas requiring waterway crossings. Impacts will be limited to the construction and installation phases of the waterway crossings within the proposed alignment. Consultation with Fisheries (NSW DPI 2012) will be ongoing to ensure fish-friendly crossings are installed, in order to minimise disturbance to fish habitat. However, the Project has the potential to have an adverse effect on the life-cycle of the species should works be undertaken in the spawning period, in areas where the species are known to be locally present. However, it is not considered likely that the Project will have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. This factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.

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

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,*
- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

T. tandanus is not migratory, and lives in a wide range of habitats including rivers, creeks, lakes, billabongs and lagoons, and although it inhabits flowing streams, prefers sluggish or still waters. It can be found in clear to turbid waters, and over substrates ranging from mud to gravel and rock. The species is rare in natural riverine habitats but can be found in farm dams throughout inland NSW (NSW FSC 2008). The species also has a preference for alluvial systems with habitat containing undercut banks, root masses and large woody debris (Clunie and Koehn 2001a).

The Project will require the upgrade or installation of water crossings throughout the Project area, which may result in some disturbance to potential *T. tandanus* habitat. Several waterways within the Project area are already spanned by various crossings. Given the presence of existing crossings, and assuming mitigation measures are adopted for the construction of fish friendly passage, it is considered unlikely that the Project would result in significant fragmentation or isolation of *T. tandanus* habitat from other areas of habitat.

Furthermore, the habitat that may be impacted by the Project is not considered to be of high importance to the long-term survival of the population in the locality, as the disturbance will be

limited to waterway crossing construction, and impact likelihood reduced through adoption of mitigation measures recommended in **Section 7, Appendix D4** of this Report.

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

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area.

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

A recovery plan exists for the species (Clunie and Koehn 2001a), that outlines a number of recovery actions for the species, of which the following are relevant to the Project:

- Ensure that flow regimes are not significantly changed in areas where significant populations of freshwater catfish occur.

In addition to these recovery plan actions, it has been recommended that waterway crossings be constructed to allow fish friendly passage, hence the Project will not conflict with the recovery strategies for 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 following key threatening processes (under the TSC Act) have been identified as being relevant to *T.tandanus*:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; any changes to the natural flow of waterways within the Project area may limit the potential of this species from moving throughout the locality.
- Predation by *Gambusia holbrooki*; this species is threatened by predation by the invasive species *Gambusia holbrooki*.
- Removal of dead wood and dead trees; dead wood within rivers is likely to provide potential habitat for this species.

Conclusion

The Project is **not** considered likely to have an adverse impact on a population of *Tandadnus tandanus*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report which aim to minimise the potential impact of the Project, to ensure that biodiversity values within the Project area are maintained or improved. All access track works associated with the currently proposed 37 waterway crossing upgrades and 27 new waterway installations (**Table 7-4** of this Appendix) to be designed and constructed in accordance with the NSW DPI *Policy and Guidelines for Fish Friendly Waterway Crossings* and *Why Do Fish Need to Cross the Road?* (2003), and relevant TransGrid specifications. Furthermore, all works will be carried out in accordance with industry guidelines developed by Landcom (2008) *Managing Urban Stormwater: Soils and Construction* Volume 1, and (DECC, 2008) Volume 2, (*The blue book Volumes 1 and 2*). Taking these measures and guidelines into consideration, it is not considered likely that the Project will have an adverse impact on the endangered population of Eel-tailed Catfish *Tandadnus tandanus* in the Murray/Darling Basin.

References

Clunie P and Koehn J (2001a) Freshwater Catfish: A Recovery Plan. Volume1. Victorian Department of Natural Resources and Environment. Viewed online 10/2/2012 - http://www.dse.vic.gov.au/_data/assets/pdf_file/0016/112480/FreshwaterCatfishRecoveryPlan2001.pdf

Clunie P and Koehn J (2001b) Freshwater Catfish: A Resource Document. Volume 2. Victorian Department of Natural Resources and Environment. Viewed online 10/2/2012 - http://www.dse.vic.gov.au/_data/assets/pdf_file/0017/112481/FreshwaterCatfishResourceDocument2001.pdf

FSC (2008) Final Determination: The *Tandanus tandanus* – Eel tailed catfish in the Murray/Darling Basin as an endangered population. The Fisheries Scientific Committee. Viewed online 10/2/2012 - http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/290996/FD41-catfish.pdf

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Significant Impact Criteria

1.1 Flora

1.1.1 MacNutt's Wattle (*Acacia macnuttiana*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of an important population of a species

There is a slight chance that the proposal may disturb habitat that may contain specimens of *Acacia macnuttiana* (Vulnerable, EPBC Act; Vulnerable, TSC Act) in the Torrington district adjacent to the Alignment west. As no individuals were identified in areas targeted in and around the study area it is unlikely that the proposed development will have an adverse effect on the species such that a local population of the species will be placed at risk of extinction.

b) reduce the area of occupancy of an important population

The known locations of this species have been mapped on the Atlas of NSW Wildlife (DECCW, 2010). Alignment west avoids all mapped locations.

Since *Acacia macnuttiana* was not located along the alignment during field surveys conducted within the study area, the proposed action is not considered likely to reduce the overall area of occupancy of an important population as there should not be any clearing of the species.

c) fragment an existing important population into two or more populations

Acacia macnuttiana is known from five broad localities: Bald Rock National Park, Boonoo Boonoo National Park, private property south-west of Tenterfield, the Torrington district, and along the banks of Pindari Dam (DECCW, 2008). The mapped locations of these populations are remote from the Alignment west. Therefore, it is unlikely that the proposal will result in any populations being fragmented.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for this species.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for this species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of an important population

No areas of known habitat for *Acacia macnuttiana* will be cleared and therefore there should be no disruption to the breeding cycle of the species.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

As the known locations of *Acacia macnuttiana* are remote from the proposed Alignment west, it is considered very unlikely that potential habitat for this species will be removed or modified as a result of the proposed action (DECCW, 2010).

g) *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

Due to the remoteness of the proposal from the known locations of *Acacia macnuttiana*, the proposed works are unlikely to result in the establishment of any additional invasive species that may result in increased competition to this species (DECCW, 2010). The proposed works are unlikely to result in an alteration to the existing environment such that any invasive species become established in the species' habitat.

h) *introduce disease that may cause the species to decline, or*

There are no diseases known that are likely to cause *Acacia macnuttiana* to decline.

i) *interfere substantially with the recovery of the species.*

There are no existing recovery plans for *Acacia macnuttiana*. However DECCW (2005) has proposed several recovery actions for this species, relevant to the Project:

- Habitat management: Ongoing EIA - Advice to consent and planning authorities.
- Survey/Mapping and Habitat assessment.

Given the assessment and field survey undertaken as part of this report, it is considered unlikely that the species does occur within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and will not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works will cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works will not interfere with the recovery of this species, as no known individuals will be impacted, nor will any known habitat.

Conclusion

The significant impact criteria assessment concludes that the proposal is not likely to significantly impact *Acacia macnuttiana*. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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1.1.2 Ovenden's Ironbark (*Eucalyptus caleyi* subsp. *ovendenii*), Slaty Red Gum (*Eucalyptus glaucina*), Narrow-leaved Black Peppermint (*Eucalyptus nicholii*), Blackbutt Candlebark (*Eucalyptus rubida* subsp. *barbigerorum*), Wallangarra White Gum (*Eucalyptus scoparia*), Square-fruited Ironbark (*Eucalyptus tetrapleura*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of an important population of a species

Within the Project area, *Eucalyptus caleyi* subsp. *ovendenii* (Vulnerable, EPBC Act; Vulnerable, TSC Act) has been recorded as occurring in the study area, based on URS field studies conducted in the Project area. *Eucalyptus glaucina* (Vulnerable, EPBC Act; Vulnerable, TSC Act), *Eucalyptus nicholii* (Vulnerable, EPBC Act; Vulnerable, TSC Act), *Eucalyptus rubida* subsp. *barbigerorum* (Vulnerable, EPBC Act; Vulnerable, TSC Act), *Eucalyptus scoparia* (Vulnerable, EPBC Act; Endangered, TSC Act) and *Eucalyptus tetrapleura* (Vulnerable, EPBC Act; Vulnerable, TSC Act), are considered likely to occur in the Project area, based on previous records and habitats present. The Project may result in the clearing of potential habitat in the form of vegetation. The Project therefore has the potential to result in a long-term decrease in the size of a population of each of the above species.

b) reduce the area of occupancy of an important population

Eucalyptus caleyi subsp. *ovendenii* is known only from a limited area west of Guyra to west of Tenterfield, north-east NSW. Localities include western Torrington National Park, where the species occasionally dominates woodland communities. This species was reported as existing within the Project area, according to a URS field survey. According to the Threatened Species Scientific Committee, no important populations were identified within the Project area (TSSC, 2008nw).

Eucalyptus glaucina is found only on the north coast of NSW and in separate districts: near Casino where it can be locally common and farther south, from Taree to Broke, west of Maitland. No important populations were identified within the Project area (TSSC, 2008og).

Eucalyptus nicholii is found in less than 40 localities on the NSW Northern Tablelands, stretching from the Walcha-Niangala district just east of Tamworth, to just north of Glen Innes (TSSC, 2008oq). No important populations were reported within the Project area.

Eucalyptus rubida subsp. *barbigerorum* is restricted to scattered populations of the NSW Northern Tablelands, occurring from west of Glen Innes and Guyra, and in the Moonbi Ranges between Woolbrook and Nundle (TSSC, 2008pb). No important populations were identified within the Project area.

Eucalyptus scoparia is known from only three locations within NSW, all near Tenterfield in the far northern New England Tableland bioregion. It has been recorded from Bald Rock National Park, north-east of Tenterfield, western side of Donnybrook State Forest and Back Creek west of Donnybrook, west of Tenterfield (TSSC, 2008pd).

Eucalyptus tetrapleura is located in areas of coastal lowlands and coastal foothills in northern NSW. No important populations were identified within the Project area (TSSC, 2008ph).

c) *fragment an existing important population into two or more populations*

Eucalyptus caleyi subsp. *ovendenii* is known to exist in the area from URS field studies. *Eucalyptus glaucina*, *Eucalyptus nicholii*, *Eucalyptus rubida* subsp. *barbigerorum*, *Eucalyptus scoparia* and *Eucalyptus tetrapleura* are all likely to occur within the Project area. Due to the expansion of the existing 132kV easement to accommodate the proposed 330kV easement, the Project has the potential to result in the fragmentation of existing populations into two or more populations. However, the aforementioned species were not identified as important populations.

d) *adversely affect habitat critical to the survival of a species*

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for these species.

No habitat critical to the survival of these species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for these species is likely to occur within the Project area and therefore potentially be adversely impacted by the Project.

e) *disrupt the breeding cycle of an important population*

Little is known about the breeding cycle of the aforementioned *Eucalyptus* species. As the ecology of this species is largely unknown, it is difficult to determine whether the Project will disrupt the breeding cycle of this population. It should be noted that none of the populations of these species is identified as an important population.

f) *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Eucalyptus caleyi subsp. *ovendenii* is restricted in habitat to Northern NSW, from west of Guyra to west of Tenterfield. The species grows on shallow soils in dry, open grassy woodlands. Preferred altitudes are 610-820m, on granite substrates. The main threats to the species include invasion of habitat by introduced grasses, as well as clearing and fragmentation of grassy woodland habitat for agriculture, and grazing pressure (DECCWa, 2005). With this knowledge, the Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Eucalyptus glaucina is found only on the north coast of NSW and in separate districts: near Casino where it can be locally common and farther south, from Taree to Broke, west of Maitland. The species grows in grassy woodland and dry eucalypt forest and deep, moderately fertile and well-watered soils. The main threats to the species include clearing and fragmentation of habitat for agriculture and development, timber harvesting, and grazing pressure (DECCWb, 2005). Given this knowledge of the threats to this species, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Eucalyptus nicholii is common as an urban street tree and in gardens but is rarely found in the wild. Its distribution is limited to New England Tablelands of NSW, from Nundle to Tenterfield. The species is threatened by clearing and fragmentation of habitat for agriculture and grazing, destruction or disturbance due to roadside management, inappropriate fire regimes, collection of firewood, grazing by livestock, and collection of seed for horticulture (DECCWc, 2005). As a result, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Eucalyptus rubida subsp. *barbigerorum* usually occurs in woodland on medium or high fertility soils, often on cold flats. The main threats to this species are listed as clearing and fragmentation of woodland habitat for agriculture and development, timber collection and destruction and disturbance of habitat due to road-works (DECCWd, 2005). In the light of this information, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Eucalyptus scoparia occurs in Queensland and reaches its southern limit in NSW. In NSW it is known from only three locations near Tenterfield, including Bald Rock National Park. The species is found in open eucalypt forest and woodland on well-drained granite hilltops, slopes and rocky outcrops. The species is listed as Endangered under the *Threatened Species Act 1995* and is at risk of local extinction due to the small size of populations (DECCWe, 2005). Given this information, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Eucalyptus tetrapleura is restricted to dry or moist eucalypt forest on moderately fertile soil, often in low areas with poor drainage. Threats to the species include loss of habitat through clearing for agriculture, timber harvesting activities, road construction and maintenance, grazing by stock, and too-frequent fires (DECCWf, 2005). Given this information, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Eucalyptus caleyi subsp. *ovendenii* is threatened by invasive grass species, such as Coolatai Grass (DECCWa, 2005). It is possible that Coolatai Grass and other invasive grasses could exist in the Project area. *Eucalyptus glaucina* is not specifically identified as under threat by invasive species. *Eucalyptus nicholii* is not specifically identified as under threat by invasive species. *Eucalyptus rubida* subsp. *barbigerorum* is not specifically threatened by invasive species. *Eucalyptus scoparia* is not listed as specifically under threat by invasive species. *Eucalyptus tetrapleura* is not specifically listed as threatened by invasive species.

The invasive species identified may be accidentally spread via movement of plant and machinery within the Project area, or by transport of stockpiled construction material and organic matter during works undertaken in proximity to waterways.

Given the existing disturbances within the Project area, it is considered unlikely that the Project would result in invasive species that are harmful to *Eucalyptus caleyi* subsp. *ovendenii* becoming established in the species habitat.

h) introduce disease that may cause the species to decline

There are no known diseases that are likely to cause these species to decline. There is no mention in the relevant literature of any potential disease-based threats to these species. Rather, illegal clearing of land in known habitat areas and grazing is more likely to pose a more serious threat.

i) interfere substantially with the recovery of the species.

There are no existing recovery plans for *Eucalyptus caleyi* subsp. *ovendenii*, *Eucalyptus glaucina*, *Eucalyptus nicholii*, *Eucalyptus rubida* subsp. *barbigerorum* and *Eucalyptus scoparia*. DECCW (2005) has defined several recovery actions for each species as listed below, relevant to the Project:

Eucalyptus caleyi subsp. *ovendenii*

- Control feral herbivores in the range of the species.
- Research the ecological fire requirements of this species and use this information to develop ecological burning regimes and protective fire management strategies.
- Target priority weeds (especially Coolatai Grass)

Eucalyptus glaucina

- Maintain external populations in botanic gardens and nurseries.
- Liaise with landowners over management of populations of *Eucalyptus glaucina*.
- Avoid frequent fire that may suppress regeneration.
- Prepare Environmental Impact Assessment guidelines.
- Manage habitat clearing, loss or fragmentation.
- Limit grazing in known stands of *Eucalyptus glaucina* to enhance regeneration.
- Consider VCA or similar agreement for populations on private land.
- Monitor population size, habitat condition and threats at known sites with large populations.
- Assess implementation and effectiveness of forestry management prescriptions.
- Determine current population size and demography.
- Map extent of known populations.

Eucalyptus nicholii

- Only buy seed from appropriately licensed dealers.
- Only buy plants from appropriately licensed nurseries.
- Support local Landcare groups.
- Manage fire to promote regeneration.
- Practice sustainable grazing in areas of habitat and protect regenerating trees from grazing stock.
- Limit firewood collection in areas of habitat.
- Identify roadside populations and protect during road-works.
- Protect dry grassy woodland from clearing and fragmentation.

Eucalyptus rubida subsp. *barbigerorum*

- Support local Landcare groups.
- Identify roadside and easement populations and protect during road-works.
- Protect known populations and areas of potential habitat from clearing and timber collection.
- Rehabilitate disturbed areas of habitat.

Eucalyptus scoparia

- Support local Landcare groups.
- Stay on established tracks when visiting national parks.
- Protect known populations and areas of potential habitat from clearing and timber collection.
- Rehabilitate and protect disturbed areas of habitat.
- Notify OEH of any new records of *Eucalyptus scoparia* in NSW.

A recovery plan has been developed that encompasses *Eucalyptus tetrapleura* (DECCW 2010). Recovery actions identified for the species which are relevant to the Project include:

- Protect species and their habitats from the effects of clearing and fragmentation
- Protect the Region from the impact of weeds
- Minimise human-induced disturbance and mortality of species

- Reduce the impacts of domestic livestock on the natural environment.
- To engage the community and private landholders in biodiversity conservation
- To establish effective monitoring of biodiversity related projects.

In addition, DECCW (2005) has identified 22 priority actions to help recover this species. The following are related to the Project:

- Avoid frequent fire in areas of known habitat.
- Exclude stock by fencing habitat.
- Identify and protect populations in timber harvesting areas and along roadsides.
- Protect habitat from further clearing.
- Assist regeneration of habitat around isolated trees.

Given the expansion of the existing 132kV easement to accommodate the proposed 330kV easement, the Project has the potential to interfere substantially with the recovery of the above species.

Conclusion

The significant impact criteria assessment concludes that the proposal has the potential to significantly impact *Eucalyptus caleyi* subsp. *ovendenii*, *Eucalyptus glaucina*, *Eucalyptus nicholii*, *Eucalyptus rubida* subsp. *barbigerorum*, *Eucalyptus scoparia*, and *Eucalyptus tetrapleura*. As such, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in Volume 2 of the EA. A number of measures are recommended in **Section 7**, **Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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1.1.3 Ooline (*Cadellia pentastylis*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Cadellia pentastylis (Vulnerable, EPBC Act; Vulnerable, TSC Act) occurs along the western edge of the North West Slopes north from the Gunnedah area to west of Tenterfield, and extends into Queensland to Carnarvon Range and Callide Valley (DEWHA, 2008). The Atlas of NSW Wildlife (DECCW, 2010) shows *Cadellia pentastylis* populations occurring within scattered locations, including the Mole River locality and Tenterfield area south and south-east of the Alignment west. Scattered populations also exist to the north of the Alignment west near Tenterfield Creek. The species was identified at two properties both previously noted by OEH within the Mole River locality. Given that these populations are remote from the Alignment west, it is unlikely that the proposed development will have an adverse effect on the species such that the local populations will be placed at risk of extinction.

- b) reduce the area of occupancy of an important population

The known locations of this species have been mapped on the Atlas of NSW Wildlife (DECCW, 2010). Alignment west avoids all mapped locations. Since the populations of *Cadellia pentastylis* located with the adjacent vicinity of the alignment are not within the immediate Project area, the proposed action is not considered likely to reduce the overall area of occupancy of an important population as there should not be any clearing of the species.

- c) fragment an existing important population into two or more populations

Given the location and relative remoteness of current records from the Alignment west, it is unlikely that the proposal will result in any populations of *Cadellia pentastylis* being fragmented.

- d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for *Cadellia pentastylis*.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for this species is unlikely to be impacted by the Project.

- e) disrupt the breeding cycle of an important population

No areas of known habitat for *Cadellia pentastylis* will be cleared and therefore there should be no disruption to the breeding cycle of the species.

- f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

As the known locations of *Cadellia pentastylis* are remote from the proposed Alignment west, it is considered very unlikely that potential habitat for this species will be removed or modified as a result of the proposed action (DECCW, 2010).

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Due to the remoteness of the proposal from the known locations of *Cadellia pentastylis*, the proposed works are unlikely to result in the establishment of any additional invasive species that may result in increased competition to this species (DECCW, 2010). However, invasive species such as *Opuntia aurantiaca* (tiger pear) are listed as a threat within the species' Approved Conservation Advice and will need to be considered during the Project (DEWHA, 2008).

h) introduce disease that may cause the species to decline, or

Given the remoteness of known specimens from the proposed easement, it is highly unlikely that diseases would be introduced into *Cadellia pentastylis* habitat through construction activities. The Approved Conservation Advice for *Cadellia pentastylis* does not identify disease as a threat to the species' survival (DEWHA, 2008).

i) interfere substantially with the recovery of the species.

There is no recovery plan currently in place for *Cadellia pentastylis*, however OEH recommends the following actions to assist in the recovery of this species (DECC, 2005). These are:

- Support local Landcare groups.
- Assist with the control of feral goats in habitat areas.
- Protect populations and areas of potential habitat from frequent fire.
- Protect populations and habitat areas from grazing stock.
- Identify roadside populations and areas of habitat and protect during road maintenance works.
- Assist with the control weeds in habitat areas.
- Protect populations and areas of potential habitat from clearing or disturbance.
- Expand and reconnect isolated remnants of habitat.
- Enter into conservation agreements to protect Ooline populations.

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that the species occurs within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and will not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works will cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works will not interfere with the recovery of this species, as no known individuals will be impacted, nor will any known habitat.

Conclusion

The significant impact criteria assessment concludes that the proposal is not likely to significantly impact *Cadellia pentastylis*. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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1.1.4 Finger Panic Grass (*Digitaria porrecta*)

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

a) *lead to a long-term decrease in the size of a population*

Digitaria porrecta (Endangered, EPBC Act; Endangered, TSC Act) occurs in NSW and Queensland. In NSW it is found on the North West Slopes and Plains, from near Moree south to Tambar Springs and from Tamworth to Coonabarabran (DECCW, 2005). The Atlas of NSW Wildlife (DECCW, 2010) has the closest mapped *Digitaria porrecta* populations in the Inverell district, located approximately 117km to the south-west of Tenterfield. These records are remote enough from the Alignment west that the likelihood of presence is extremely low. As no individuals were identified in areas targeted in and around the study area it is unlikely that the proposed development will have an adverse effect on the species such that a population of the species will be placed at risk of extinction.

b) *reduce the area of occupancy of the species*

The known locations of this species have been mapped on the Atlas of NSW Wildlife (DECCW, 2010). Alignment west avoids all mapped locations. Since *Digitaria porrecta* was not located along the alignment during survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of an important population as there should not be any clearing of the species.

c) *fragment an existing population into two or more populations*

Given the remoteness of current records from the Alignment West, it is unlikely that the proposal will result in any populations of *Digitaria porrecta* being fragmented.

d) *adversely affect habitat critical to the survival of a species*

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for *Digitaria porrecta*. No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for this species is unlikely to be impacted by the Project.

e) *disrupt the breeding cycle of a population*

No areas of known habitat for *Digitaria porrecta* will be cleared and therefore there should be no disruption to the breeding cycle of the species.

f) *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

As the known locations of *Digitaria porrecta* are remote from the proposed Alignment West, it is considered very unlikely that potential habitat for this species will be removed or modified as a result of the proposed action (DECCW, 2010).

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Due to the remoteness of the proposal from the known locations of *Digitaria porrecta*, the proposed works are unlikely to result in the establishment of any additional invasive species that may result in increased competition to this species (DECCW, 2010). The proposed works are unlikely to result in an alteration to the existing environment such that any invasive species become established in the species' habitat.

h) introduce disease that may cause the species to decline, or

There are no diseases known that are likely to cause *Digitaria porrecta* to decline.

i) interfere with the recovery of the species.

There are no existing recovery plans for *Digitaria porrecta*. However DECCW (2005) has proposed priority actions for this species relevant to the Project:

- Conduct targeted surveys in potential habitat.
- Undertake weed control, especially of invasive exotic grasses.
- Ensure DECC is advised of any consents or approvals that affect the species.

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that the species does occur within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and will not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works will cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works will not interfere with the recovery of this species, as no known individuals will be impacted, nor will any known habitat.

Conclusion

The significant impact criteria assessment concludes that the proposal is not likely to significantly impact *Digitaria porrecta*. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DECCW (2005a) *Digitaria porrecta* – Profile

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10222>

DECCW (2005b) *Digitaria porrecta* - Priority Actions.

http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/pas_speciestype_details.aspx?type=Shrubs&kingdom=Plant

DECCW (2010) NPWS – Atlas of NSW Wildlife.

<http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp>

DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

1.1.5 Hairy Jointgrass (*Arthraxon hispidus*) and Bluegrass (*Dichanthium setosum*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Arthraxon hispidus (Vulnerable, EPBC Act; Vulnerable, TSC Act) has been recorded over a wide area in northern NSW from a variety of habitat types. It is found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps (DECCW, 2005a). The Atlas of NSW Wildlife (DECCW, 2010) has mapped *Arthraxon hispidus* in the Kyogle district to the north of the alignment East. Although these records are remote from the alignment East, the alignment traverses areas that may contain habitat for *Arthraxon hispidus*. However, given that the alignment east utilises an existing cleared easement and traverses mostly disturbed land, it is unlikely that the proposal would impact on important populations of this species. As no individuals were identified in areas targeted in and around the study area it is unlikely that the proposed development will have an adverse effect on the size of the species such that the local population of the species will be placed at risk of extinction.

Within NSW, *Dichanthium setosum* (Vulnerable, EPBC Act; Vulnerable, TSC Act) occurs chiefly on the northern tablelands in the Saumarez area, west of Armidale, and 18-30 km east of Guyra (approximately 165km to the south of the western extremity of Alignment West). It is associated with heavy basaltic black soils and stony red-brown hard setting loam with clay subsoil and is found in moderately disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pasture (DSEWPaC, 2008). Within the vicinity of the Project, *Dichanthium setosum* has been mapped to the north on the western side of the Clarence River near Tabulam (DECCW, 2010) and also in alignment west as per **Figure 9a** of the Biodiversity report¹. Field surveys conducted of the study area also determined this species from west of Tenterfield, in close proximity to Reedy Creek near the Riverton locality within the proposed easement on Alignment West. No populations within DSEWPaC (2008) or DECCW (2005c) are identified as important populations (defined within DEWHA, 2009), however protection of known sites and occurrences is listed as an important action to assist in the recovery of the species. Given the Project would require the potential disturbance and clearing of this species from within a known location, the Project is considered to have the potential to decrease the size of a known population. The population within the study area could be considered important for genetic diversity or dispersal purposes.

The populations identified during the field assessments are not considered to be important populations based on their isolation and limited extent.

- b) reduce the area of occupancy of an important population

The known locations of this species have been mapped on the Atlas of NSW Wildlife (DECCW, 2010). Alignment East avoids all mapped locations. Since *Arthraxon hispidus* was not located along the alignment during field survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of an important population as there should not be any clearing of the species.

Mitigation measures are recommended for this species to assist in minimising impacts associated with the Project. However, the Project does have the potential to impact on known populations of *Dichanthium setosum* and its habitat. The alignment west would impact on a

¹ The identification and records of *Dichanthium setosum* were incidental sightings made during field surveys by heritage consultants. Access is no longer available to the locations where this species was identified. As such, it is not currently possible to confirm the numbers of this species to be potentially impacted. Further details will be obtained during pre-clearance surveys.

small population of *Dichanthium setosum*. The proposal would therefore reduce the occupancy of a known population of this species.

c) *fragment an existing important population into two or more populations*

Arthraxon hispidus is known from a number of in the Kyogle district to the north of the alignment East (DECCW, 2010). The mapped locations of these populations are remote from the alignment East. Therefore, it is unlikely that the proposal would result in any populations being fragmented.

The population of *Dichanthium setosum* recorded from the alignment west may constitute an important population according to information provided within DEWHA (2009), which notes that populations may be considered important for reasons such as maintaining genetic diversity or seed dispersal. As the Project would impact the known population, there is potential for a population to experience fragmentation as a result of the Project.

d) *adversely affect habitat critical to the survival of a species*

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for *Arthraxon hispidus* or *Dichanthium setosum*.

No habitat critical to the survival of these species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for these species is unlikely to be impacted by the Project.

e) *disrupt the breeding cycle of an important population*

No areas of known habitat for *Arthraxon hispidus* would be cleared and therefore there should be no disruption to the breeding cycle of the species.

The Project would involve impacts to potential habitat for the known population of *Dichanthium setosum* recorded from the Alignment West. While this species has no listed important populations within the literature (DSEWPaC 2008 or DECCW 2005c), some populations may be considered important based on DEWHA (2009). As such, the Project has the potential to impact on the life cycle and reproduction of this species within the local area.

f) *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

As the known locations of *Arthraxon hispidus* are remote from the proposed alignment East, it is considered very unlikely that potential habitat for this species would be removed or modified as a result of the proposed action (DECCW, 2010).

Core habitat areas for *Dichanthium setosum* occur chiefly on the northern tablelands in the Saumarez area, west of Armidale, and 18-30km east of Guyra. The proposal would therefore not impact on the quality of habitat such that the species would decline within its range, however the Project has the potential to modify, remove or isolate potential and known habitat of this species within the easement.

g) *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

Due to the remoteness of the proposal from the known locations of *Arthraxon hispidus*, the proposed works are unlikely to result in the establishment of any additional invasive species that may result in increased competition to this species (DECCW, 2010). The proposed works are unlikely to result in an alteration to the existing environment such that any invasive species become established in the species' habitat.

The Approved Conservation Advice for *Dichanthium setosum* (DSEWPaC, 2008) notes that the main identified threats to the species include invasion by introduced grasses such as Coolatai grass (*Hyparrhenia hirta*), Lippia (*Phyla canescens*) and African Lovegrass

(*Eragrostis curvula*). While efforts would be made to ensure weed control is undertaken throughout the Project area, there is potential for an increase of weed spread within the easement resulting from increased levels of disturbance.

h) *introduce disease that may cause the species to decline, or*

There are no diseases known that are likely to cause *Arthraxon hispidus* to decline.

There are no diseases known that are likely to cause *Dichanthium setosum* to decline

i) *interfere substantially with the recovery of the species.*

There are no existing recovery plans for *Arthraxon hispidus*. However DECCW (2005) has proposed priority actions for this species, of which the following is relevant to the Project:

- Control feral animals in known habitat for this species.

Given the assessment and field survey undertaken as part of this report, it is considered unlikely that the species does occur within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works would not interfere with the recovery of this species, as no known individuals would be impacted, nor would any known habitat.

There are no existing recovery plans for *Dichanthium setosum*. However DECCW (2005) has proposed several priority actions for this species, relevant to the Project:

- Clearly identify roadside populations and ensure no impact by road maintenance. (Medium priority);
- Undertake weed control, especially of invasive exotic grasses.
- Determine appropriate burning regimes and incorporate into fire management plans and park management plans.
- Discourage fertilizer drift into populations.
- Fence sites with high density populations to prevent grazing.

The field survey undertaken as part of this report confirmed the presence of *Dichanthium setosum* within the easement west of Tenterfield. As such there would be impacts to a small population of this species. Given the small area of disturbance, it is not expected that the recovery of this species would be impeded significantly. In addition, the proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. Environmental planning during construction would ensure that impacts are minimised to this species as far as practicable.

Conclusion

The significant impact criteria assessment concludes that the proposal is **not** likely to significantly impact *Arthraxon hispidus*. As such, a referral to the Minister is not required.

The significant impact criteria assessment concludes that the proposal may significantly impact *Dichanthium setosum*. As such, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in Volume 2 of the EA. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

- DECCW (2005a) *Arthraxon hispidus* – Profile
<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10066>
- DECCW (2005b) *Arthraxon hispidus* - Priority Actions.
http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/pas_speciestype_details.aspx?type=Shrubs&kingdom=Plant
- DECCW (2005c) *Dichanthium setosum* – Priority Actions
http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/pas_speciestype_details.aspx?type=Herbs+and+Forbs&kingdom=Plant
- DECCW (2010) NPWS – Atlas of NSW Wildlife.
<http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp>
- DSEWPaC (2008) Approved Conservation Advice for *Dichanthium setosum*.
<http://www.environment.gov.au/biodiversity/threatened/species/pubs/14159-conservation-advice.pdf>
- DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

1.1.6 Torrington Pea (*Almaleea cambagei*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

The Atlas of NSW Wildlife (DECCW, 2010) has mapped *Almaleea cambagei* (Vulnerable, EPBC Act; Endangered, TSC Act) within Torrington State Recreation Park (TSRP). The records are located a significant distance from the western extent of the Alignment West. Despite the remoteness from known records, there is a slight chance that the proposal may disturb habitat that may contain specimens of *Almaleea cambagei* beyond the boundary of the TSRP in the Torrington district adjacent to the Alignment West. As no individuals were identified in areas targeted in and around the study area it is unlikely that the proposed development would have an adverse effect on the size of the species such that the local population of the species would be placed at risk of extinction.

- b) reduce the area of occupancy of an important population

The known locations of this species have been mapped on the Atlas of NSW Wildlife (DECCW, 2010). Alignment west avoids all mapped locations.

Since *Almaleea cambagei* was not located along the alignment during field survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of an important population as there should not be any clearing of the species.

- c) fragment an existing important population into two or more populations

Almaleea cambagei is known from three localities, near Torrington and Glencoe in the Northern Tablelands of NSW, and in the Wallangara region of southern Queensland (DSEWPaC, 2008). The mapped locations of these populations are remote from the Alignment West. Therefore, it is unlikely that the proposal would result in any populations being fragmented.

- d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for this species.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for this species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of an important population

No areas of known habitat for *Almaleea cambagei* would be cleared and therefore there should be no disruption to the breeding cycle of the species.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

As the known locations of *Almaleea cambagei* are remote from the proposed Alignment West, it is considered very unlikely that potential habitat for this species would be removed or modified as a result of the proposed action (DECCW, 2010).

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Due to the remoteness of the proposal from the known locations of *Almaleea cambagei*, the proposed works are unlikely to result in the establishment of any additional invasive species that may result in increased competition to this species (DECCW, 2010). The proposed works are unlikely to result in an alteration to the existing environment such that any invasive species become established in the species' habitat.

h) introduce disease that may cause the species to decline, or

There are no diseases known that are likely to cause *Almaleea cambagei* to decline.

i) interfere substantially with the recovery of the species.

There are no existing recovery plans *Almaleea cambagei*. However DECCW (2005) has proposed a number of priority actions for this species relevant to the Project:

- Control feral pigs in suitable *Almaleea cambagei* habitat.
- Identify and avoid populations on road/track sides during roadworks.
- Prevent clearing and draining of wet heath areas that provide potential habitat for *Almaleea cambagei*.
- Survey areas of suitable habitat for *Almaleea cambagei* in areas adjacent to known populations.

Given the assessment and field survey undertaken as part of this report, it is considered unlikely that the species does occur within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works will not interfere with the recovery of this species, as no known individuals would be impacted, nor would any known habitat.

Conclusion

The significant impact criteria assessment concludes that the proposal is not likely to significantly impact *Almaleea cambagei*. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate

the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DECCW (2005) *Almaleea cambagei* - Priority actions.

http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/pas_speciestype_details.aspx?type=Shrubs&kingdom=Plant

DECCW (2010) NPWS – Atlas of NSW Wildlife.

<http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp>

DSEWPac (2008) Approved Conservation Advice for *Almaleea cambagei*.

<http://www.environment.gov.au/biodiversity/threatened/species/pubs/56308-conservation-advice.pdf>

DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

1.1.7 Tall Knotweed (*Persicaria elatior*), Heath Wrinklewort (*Rutidosia heterogama*) and Austral Toadflax (*Thesium australe*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) *lead to a long-term decrease in the size of an important population of a species*

The Project may result in the clearing of potential habitat in the form of vegetation. Given the distribution of the above listed species, the Project has the potential to result in a long-term decrease in the size of a population of *Persicaria elatior*, *Rutidosia heterogama* and *Thesium australe*.

b) *reduce the area of occupancy of an important population*

Persicaria elatior is known to occur in south-eastern NSW (Moruya State Forest, Upper Avon River north of Robertson, Bermagui and Picton Lakes) northern NSW (Raymond Terrace and the Grafton area) and Queensland. This species has also been identified as likely to occur within the Project area. Given the scattered nature of this species, the works associated with the Project have the potential to result in a long-term decrease in the size of a population of *Persicaria elatior*.

Rutidosia heterogama is located between Wyong and Evans Head and on the New England Tablelands from Torrington and Ashford south to Wandsworth south-west of Glen Innes. This species has also been identified as likely to occur within the Project area. Given the scattered nature of this species the works associated with the Project have the potential to result in a long-term decrease in the size of a population of *Rutidosia heterogama*.

Thesium australe occurs in small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. This species is also present in Tasmania, Queensland and in eastern Asia. Give the scattered nature of this species and its small populations, the works associated with the Project have the potential to result in a long-term decrease in the size of a population of *Thesium australe*.

c) *fragment an existing important population into two or more populations*

All of the above species are considered likely to occur within the Project area. The Project would require the expansion of the existing 132kV easement to accommodate the proposed

330kV easement, as well as the establishment of a new easement to accommodate the western alignment. However, as the exact locations of the above species are not known, it is difficult to determine whether the Project would result in the fragmentation of existing populations into two or more populations.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for this species.

No habitat critical to the survival of these species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for these species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of an important population

Little is known about the breeding cycle of *Persicaria elatior*. Its tiny flowers are in long, narrow spikes to 5 cm long. The pink flower-segments are less than 4mm long. As the ecology of this species is largely unknown, it is difficult to determine whether the Project would disrupt the breeding cycle of this population.

Rutidosia heterogama has bright yellow daisy heads up to 2 cm wide. Little is known about the breeding cycle of this species. Without further information it is difficult to determine whether the Project would disrupt the breeding cycle of this population.

The flowers of the *Thesium australe* are minute and white and appear in spring. The fruit is small and nut-like, developing in summer. Little is known about the breeding cycle of this species. Without further information it is difficult to determine whether the Project would disrupt the breeding cycle of this population.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Persicaria elatior occurs in damp places, particularly beside streams and lakes. It is also found occasionally in swamp forest or associated with disturbance. The main threats to the survival of this species include inadvertent clearing, damage to road and track populations through maintenance activities and clearing of or hydrological changes to wetland vegetation. Given this knowledge of the species current habitat, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Rutidosia heterogama grows in heath on sandy soils and moist areas in open forest. This species has also been recorded along disturbed roadsides. The key threats to the survival of this species include habitat loss and fragmentation, frequent fire, trampling or picking by visitors, roadside management and risk of local extinction due to low numbers. Given this knowledge of the species current habitat, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Thesium australe occurs in grassland or grassy woodland. It is found in damp sites in association with Kangaroo Grass (*Themeda australis*) and is often hidden amongst grasses and herbs. The main threats to the survival of this species are loss and degradation of habitat as a result of development, intensification of grazing regimes, weed infestation and road works. Given this knowledge of the species current habitat, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Weed infestation has been identified as a threat to *Thesium australe*. It is possible that invasive species already exist within the Project area. Invasive species may be accidentally spread via movement of plant and machinery within the Project area, or by transport of stockpiled construction material and organic matter during works undertaken in proximity to waterways. As such, the Project has the potential to result in disturbance to a number of areas.

Weed infestation has not been identified as a major threat to *Persicaria elatior* or *Rutidosia heterogama*.

Given the existing disturbances within the Project area, it is considered unlikely that the Project would result in invasive species that are harmful to the above species becoming established in the species habitat.

h) introduce disease that may cause the species to decline, or

There are no known diseases that are likely to cause these species to decline. There is no mention in the relevant literature of any potential disease-based threats to these species. Rather, illegal clearing of land in known habitat areas and grazing is more likely to pose a more serious threat.

i) interfere substantially with the recovery of the species.

There are no existing recovery plans for the above species. However DECCW (2005) has defined several recovery actions for each species.

Given the expansion of the existing 132kV easement to accommodate the proposed 330kV easement, the Project has the potential to interfere substantially with the recovery of *Persicaria elatior*, *Rutidosia heterogama* and *Thesium australe*.

Conclusion

The significant impact criteria assessment concludes that the proposal has the potential to significantly impact on *Persicaria elatior*, *Rutidosia heterogama* and *Thesium australe*. As such, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in Volume 2 of the EA. A number of measures are recommended in **Section 7**, **Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Department of Climate Change and Water (2005) Threatened species - *Persicaria elatior*. Viewed online 25/11/2010

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10590>

Department of Climate Change and Water (2005) Threatened species - *Rutidosia heterogama*. Viewed online 25/11/2010

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10737>

Department of Climate Change and Water (2005) Threatened species - *Thesium australe*. Viewed online 25/11/2010

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10802>

Department of Environment, Water, Heritage and the Arts (2010) EPBC Act Protected Matters Report.

NSW National Parks and Wildlife Service (2010) Atlas of NSW Wildlife Viewed online 23/11/2010 <http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp>

DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

1.1.8 Native Jute (*Corchorus cunninghamii*)

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

a) lead to a long-term decrease in the size of a population

Within the Project area, *Corchorus cunninghamii* (Endangered, EPBC Act; Endangered, TSC Act) is considered likely to occur based on previous records. It is considered likely that works associated with the Project would result in a long-term decrease in the size of a population of *Corchorus cunninghamii*.

b) reduce the area of occupancy of the species

Corchorus cunninghamii occurs from Richmond River in north east NSW to the Brisbane River in Queensland. Four distinct populations occur within Queensland between the Beenleigh district and the lower Brisbane River. *Corchorus cunninghamii* has been recorded in NSW from foothill and range country north of the Richmond River between Lismore, Toonumbar and Mt Lindsay near the Queensland border. It has also been listed as likely to occur within the Project area (EPBC Act Protected Matters Report, 2010). Given the species known populations in the NSW and QLD, it is considered unlikely that works associated with the Project would result in a long-term decrease in the size of a population of *Corchorus cunninghamii*.

c) fragment an existing population into two or more populations

The Project would require the expansion of the existing 132kV easement to accommodate the proposed 330kV easement within the alignment east. It is considered likely that any expansion works associated with the Project would result in the fragmentation of an existing population into two or more populations, as the existing easement may already fragment potential *Corchorus cunninghamii* habitat.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for this species within NSW.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for this species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of a population

There is little known information on the breeding system of *Corchorus cunninghamii*. Flowers appear to be pollinated by Honey Bees (*Apis mellifera*), native bees (*Trigona* sp.) and sand wasps (*Bembix* sp.) This species has a relatively short lifespan (of up to three or four years). Reproduction occurs by seed only. Seeds are released in a dormant state which can be broken by disturbances such as fires or physical disturbance.

Given the existing 132kV easement and associated access tracks, as well as the dominance of agricultural and forestry related activities in the region, it is considered unlikely that the

Project would result in further disruption to the breeding system of any population of *Corchorus cunninghamii*.

f) *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Corchorus cunninghamii occurs primarily in open forest in Queensland and tall wet sclerophyll forest and hoop line plantations in NSW. It occurs at low to mid elevation (150-450m) and may have originally extended to footslopes near the Richmond floodplain, which are now largely cleared. The Queensland sites have a similar topography with occupancy in hilly to steep country at altitudes of 140-350m. The major form of natural disturbance is from fire. Soil disturbance relating to human activities can stimulate germination of species. Thinning operations association with forestry activities can have a positive impact on *Corchorus cunninghamii*. Response in relation to other forestry activities is unknown.

Given this knowledge of the species current habitat, it is considered likely that works associated with the Project would not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) *result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*

Corchorus cunninghamii may be threatened by invasive species such as Lantana (*Lantana camara*), Crofton Weed (*Ageratina adenophorum*) and Mist Flower (*Ageratina riparia*). These species threaten to displace populations of *Corchorus cunninghamii* by competition, smothering and habitat alteration. It is possible that each of these invasive species already exist within the Project area. Each of these invasive species may be accidentally spread via movement of plant and machinery within the Project area, or by transport of stockpiled construction material and organic matter during works undertaken in proximity to waterways. As such, the Project has the potential to result in disturbance to a number of waterways throughout the Project area.

Given the existing disturbances within the Project area, it is considered unlikely that the Project would result in invasive species that are harmful to *Corchorus cunninghamii* becoming established in the species habitat.

h) *introduce disease that may cause the species to decline, or*

It is considered unlikely that the Project would introduce any diseases that may cause *Corchorus cunninghamii* to decline. Mitigation measures are recommended in **Section 7, Appendix D4** of this Report to minimise the risk of the introduction of the diseases into all areas associated with the Project.

i) *interfere with the recovery of the species.*

The draft NSW and National Recovery Plan for the *Corchorus cunninghamii* was developed in November 2004. This recovery plan considers the conservation requirements of the species within its known range across NSW and identifies the actions to be taken to ensure the long-term viability of *Corchorus cunninghamii* in nature and the parties who would undertake these actions.

It is likely that *Corchorus cunninghamii* currently exists in the Project area based on previous research. Given the presence of the existing 132kV easement and associated disturbances, the Project may have a significant impact on populations of *Corchorus cunninghamii* if they exist within the Project area. Given the existing disturbance regimes, the project is may interfere with the recovery of *Corchorus cunninghamii*.

Conclusion

The significant impact criteria assessment concludes that the proposal has the potential to significantly impact *Corchorus cunninghamii*. As such, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in Volume 2 of the EA. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Department of Environment and Conservation (NSW) (2004) Draft NSW and National Recovery Plan *Corchorus cunninghamii* November 2004. Viewed online 23/11/2010 <http://www.environment.nsw.gov.au/resources/nature/recoveryplanDraftCorchorusCunninghamii.pdf>

NSW National Parks and Wildlife Service (2010) Atlas of NSW Wildlife Viewed online 23/11/2010. <http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp>

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1.1.9 Black-clubbed Spider-orchid (*Caladenia atroclavia*)

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

a) *lead to a long-term decrease in the size of a population*

Caladenia atroclavia (Endangered, EPBC Act; Not Listed, TSC Act) is known from four populations, three in Girraween National Park and one in the Wyberba area of the Darling Downs, south-east Queensland (DSEWPaC, 2008). As all populations are within the Queensland, they are located a significant distance from the Alignment and therefore it is unlikely that the proposed development would have an adverse effect on the species such that the local populations would be placed at risk of extinction.

b) *reduce the area of occupancy of the species*

The known locations of *Caladenia atroclavia* are remote from the Alignment by a significant distance. Since *Caladenia atroclavia* was not located along the alignment during survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of an important population as there should not be any clearing of the species.

c) *fragment an existing population into two or more populations*

Given the remoteness of the nearest records from the Alignment, it is unlikely that the proposal would result in any populations of *Caladenia atroclavia* being fragmented.

d) *adversely affect habitat critical to the survival of a species*

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for *Caladenia atroclavia*.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for this species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of a population

No areas of known habitat for *Caladenia atroclavia* would be cleared and therefore there should be no disruption to the breeding cycle of the species.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

As the nearest known locations of *Caladenia atroclavia* are remote from the proposed Alignment, it is considered very unlikely that potential habitat for this species would be removed or modified as a result of the proposed action.

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Due to the remoteness of the proposal from the nearest known locations of *Caladenia atroclavia*, the proposed works are unlikely to result in the establishment of any additional invasive species that may result in increased competition to this species.

h) introduce disease that may cause the species to decline, or

Given the remoteness of known specimens from the proposed easement, it is highly unlikely that diseases would be introduced into *Caladenia atroclavia* habitat through construction activities.

i) interfere with the recovery of the species.

There are no existing recovery plans for *Caladenia atroclavia*. DSEWPac (2008) has listed a number of priority actions for this species:

- Design and implement a management plan for the prevention of illegal removal of *C. atroclavia*;
- Monitor known populations to identify key threats;
- Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary;
- Identify populations of high conservation priority;
- Ensure development activities involving substrate or vegetation disturbance in areas where *C. atroclavia* occurs do not adversely impact on known populations;
- Investigate formal conservation arrangements such as the use of covenants, conservation agreements or inclusion in reserve tenure;
- Control access routes to suitably constrain public access to known sites on public land; Suitably control and manage access on private land
- Minimise adverse impacts from land use at known sites;
- Develop and implement a management plan for the control of invasive weeds in the local region;
- Identify and remove weeds in the local area, which could become a threat to *C. atroclavia*, using appropriate methods;
- Manage sites to prevent introduction of invasive weeds, which could become a threat to *C. atroclavia*, using appropriate methods
- Develop and implement a management plan for the control and eradication of feral pigs in the local region and reserve areas;
- Develop and implement a suitable fire management strategy for *C. atroclavia*;

- Identify appropriate intensity and interval of fire to promote seed germination and vegetation regeneration;
- Provide maps of known occurrences to local and state Rural Fire Services and seek inclusion of mitigative measures in bush fire risk management plans, risk register and/or operation maps;
- Undertake appropriate seed collection and storage;
- Investigate options for linking, enhancing or establishing additional populations; and
- Implement appropriate national translocation protocols if establishing additional populations is considered necessary and feasible.

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that the species occurs within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works would not interfere with the recovery of this species, as no known individuals would be impacted, nor would any known habitat.

Conclusion

The significant impact criteria assessment concludes that the proposal is not likely to significantly impact *Caladenia atroclavia*. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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Department of the Environment, Water, Heritage and the Arts (2009). EPBC Act Policy Statement 1.1 Significant Impact Guidelines. Matters of National Environmental Significance. Commonwealth of Australia

DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

1.1.10 Leafless Tongue-orchid (*Cryptostylis hunteriana*) and Hartman's *Sarcophilus* (*Sarcophilus hartmannii*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Cryptostylis hunteriana (Vulnerable, EPBC Act; Vulnerable, TSC Act) has been recorded from as far north as Gibraltar Range National Park south into Victoria around the coast as far as Orbost (DECCW, 2005a). The Atlas of NSW Wildlife (DECCW, 2010) shows the nearest *Cryptostylis hunteriana* populations to the proposal are located within Washpool National Park, approximately 60km south of the easement. As no individuals were identified in and around the study area, and the known locations are remote from the Alignment, it is unlikely that the proposed development would have an adverse effect on the species such that the local populations would be placed at risk of extinction.

Sarcochilus hartmannii (Vulnerable, EPBC Act; Vulnerable, TSC Act) is found from the Richmond River in northern NSW to Gympie in south-east Queensland (DECCW, 2005b). The Atlas of NSW Wildlife (DECCW, 2010) shows the nearest mapped locations are in the Kyogle district to the north of Lismore. As all mapped populations are located at a distance from the proposed alignment East, it is unlikely that the proposed development would have an adverse effect on the species such that the local populations would be placed at risk of extinction.

b) reduce the area of occupancy of an important population

The known locations of *Cryptostylis hunteriana* have been mapped on the Atlas of NSW Wildlife (DECCW, 2010). The proposal's Alignment avoids the nearest mapped locations by a significant distance. Since *Cryptostylis hunteriana* was not located along the alignment during survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of an important population as there should not be any clearing of the species.

Sarcochilus hartmannii populations are located a significant distance from the alignment East. Since *Sarcochilus hartmannii* was not located along the alignment during survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of an important population as there should not be any clearing of the species.

c) fragment an existing important population into two or more populations

Given the remoteness of the nearest records from the Alignment, it is unlikely that the proposal would result in any populations of *Cryptostylis hunteriana* being fragmented.

Given the remoteness of current records from the alignment East, it is unlikely that the proposal would result in any populations of *Sarcochilus hartmannii* being fragmented.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for *Cryptostylis hunteriana* and *Sarcochilus hartmannii*.

No habitat critical to the survival of these species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for these species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of an important population

No areas of known habitat for *Cryptostylis hunteriana* would be cleared and therefore there should be no disruption to the breeding cycle of the species.

No areas of known habitat for *Sarcochilus hartmannii* would be cleared and therefore there should be no disruption to the breeding cycle of the species.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

As the nearest known locations of *Cryptostylis hunteriana* are remote from the proposed Alignment, it is considered very unlikely that potential habitat for this species would be removed or modified as a result of the proposed action (DECCW, 2010).

The known habitat of *Sarcochilus hartmannii* is remote from the proposed alignment East. The proposal is therefore unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat for this species.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Due to the remoteness of the proposal from the nearest known locations of *Cryptostylis hunteriana*, the proposed works are unlikely to result in the establishment of any additional invasive species that may result in increased competition to this species (DECCW, 2010).

Crofton weed (*Ageratina adenophora*) and mistflower (*Ageratina riparia*) are noted threats to *Sarcochilus hartmannii* (DECCW, 2005b). Given the remoteness of known populations of *Sarcochilus hartmannii* from the alignment East, it is unlikely that the proposed works would result in the establishment of these invasive species.

h) introduce disease that may cause the species to decline, or

Given the remoteness of known specimens from the proposed easement, it is highly unlikely that diseases would be introduced into *Cryptostylis hunteriana* habitat through construction activities.

Given the remoteness of known populations of *Sarcochilus hartmannii* from the proposed easement, it is highly unlikely that diseases would be introduced into its habitat through construction activities.

i) interfere substantially with the recovery of the species.

There are no existing recovery plans for *Cryptostylis hunteriana*. DECCW (2005a) has listed four priority actions for this species:

- Protection of key populations that in any one year have more than 20 individuals;
- Prepare plans of management for development sites (incl. Callala Bay) where plants have been retained and managed;
- Long-term monitoring of key populations that in any one year have at least 20 individuals; and
- Map known populations and identify sites with over 20 plants.

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that the species occurs within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works would not interfere with the recovery of this species, as no known individuals would be impacted, nor would any known habitat.

There are no existing recovery plans for *Sarcochilus hartmannii*. DECCW (2005b) has listed six priority actions for this species:

- Develop targeted education and awareness program highlighting threats to native orchids from illegal collecting, including advice to only purchase plants from licensed nurseries;
- Reserve fire management Strategy to include operational guidelines to protect this species from fire;
- Develop Environmental Impact Assessment guidelines;
- Re-route walking tracks away from known populations of *Sarcochilus hartmannii*;
- Assess weed threats, particularly Mist Flower and Crofton Weed; and
- Survey to confirm populations at known locations and survey nearby potential habitat.

Conclusion

The significant impact criteria assessment concludes that the proposal is not likely to significantly impact *Cryptostylis hunteriana* and *Sarcochilus hartmannii*. As such, a referral to

the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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DECCW (2005b) Hartman's Sarcophilus – Profile

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DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

1.1.11 Pygmy Cypress Pine (*Callitris oblonga*) and Red Lilly Pilly (*Syzygium hodgkinsoniae*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Within the Project area, *Callitris oblonga* (Vulnerable, EPBC Act; Vulnerable, TSC Act), *Syzygium hodgkinsoniae* (Vulnerable, EPBC Act; Vulnerable, TSC Act) are likely to occur based on previous records (Atlas of NSW Wildlife, EPBC Act Protected Matter Report) and habitats present.

The Project may result in the clearing of potential habitat in the form of vegetation. Given the distribution of the above listed species, the Project has the potential to result in a long-term decrease in the size of a population of *Callitris oblonga* and *Syzygium hodgkinsoniae*.

- b) reduce the area of occupancy of an important population

Callitris oblonga is located in NSW (two subspecies) and Tasmania (one subspecies). In NSW, the subspecies *parva* occurs in northern NSW on the eastern edge of the New England Tablelands. Subspecies *corangensis* occurs in the Corang River Catchment. *Callitris oblonga* is also considered likely to occur within the Project area. Given the scattered nature of this species, the works associated with the Project have the potential to result in a long-term decrease in the size of a population of *Callitris oblonga*.

Syzygium hodgkinsoniae has a restricted range from the Richmond River in north-east NSW to Gympie in Queensland. This species is sparsely distributed, but can be found locally common in some parts of its range. *Syzygium hodgkinsoniae* is also considered likely to occur within the Project area. Given the scattered nature of this species, the works associated with the Project have the potential to result in a long-term decrease in the size of a population of *Syzygium hodgkinsoniae*.

- c) fragment an existing important population into two or more populations

The above species are considered likely to occur within the Project area. The Project would require the expansion of the existing 132kV easement to accommodate the proposed 330kV

easement. However, as the exact locations of the above species in the Project area are unknown, it is difficult to determine whether the Project would result in the fragmentation of existing populations into two or more populations.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for this species.

No habitat critical to the survival of these species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for these species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of an important population

Callitris oblonga is a fast growing species with seeds that germinate readily. As the ecology of this species is largely unknown, it is difficult to determine whether the Project would disrupt the breeding cycle of this population.

Little is known about the breeding cycle of *Syzygium hodgkinsoniae*. The flowers of this species are off white, fluffy and honey scented. The fruit are 4cm in diameter, round and bright red. As the ecology of this species is largely unknown, it is difficult to determine whether the Project would disrupt the breeding cycle of this population.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

In NSW, *Callitris oblonga* occurs along sandy watercourses, shrubland, open woodland and dry sites such as exposed ridges. The main threats to the survival of this species include clearing and fragmentation of habitat for agriculture, frequent fire, grazing, weed infestation, disturbance by roadworks and roadside maintenance, erosion, damage by trail bikes and local extinction due to small, scattered populations. This species is also naturally killed by flood-waters. Given this knowledge of the species current habitat, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Syzygium hodgkinsoniae is mainly found in riverine and subtropical rainforest on rich alluvial or basaltic soils. The key threats to the survival of this species include clearing and fragmentation of habitat for development, agriculture, road-works and powerlines, weed infestation, grazing, general degradation of rainforest habitat, roadside slashing and mowing and illegal collection for horticulture. Given this knowledge of the species current habitat, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Callitris oblonga may be threatened by invasive species such as Blackberry (*Rubus fruticosus*) and potential from *Pinus radiata* and Broom (*Cytisus* sp.) Weed infestation has been identified as a threat to *Syzygium hodgkinsoniae*, however specific species have not been mentioned. It is possible that invasive species already exist within the Project area. Invasive species may be accidentally spread via movement of plant and machinery within the Project area, or by transport of stockpiled construction material and organic matter during works undertaken in proximity to waterways. As such, the Project has the potential to result in disturbance to a number of areas.

Given the possibility of existing disturbances within the Project area, it is considered unlikely that the Project would result in invasive species that are harmful to the above species becoming established in the species habitat.

h) introduce disease that may cause the species to decline, or

There are no known diseases that are likely to cause these species to decline. There is no mention in the relevant literature of any potential disease-based threats to these species. Rather, illegal clearing of land in known habitat areas and grazing is more likely to pose a more serious threat.

i) interfere substantially with the recovery of the species.

There are no existing recovery plans for the above species. However DECCW (2005) has defined several recovery actions for each species.

Given the expansion of the existing 132kV easement to accommodate the proposed 330kV easement, the Project has the potential to interfere substantially with the recovery of *Callitris oblonga*, *Syzygium hodgkinsoniae*.

Conclusion

The significant impact criteria assessment concludes that the proposal has the potential to significantly impact on *Callitris oblonga* and *Syzygium hodgkinsoniae*. As such, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in Volume 2 of the EA. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Approved Conservation Advice for *Callitris oblonga* (Pygmy Cypress Pine). Viewed online 25/11/2010.

<http://www.environment.gov.au/biodiversity/threatened/species/pubs/66687-conservation-advice.pdf>

Department of Climate Change and Water (2005) Threatened species - *Callitris oblonga*. Viewed online 25/11/2010

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10132>

Department of Climate Change and Water (2005) Threatened species - *Syzygium hodgkinsoniae*. Viewed online 25/11/2010

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10792>

Department of Environment, Water, Heritage and the Arts (2010) EPBC Act Protected Matters Report.

NSW National Parks and Wildlife Service (2010) Atlas of NSW Wildlife Viewed online 23/11/2010. <http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp>

DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

1.1.12 Granite Boronia (*Boronia granitica*), Beadle's Grevillea (*Grevillea beadleana*), Torrington Beard-heath (*Leucopogon confertus*) and Nightcap Plectranthus (*Plectranthus nitidus*)

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

a) lead to a long-term decrease in the size of a population

Boronia granitica (Endangered, EPBC Act; Vulnerable, TSC Act) occurs in scattered localities on the New England Tablelands and North West Slopes north from the Armidale area to the Stanthorpe district in southern Queensland (DECCW, 2005a). The Atlas of NSW Wildlife (DECCW, 2010) shows a *Boronia granitica* population within the Torrington State Recreation Area to the south and south-east of the western extent of the Alignment West. As no individuals were identified in and around the study area and the known locations are remote from the Alignment West, it is unlikely that the proposed development would have an adverse effect on the species such that a population would be placed at risk of extinction.

Grevillea beadleana (Endangered, EPBC Act; Endangered, TSC Act) is known from four separate areas, all in north-east NSW: the Torrington area west of Tenterfield, Oxley Wild Rivers National Park, Guy Fawkes River National Park and at Shannon Creek south-west of Grafton (DECCW, 2005b). The Atlas of NSW Wildlife (DECCW, 2010) shows the locations nearest to the proposed alignment west are located to the south-west of Tenterfield and in the Torrington State Recreation Area and environs. All populations are located a significant distance from the proposed Alignment West. As such, it is unlikely that the proposed development would have an adverse effect on the species such that the local populations would be placed at risk of extinction.

Leucopogon confertus (Endangered, EPBC Act; Endangered, TSC Act) has not been located recently and may be extinct. The only collection record is from near Torrington, in the Northern Tablelands (DSEWPoC, 2010).

Plectranthus nitidus (Endangered, EPBC Act; Endangered, TSC Act) has a distribution restricted to south-east Queensland and north-east NSW where it occurs from Nightcap Range north to the McPherson Rangers. This area lies to the north of the alignment East by more than 80 km. Therefore, given that the species is not known from the Project area, it is unlikely that the Project would impact on any populations of the species.

b) reduce the area of occupancy of the species

The known locations of *Boronia granitica* have been mapped on the Atlas of NSW Wildlife (DECCW, 2010). Alignment west avoids all mapped locations. Since *Boronia granitica* was not located along the alignment during survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of a population as there should not be any clearing of the species.

Grevillea beadleana populations are located a significant distance from the Alignment West. Since *Grevillea beadleana* was not located along the alignment during survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of a population as there should not be any clearing of the species.

Leucopogon confertus populations are located a significant distance from the Alignment West. Since *Leucopogon confertus* was not located along the alignment during survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of a population as there should not be any clearing of the species.

Plectranthus nitidus populations are located a significant distance from the Project area. Since *Plectranthus nitidus* was not located along the alignment during survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of a population as there should not be any clearing of the species.

c) fragment an existing population into two or more populations

Given the remoteness of current records from the Alignment West, it is unlikely that the proposal would result in any populations of *Boronia granitica* being fragmented.

Given the remoteness of current records from the Alignment West, it is unlikely that the proposal would result in any populations of *Grevillea beadleana* being fragmented.

Given the remoteness of current records from the Alignment West, it is unlikely that the proposal would result in any populations of *Leucopogon confertus* being fragmented.

Given the remoteness of current records from the alignment East, it is unlikely that the proposal would result in any populations of *Plectranthus nitidus* being fragmented.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for; *Boronia granitica*, *Grevillea beadleana*, *Leucopogon confertus* or *Plectranthus nitidus*.

No habitat critical to the survival of these species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for these species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of a population

No areas of known habitat for; *Boronia granitica*, *Grevillea beadleana*, *Leucopogon confertus* or *Plectranthus nitidus* would be cleared and therefore there should be no disruption to the breeding cycle of the species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

As the known locations of *Boronia granitica* are remote from the proposed Alignment West, it is considered very unlikely that potential habitat for this species would be removed or modified as a result of the proposed action (DECCW, 2010).

The known habitat of *Grevillea beadleana* is remote from the proposed Alignment West. The proposal is therefore unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat for this species.

The known habitat of *Leucopogon confertus* is remote from the proposed Alignment West. The proposal is therefore unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat for this species.

As the known locations of *Plectranthus nitidus* are remote from the proposed alignment East, it is considered very unlikely that potential habitat for this species would be removed or modified as a result of the proposed action.

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Due to the remoteness of the proposal from the known locations of *Boronia granitica*, the proposed works are unlikely to result in the establishment of any additional invasive species

that may result in increased competition to this species (DECCW, 2010). Invasive species are not listed as a threat within the species' National Recovery Plan (NSWNPWS, 2002).

Given the remoteness of known populations of *Grevillea beadleana* it is unlikely that the proposed works would result in the establishment of any additional invasive species. In addition, the Approved NSW and National Recovery Plan for *Grevillea beadleana* (DEC, 2004) does not identify invasive species as a significant threat to the survival of this species.

Given the remoteness of known populations of *Leucopogon confertus* it is unlikely that the proposed works would result in the establishment of any additional invasive species. Threats listed by DECCW (2005d) for *Leucopogon confertus* do not include invasive flora. However, they do include grazing by feral goats and cattle (DECCW 2005d)

Due to the remoteness of the proposal from the known locations of *Plectranthus nitidus*, the proposed works are unlikely to result in the establishment of any additional invasive species that may result in increased competition to this species (DECCW, 2010).

h) introduce disease that may cause the species to decline, or

Given the remoteness of known specimens from the proposed easement, it is highly unlikely that diseases would be introduced into *Boronia granitica* habitat through construction activities. The National Recovery Plan for *Boronia granitica* does not identify disease as a threat to the species' survival (NSWNPWS, 2002).

Given the remoteness of known populations of *Grevillea beadleana* from the proposed easement, it is highly unlikely that diseases would be introduced into its habitat through construction activities. The National Recovery Plan for *Grevillea beadleana* does not identify disease as a threat to the species' survival (DEC, 2004).

Given the remoteness of known populations of *Leucopogon confertus* from the proposed easement, it is highly unlikely that diseases would be introduced into its habitat through construction activities. The list of known threats for *Leucopogon confertus* does not identify disease as a threat to the species' survival (DECCW, 2005d).

Given the remoteness of known populations of *Plectranthus nitidus* from the proposed easement, it is highly unlikely that diseases would be introduced into its habitat through construction activities.

i) interfere with the recovery of the species.

A National Recovery Plan has been prepared for *Boronia granitica* (NSWNPWS, 2002). The Recovery Plan identifies six broad actions (detailed further in the Plan) to assist in the recovery of this species. These are:

- Implement research and monitoring programs;
- Manage current reserved areas;
- Manage the Torrington State Recreation Area population;
- Manage the Howell and Parlour Mountain populations;
- Publicity; and
- Horticulture.

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that the species occurs within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such,

the proposed works would not interfere with the recovery of this species, as no known individuals would be impacted, nor would any known habitat.

A NSW and National Recovery Plan have been prepared for *Grevillea beadleana*. Six recovery objectives have been developed with the overall aim of reducing the risk of extinction of the species:

- Increase knowledge of extant populations through further surveys of known populations and identification of new populations;
- Improve ecological understanding of *Grevillea beadleana*;
- Protect populations on private and leasehold land with the co-operation of the landowner or lessee;
- Promote persistence of *Grevillea beadleana* within current range by reducing or removing threats;
- Increase community awareness of the species and its management; and
- Co-ordinate implementation of the Recovery Plan

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that the species occurs within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works would not interfere with the recovery of this species, as no known individuals would be impacted, nor would any known habitat.

No recovery plans have been prepared for *Leucopogon confertus* DECCW (2005d). However, threat abatement plans for this species propose a number of recovery priorities. These are;

- Observed hygiene protocols and track closure signs in national parks;
- Assist with the control of feral goats;
- Protect areas of potential habitat from heavy grazing by domestic stock;
- Protect areas of open forest and woodland in rocky areas from clearing and fragmentation; and
- Report any new records of *Leucopogon confertus* to OEH.

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that *Leucopogon confertus* occurs within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works would not interfere with the recovery of this species, as no known individuals would be impacted, nor would any known habitat.

A recovery plan has been prepared that encompasses *Plectranthus nitidus* (DECCW 2010). A number of recovery actions are recommended for the species, of which the following are relevant to the Project:

- To protect rainforest, related vegetation and species from clearing;
- To protect rainforest and related vegetation from fragmentation, modification and degradation;
- To protect rainforest and related vegetation from the impact of weeds;
- To protect rainforest from fire and to promote the implementation of appropriate fire regimes in related vegetation;

- To protect rainforest and related vegetation from the impact of pest animals;
- To minimise the impacts of human interference;
- To control and minimise impacts of introduced pathogens and diseases;
- To engage the community and private land-holders in biodiversity conservation; and
- To establish effective monitoring of biodiversity related projects.

Additionally, DECCW (2005c) has proposed a number of recovery priorities for *Plectranthus nitidus*. These are:

- Ensure land managers are aware of the species and that appropriate measures are taken to protect habitat;
- Undertake surveys for the species at any site prior to logging operations;
- Control introduced weeds in potential habitat areas;
- Assess known and potential threats to all known sites;
- Ensure fire plans mitigate threats to this species; and
- Map habitat, map populations, assess habitat condition and estimate population extent.

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that *Plectranthus nitidus* occurs within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and detailed pre-clearance survey would be conducted prior to construction. If any individuals are found to occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works would not interfere with the recovery of this species, as no known individuals would be impacted, nor would any known habitat.

Conclusion

The significant impact criteria assessment concludes that the proposal is not likely to significantly impact *Boronia granitica*, *Grevillea beadleana*, *Leucopogon confertus* or *Plectranthus nitidus*. Consequently, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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1.1.13 Crescent-leaved Homoranthus (*Homoranthus lunatus*), Rusty Desert Phebalium (*Phebalium glandulosum* subsp. *eglandulosum*), *Phebalium whitei* and Torrington Mint-bush (*Prostanthera staurophylla sensu stricto*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Homoranthus lunatus (Vulnerable, EPBC Act; Vulnerable, TSC Act) occurs near Tenterfield and Torrington on the New England Tablelands of NSW, including Bald Rock and Boonoo Boonoo National Parks near Tenterfield. (DECCW, 2005a). The Atlas of NSW Wildlife (DECCW, 2010) shows the *Homoranthus lunatus* populations located within and adjacent to the Basket Swamp, Boonoo Boonoo and Bald Rock National Parks. All mapped populations are located to the north of the Alignment West. Although no individuals were identified within the Project area, the small and highly localised populations of this species make it prone to catastrophic events such as localised clearing. Consequently, there is potential for the Project to have an adverse effect on the species such that the local populations would be placed at risk of extinction.

Phebalium glandulosum subsp. *eglandulosum* (Vulnerable, EPBC Act; Endangered, TSC Act) is found in NSW in the Torrington district and in the Severn River Nature Reserve north-west of Glen Innes, on the New England Tablelands (DECCW, 2005b). The Atlas of NSW Wildlife (DECCW, 2010) shows the locations of mapped populations are a significant distance to the south of the proposed Alignment West. As all populations are located at a distance from the proposed alignment, it is unlikely that the proposed development would have an adverse effect on the species such that the local populations would be placed at risk of extinction.

Phebalium whitei (Vulnerable, EPBC Act; Not listed, TSC Act) is known from south-east Queensland in the Stanthorpe area from Lyra to Wyberba. It is conserved in Girraween National Park. Collections have been made along Bald Rock Creek, at Wyberba, Lyra and The Junction, Girraween NP. Two populations occur in Girraween NP (DSEWPac, 2008a). The noted populations of this species are located remotely from the Alignment West. It is therefore unlikely that the proposed development would have an adverse effect on the species such that the local populations would be placed at risk of extinction.

Prostanthera staurophylla sensu stricto (Vulnerable, EPBC Act; Endangered, TSC Act) is known from a single location near Mt Mackenzie, south-west of Tenterfield (DSEWPac, 2008b). As the alignment west is positioned to the north of Tenterfield, the proposal would not impact on this population. It is therefore unlikely that the proposed development would have

an adverse effect on the species such that the local populations would be placed at risk of extinction

b) reduce the area of occupancy of an important population

The known locations of *Homoranthus lunatus* have been mapped on the Atlas of NSW Wildlife (DECCW, 2010). Alignment West avoids all mapped locations. Although *Homoranthus lunatus* was not located along the alignment during survey efforts, the proposed action does have the potential to reduce the overall area of occupancy of an important population. This is due to the fact that the species occurs in very localised areas and is prone to events such as localised clearing that may result in loss of an entire population.

Phebalium glandulosum subsp. *eglandulosum* populations are located a significant distance from the Alignment West. Since *Phebalium glandulosum* subsp. *eglandulosum* was not located along the alignment during survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of an important population as there should not be any clearing of the species.

Known populations of *Phebalium whitei* are located at a distance from the Alignment West. The proposal is unlikely therefore to impact on an important population of the species.

As the known population of *Prostanthera staurophylla sensu stricto* is located remotely from the Alignment West, the proposal is unlikely to impact on an important population of the species.

c) fragment an existing important population into two or more populations

While Alignment West avoids all known populations of *Homoranthus lunatus*, there is potential for unknown populations to occur within areas that would be impacted by the Project. Given that this species grows in small and localised populations, there is potential for the Project to result in the fragmentation of an important population into two or more populations.

Given the remoteness of current records from the Alignment West, it is unlikely that the proposal would result in any populations of *Phebalium glandulosum* subsp. *eglandulosum* being fragmented.

Given the remoteness of current records from the Alignment West, it is unlikely that the proposal would result in any populations of *Phebalium whitei* being fragmented.

Given the remoteness of current records from the Alignment West, it is unlikely that the proposal would result in any populations of *Prostanthera staurophylla sensu stricto* being fragmented.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for *Homoranthus lunatus*, *Phebalium glandulosum* subsp. *eglandulosum*, *Phebalium whitei* or *Prostanthera staurophylla sensu stricto*.

No habitat critical to the survival of these species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for these species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of an important population

No areas of known habitat for *Homoranthus lunatus* would be cleared and therefore there should be no disruption to the breeding cycle of the species.

No areas of known habitat for *Phebalium glandulosum* subsp. *eglandulosum* would be cleared and therefore there should be no disruption to the breeding cycle of the species.

No areas of known habitat for *Phebalium whitei* would be cleared and therefore there should be no disruption to the breeding cycle of the species.

No areas of known habitat for *Prostanthera staurophylla sensu stricto* would be cleared and therefore there should be no disruption to the breeding cycle of the species.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The known locations of *Homoranthus lunatus* are remote from the proposed Alignment West. However, there is potential for this species to occur within the Project area, as suitable habitat exists within the area of proposed works. Given that this species is at risk from the localised clearing, due to its highly localised and small populations, it is considered that the Project has the potential to impact on habitat for this species (DECCW, 2010).

The known habitat of *Phebalium glandulosum* subsp. *eglandulosum* is remote from the proposed Alignment West. The proposal is therefore unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat for this species.

The known habitat of *Phebalium whitei* is remote from the proposed Alignment West. The proposal is therefore unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat for this species.

The known habitat of *Prostanthera staurophylla sensu stricto* is remote from the proposed Alignment West. The proposal is therefore unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat for this species

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Homoranthus lunatus is threatened by feral goats, which were observed several times within the Project area. Given that feral goats are already established within the Project area, it is considered unlikely that the proposed works would result in the establishment of any additional invasive species within the Project area (DECCW, 2010).

Given the remoteness of known populations of *Phebalium glandulosum* subsp. *eglandulosum* it is unlikely that the proposed works would result in the establishment of any additional invasive species. Weeds are not known to be a major threat to this species.

As populations of *Phebalium whitei* are located away from the proposed Alignment West. It is highly unlikely that the proposal would result in the introduction of a harmful invasive species to the habitat of this species.

Given the distance of the known populations from the proposal, it is unlikely that works would contribute to the introduction of invasive weeds to this species habitat.

h) introduce disease that may cause the species to decline, or

There is no disease identified within the literature that is considered likely to cause *Homoranthus lunatus* to decline.

Given the remoteness of known populations of *Phebalium glandulosum* subsp. *eglandulosum* from the proposed easement, it is highly unlikely that diseases would be introduced into its habitat through construction activities.

Given the remoteness of known populations of *Phebalium whitei* from the proposed easement, it is highly unlikely that diseases would be introduced into its habitat through construction activities.

Given the remoteness of known populations of *Prostanthera staurophylla sensu stricto* from the proposed easement, it is highly unlikely that diseases would be introduced into its habitat through construction activities.

i) *interfere substantially with the recovery of the species.*

There are no existing recovery plans for *Homoranthus lunatus*. DECCW (2005a) has proposed a single priority action for this species; Control feral animals within the species range.

The proposed works are unlikely to result in any change to the existing fire regime, and are unlikely to alter the presence of feral goats within the Project area, as they are already established. If any individuals are found to occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works would not interfere with the recovery of this species.

There are no existing recovery plans for *Phebalium glandulosum* subsp. *eglandulosum*. DECCW (2005b) has proposed a single priority action for this species; Control and monitor feral and domestic ungulate disturbance in known and potential habitat.

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that the species occurs within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works would not interfere with the recovery of this species, as no known individuals would be impacted, nor would any known habitat.

There are no existing recovery plans for *Phebalium whitei*. DSEWPac (2008a) proposes the following recovery and threat abatement actions that are relevant to the Project:

- Monitor known populations to identify key threats;
- Ensure road widening and maintenance activities (or other infrastructure or development activities) involving substrate or vegetation disturbance in areas where *P. whitei* occurs do not adversely impact on known populations;
- Minimise adverse impacts from land use at known sites

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that the species occurs within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works would not interfere with the recovery of this species, as no known individuals would be impacted, nor would any known habitat.

There are no existing recovery plans for *Prostanthera staurophylla sensu stricto*. However DSEWPac (2008b) has proposed the following priority action for this species relevant to the Project:

- Ensure maintenance activities (or other infrastructure or development activities involving substrate or vegetation disturbance) in areas where *Prostanthera staurophylla* occurs do not adversely impact on known populations.

Conclusion

The significant impact criteria assessment concludes that the proposal is not likely to significantly impact *Phebalium glandulosum* subsp. *eglandulosum*, *Phebalium whitei* and *Prostanthera staurophylla sensu stricto*. As such, a referral to the Minister is not required.

The significant impact criteria assessment concludes that the proposal may significantly impact *Homoranthus lunatus*. Consequently, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in Volume 2 of the EA. A number of measures are recommended in **Section 7**, **Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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1.1.14 Rusty Rose Walnut (*Endiandra hayesii*), Rough-shelled Bush Nut (*Macadamia tetraphylla*) and Onion Cedar (*Owenia cepiodora*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Within the Project area, *Endiandra hayesii* (Vulnerable, EPBC Act; Vulnerable, TSC Act), *Macadamia tetraphylla* (Vulnerable, EPBC Act; Vulnerable, TSC Act) and *Owenia cepiodora* (Vulnerable, EPBC Act; Vulnerable, TSC Act) are likely to occur based on previous records (Atlas of NSW Wildlife, EPBC Act Protected Matter Report) and habitats present. The Project may result in the clearing of potential habitat for each these species. However, no known habitat would be impacted by the Project. Based on previous records of these species, and given that they were not observed within the Project area during field surveys, it is considered unlikely that the Project would result in a long-term decrease in the size of a population of each of the above species.

b) reduce the area of occupancy of an important population

Endiandra hayesii has a restricted distribution from Burleigh Heads in Queensland to the Richmond River in north-east NSW, where it is locally abundant in some locations. This species is considered to have the potential to occur within the Project area, within Alignment East, based on the presence of suitable habitat. However there are no previous records within the Project area. The works associated with the Project are, therefore, considered unlikely to reduce the area of occupancy of a population of *Endiandra hayesii*.

Macadamia tetraphylla is largely confined to the Richmond and Tweed Rivers in north-east NSW, with a limited range extending across the border into Queensland. This species is considered to have the potential to occur within the Project area within Alignment East, based on the presence of suitable habitat. However there are no previous records within the Project area. The works associated with the Project are therefore considered unlikely to reduce the area of occupancy of a population of *Macadamia tetraphylla*.

Owenia cepiodora is distributed north from the Richmond River in north-east NSW, extending just across the Queensland border. This species is considered to have the potential to occur within the Project area within Alignment East, based on the presence of suitable habitat. However, there are no previous records within the Project area. There are, however, records within 5 km of the Project area. The works associated with the Project are considered unlikely to reduce the area of occupancy of a population of *Owenia cepiodora*.

c) fragment an existing important population into two or more populations

Endiandra hayesii, *Macadamia tetraphylla* and *Owenia cepiodora* are all considered to have the potential to occur within the Project area. However, no records for these species exist within the area of proposed works. The Project would require the expansion of the existing 132kV easement to accommodate the proposed 330kV easement, as well as the establishment of the 330kV easement for Alignment West. Works associated with the Project are considered unlikely to result in the fragmentation of existing populations into two or more populations of *Endiandra hayesii*, *Macadamia tetraphylla* and *Owenia cepiodora*, based on the location of previous records of these species.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for this species.

No habitat critical to the survival of these species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for these species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of an important population

Endiandra hayesii has been observed to flower in January, March, May, October and November. Flowers are small and white to pale green, and are held in small clusters. The fleshy fruits are egg-shaped, 2.5-3cm long, and purplish-black when ripe. Fruits have been recorded in March, May, October and November and are likely to be distributed by birds. Cleared fresh seed of this species has been observed to germinate readily within eight weeks. It is likely that this species is insect pollinated. This species has the potential to occur within the Project area, based on the presence of suitable habitat. However, there are no known records of this species within the Project area. Consequently, it is considered unlikely that the Project has the potential to disrupt the breeding cycle of a population of *Endiandra hayesii*.

Macadamia tetraphylla has a creamy pink to purple flowers that hang in long strings among the leaves. The fruit is woody brown and globular. Edible seeds are enclosed in a brown shell

inside a round green husk. *Macadamia tetraphylla* is estimated to have a lifespan of over 100 years, with a juvenile period greater than six years (DSEWPaC, 2010a). Flowering occurs from August to October and is recorded fruiting between January and April. The species reproduces from seed and seed dispersal is via streams. Clean nuts germinate within a period of two weeks and the seed remains viable for a period of a few weeks to six months. Vegetative resprouting and new seedlings have been recorded following habitat damage (DSEWPaC, 2010). This species has the potential to occur within the Project area, based on the presence of suitable habitat. However there are no known records of this species within the Project area. Consequently, it is considered unlikely that the Project has the potential to disrupt the breeding cycle of a population of *Macadamia tetraphylla*.

Little is known about the breeding cycle of *Owenia cepiodora*. The flowers of the *Owenia cepiodora* are white and in clusters at the ends of branchlets. The species produces red fruit that are 15-20mm wide, with white pulpy flesh surrounding a stone with one or two seeds. Given that there are no known records of this species within the Project area, it is considered unlikely that the Project has the potential to disrupt the breeding cycle of a population of *Owenia cepiodora*.

f) *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Endiandra hayesii occurs in subtropical and warm temperate rainforests and Brush Box forests. The altitude varies from near sea-level to 800m ASL. The main threats to this species include loss of habitat through clearing and development, the presence of low numbers and weed infestation. In addition, reduced and fragmented populations are likely to suffer loss of genetic variation due to loss of individuals with unique genetic variants, inbreeding and genetic drift. It is also unknown the extent to which fruit collections from wild populations takes place.

Given that this species was not found within the Project area, nor are there previous records from within the Project area, it is considered unlikely that the Project would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Macadamia tetraphylla is usually found in the subtropical rainforest near the coast, complex notophyll vineforest, at the margins of these forests and in mixed sclerophyll forest (DSEWPaC, 2010a). The main threats to this species include clearing and fragmentation due to development, agriculture and roadworks, the presence of low numbers, grazing and trampling, fire, weed invasion and loss of local genetic strains. Given that this species was not found within the Project area, nor are there previous records from within the Project area, it is considered unlikely that the Project would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Owenia cepiodora occurs in subtropical and dry rainforest on or near soils derived from basalt. The main threats to the survival of this species include habitat loss and fragmentation, grazing, fire, weed invasion, climate change, active acid sulphate soils and the removal of dead wood. Given that this species was not found within the Project area, none are there previous records from within the Project area, it is considered unlikely that the Project would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

Endiandra hayesii may be threatened by invasive species such as Lantana (*Lantana camara*) and Camphor Laurel (*Cinnamomum camphora*). These species may compete with *Endiandra*

hayesii and can smother seedlings as they emerge. It is also recognised that due to its high flammability, *Lantana camara* may increase the fire risks to *Endiandra hayesii* (DSEWPaC, 2010b).

Macadamia tetraphylla may be threatened by invasive species such as the Mickey Mouse Plant (*Ochna serrulata*), Privet (*Ligustrum* spp.), Mistflower (*Ageratina riparia*), Groundsel (*Baccharis halimifolia*), Camphor Laurel (*Cinnamomum camphor*), Lantana (*Lantana camara*), Passionfruit (*Passiflora edulis*), *Pinus* spp., Blue Billygoat-weed (*Ageratum houstonianum*), Crofton-weed (*Eupatorium adenophorum*), Mist-flower (*Eupatorium riparium*), Silver-leaved Desmodium (*Desmodium uncinatum*) and Wild Tobacco Tree (*Solanum mauritianum*) (DSEWPaC, 2010a).

Owenia cepiodora may also be threatened by invasive species such as Lantana (*Lantana camara*).

Several of the invasive species listed above already exist within the Project area, and some have the potential to be spread via works associated with the Project.

Each of these species is only predicted to occur along Alignment East, in which the existing 132kV Transmission Line is located. Given the existing disturbances within the Alignment East of the Project area, it is considered unlikely that the Project would result in any additional invasive species that are harmful to *Endiandra hayesii*, *Macadamia tetraphylla* and *Owenia cepiodora* becoming established in the species habitat.

h) introduce disease that may cause the species to decline, or

There are no known diseases that are likely to cause these species to decline. There is no mention in the relevant literature of any potential disease-based threats to these species. Rather, illegal clearing of land in known habitat areas and grazing is more likely to pose a more serious threat.

i) interfere substantially with the recovery of the species.

A recovery plan currently exists for the *Endiandra hayesii*. The overall objective of this recovery plan is to prevent the decline of populations of *Endiandra hayesii* in the wild, to ensure ongoing viability of wild populations, and to maintain the evolutionary potential of the taxa (Department of Environment and Conservation (NSW), 2004). Additional recovery actions are identified in DECCW (2010) that are relevant to the Project and the species:

- To protect rainforest, related vegetation and species from clearing.
- To protect rainforest and related vegetation from fragmentation, modification and degradation.
- To protect rainforest and related vegetation from the impact of weeds.
- To minimise the impacts of human interference.
- To control and minimise impacts of introduced pathogens and diseases.
- To engage the community and private land-holders in biodiversity conservation.
- To establish effective monitoring of biodiversity related projects.

A recovery plan has been developed that encompasses *Macadamia tetraphylla* which lists a number of recovery actions for the species (Costello et al., 2009). The following are related to the Project:

- Identify and evaluate the extent and quality of southern macadamia species populations and their habitat.
- Reduce and manage the major threatening processes affecting southern macadamia species habitat.

DEC (2005) has also identified a number of recovery actions for *Macadamia tetraphylla*. Those relevant to the Project include:

- Undertake habitat assessments at known sites and ascertain threats, considering information from previous surveys.
- Ensure that land managers and other stakeholders are aware of populations and habitat.
- Prevent rainforest habitat loss, degradation and fragmentation.
- Undertake weed removal at priority sites.

A recovery plan has been developed that encompasses *Owenia cepiodora* (DECCW 2010). This plan identifies the following recovery actions for the species:

- To protect rainforest, related vegetation and species from clearing.
- To protect rainforest and related vegetation from fragmentation, modification and degradation.
- To protect rainforest and related vegetation from the impact of weeds.
- To minimise the impacts of human interference.
- To control and minimise impacts of introduced pathogens and diseases.
- To engage the community and private land-holders in biodiversity conservation.
- To establish effective monitoring of biodiversity related projects.

DEC (2005) has defined several recovery actions for *Owenia cepiodora*:

- All populations occurring on roadside areas would be marked in the field.
- Undertake site assessments and monitoring of existing and new populations as located.
- Investigate extent of distribution through targeted surveys.

Given that works associated with the Project within Alignment East would involve the expansion of the existing 132kV easement to accommodate the proposed 330kV easement, the Project is considered unlikely to interfere substantially with the recovery of the above species.

Conclusion

The significant impact criteria assessment concludes that the proposal is unlikely to significantly impact on *Endiandra hayesii*, *Macadamia tetraphylla* and *Owenia cepiodora*. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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1.1.15 Sweet Myrtle (*Gossia fragrantissima*) and Ripple-leaf Muttonwood (*Myrsine richmondensis*)

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

- a) lead to a long-term decrease in the size of a population

Within the Project area, *Gossia fragrantissima* (Endangered, EPBC Act; Endangered, TSC Act) and *Myrsine richmondensis* (Endangered, EPBC Act; Endangered, TSC Act) are likely to occur based on previous records (Atlas of NSW Wildlife, EPBC Act Protected Matter Report) and habitats present. The Project may result in the clearing of potential habitat in the form of vegetation. Given the species known populations and distribution, the Project has the potential to result in a long-term decrease in the size of a population of *Gossia fragrantissima* and *Myrsine richmondensis*.

- b) reduce the area of occupancy of the species

Gossia fragrantissima is distributed throughout south-east Queensland and north-east NSW south to the Richmond River. This species is mainly found on basalt derived soils. The species has been identified as likely to occur within the Project area. As the Project would require the expansion of the existing 132kV easement to accommodate the proposed 330kV easement, it is considered likely that works associated with the Project would result in a long-term decrease in the size of a population of *Gossia fragrantissima*.

Myrsine richmondensis occurs in only a few populations at Coraki, Boatharbour near Lismore and the Cherry Tree area west of Casino. The population west of Casino is the largest known population with in excess of 370 plants. This species is also considered likely to occur within the Project area. As the Project would require the expansion of the existing 132kV easement to accommodate the proposed 330kV easement, it is considered likely that works associated with the Project would result in a long-term decrease in the size of a population of *Myrsine richmondensis*.

c) *fragment an existing population into two or more populations*

The Project would require the expansion of the existing 132kV easement to accommodate the proposed 330kV easement. The Project has the potential to result in the fragmentation of existing populations into two or more populations of *Gossia fragrantissima* and *Myrsine richmondensis*.

d) *adversely affect habitat critical to the survival of a species*

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for this species within NSW.

No habitat critical to the survival of these species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for these species is unlikely to be impacted by the Project.

e) *disrupt the breeding cycle of a population*

Little is known about the breeding cycle of *Gossia fragrantissima*. The flowers of *Gossia fragrantissima* are small, white and fragrant and are followed by small, round, yellow to orange berries. The Project has the potential to have an impact on the breeding system of the *Gossia fragrantissima* population likely to exist within the Project area.

The flowers of *Myrsine richmondensis* are small, with prominent raised glands. Flowering has been recorded as occurring between October and December. Fruit has been recorded in November and early January. Field observations indicate that this species relies on both seed production and suckering for reproduction. It is unknown how this species is pollinated, however it is considered likely that this species is insect-pollinated. Seed dispersal is unknown (DECCW, 2004). There is little other known information about the breeding cycle of this species. The Project has the potential to have an impact on the breeding system of the *Myrsine richmondensis* population likely to exist within the Project area.

f) *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Gossia fragrantissima occurs mainly in dry subtropical and riverine rainforest. It is also known that this species can grow as isolated plants from roots left in the ground when rainforest is cleared. The main threats to the survival of this species include habitat degradation through weed invasion and disturbance, loss of habitat associated with clearing and fragmentation and grazing. Local extinction is also a risk due to populations being so small. Given this knowledge of the species current habitat, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Myrsine richmondensis grows in subtropical and dry rainforest and swamp forest on creek flats and slopes, as well as in swamp sclerophyll forest/rainforest ecotone on the Richmond River floodplain. The main threats to the survival of this species include the widening and maintenance of roads, loss of habitat associated with clearing and fragmentation, fire along

the edges of rainforest patches, weed infestation, trampling and grazing. Local extinction is also a risk due to populations being so small. Given this knowledge of the species current habitat, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Little information exists as to the impact invasive species can have on existing populations of *Gossia fragrantissima* in the Project area, however it is noted that weed infestation is one of the main threats to the species.

All known populations of *Myrsine richmondensis* are threatened by weed infestation (particularly Lantana, exotic vines and Honey Locust) and competition (DECCW, 2005a). A list of the prominent weed species to threaten and compete with *Myrsine richmondensis* is provided in the Approved NSW and National Recovery Plan (DECCW, 2004).

It is possible that invasive species already exist within the Project area and could potentially displace populations *Gossia fragrantissima* and *Myrsine richmondensis* an. Invasive species may also be accidentally spread via movement of plant and machinery within the Project area, or by transport of stockpiled construction material and organic matter during works undertaken.

Given the existing disturbances within the Project area, it is considered unlikely that the Project would result in invasive species that are harmful to *Gossia fragrantissima* and *Myrsine richmondensis* becoming established in the species habitat.

h) introduce disease that may cause the species to decline, or

It is considered unlikely that the Project would introduce any diseases that may cause the above species to decline. Mitigation measures are recommended in **Section 7, Appendix D4** of this Report to minimise the risk of the introduction of the diseases into all areas associated with the Project.

i) interfere with the recovery of the species.

A recovery plan has been developed for *Myrsine richmondensis*. This plan describes a number of key recovery actions for this species. Some of the actions relevant to the Project area include installing roadside markers where the species is likely to be affected by maintenance of road verges, site assessment of population/s that exist within the Project area, continuation of weed control and bush regeneration programs and exclusion of fire from know habitat.

A recovery plan has been developed that encompasses *Gossia fragrantissima*. A number of recovery actions are recommended for the species (DECCW 2010) that are relevant to the Project:

- To protect rainforest, related vegetation and species from clearing
- To protect rainforest and related vegetation from fragmentation, modification and degradation
- To protect rainforest and related vegetation from the impact of weeds
- To protect rainforest and related vegetation from grazing and trampling by livestock
- To control and minimise impacts of introduced pathogens and diseases
- To engage the community and private land-holders in biodiversity conservation
- To establish effective monitoring of biodiversity related projects

Additionally DEC (2005) has identified nine priority actions to help recover this species. The following are related to the Project:

- Fence rainforest remnants to protect them from cattle.
- Control weeds in dry subtropical and riverine rainforest.
- Protect areas of rainforest habitat.
- Expand and connect remaining remnants of habitat.

Conclusion

The significant impact criteria assessment concludes that the proposal has the potential to significantly impact on *Gossia fragrantissima* and *Myrsine richmondensis*. As such, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in Volume 2 of the EA. A number of measures are recommended in **Section 7**, **Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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1.1.16 Thorny Pea (*Desmodium acanthocladum*) and Brush Sophora (*Sophora fraseri*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Within the Project area, *Desmodium acanthocladum* (Vulnerable, EPBC Act; Vulnerable, TSC Act) and *Sophora fraseri* (Vulnerable, EPBC Act; Vulnerable, TSC Act) are considered likely to occur based on previous records (Atlas of NSW Wildlife, EPBC Act Protected Matter Report) and habitats present. The Project may result in the clearing of potential habitat in the form of vegetation suitable for these species to occur in. The Project therefore has the potential to result in a long-term decrease in the size of a population of each of the above species.

b) reduce the area of occupancy of an important population

Desmodium acanthocladum only occurs in north east NSW. It is found in the Lismore area, and there are also records from near Grafton, Coraki, Casino and Mount Warning area. This species is considered likely to occur within the Project area based on the presence of suitable habitat. No known records of this species would be impacted by the Project, and no known habitat for this species would be cleared. Consequently, it is considered unlikely that works associated with the Project would result in a long-term decrease in the size of a population of *Desmodium acanthocladum*.

Sophora fraseri is found north of Casino through to north-east NSW, where it is very rare. It is also located in south-east Queensland where it is widespread but not common. This species is also listed as likely to occur within the Project area based on the presence of suitable habitat. No known records of this species would be impacted by the Project, and no known habitat for this species would be cleared. Consequently, it is considered unlikely that works associated with the Project would result in a long-term decrease in the size of a population of *Sophora fraseri*.

c) fragment an existing important population into two or more populations

Desmodium acanthocladum and *Sophora fraseri* are considered to have the potential to occur within the Project area, based on the presence of suitable habitat. No known populations of these species have been recorded within the easement. Consequently, the Project is considered unlikely to result in the fragmentation of any existing populations into two or more populations.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for these species.

No habitat critical to the survival of these species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for these species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of an important population

Little is known about the breeding cycle of *Desmodium acanthocladum*. Flowering occurs in summer followed by a stick seed pod about 5 cm long. As the ecology of this species is largely unknown, it is difficult to determine whether the Project would disrupt the breeding cycle of this population.

The pale yellow flowers of the *Sophora fraseri* have the shape of a typical pea flower, and are arranged in groups at the ends of branches. The seed pods are 3-10cm long and contain two to six seeds. Little is known about the breeding cycle of this species. Without further information it is difficult to determine whether the Project would disrupt the breeding cycle of this population.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Desmodium acanthocladum occurs mainly in dry rainforest, in the fringes of riverine subtropical rainforest and on basalt-derived soils at low elevations. The main threats to the survival of this species include damage to plants and habitat by roadworks, clearing and fragmentation for agriculture or development, browsing and trampling by stock and weed infestation. Given this knowledge of the species current habitat, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Sophora fraseri usually occurs in moist situations, often near rainforest. The main threats to this species include loss of habitat through clearing and development, weed infestation, inappropriate fire regimes, and timber harvesting activities. This species is at risk of local extinction because populations are small. Given this knowledge of the species current habitat, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Desmodium acanthocladum may be threatened by invasive species such as Asparagus fern and Lantana. *Sophora fraseri* may also be threatened by a variety of invasive species, especially Lantana. It is possible that each of these invasive species already exist within the Project area.

Each of these invasive species may be accidentally spread via movement of plant and machinery within the Project area, or by transport of stockpiled construction material and organic matter during works undertaken in proximity to waterways. As such, the Project has the potential to result in disturbance to a number of areas.

Given the existing disturbances within the Project area, it is considered unlikely that the Project would result in invasive species that are harmful to *Desmodium acanthocladum* and *Sophora fraseri* becoming established in the species habitat.

h) introduce disease that may cause the species to decline, or

There are no known diseases that are likely to cause these species to decline. There is no mention in the relevant literature of any potential disease-based threats to these species. Rather, illegal clearing of land in known habitat areas and grazing is more likely to pose a more serious threat.

i) interfere substantially with the recovery of the species.

There are no existing recovery plans for *Desmodium acanthocladum* or *Sophora fraseri*. However DECCW (2005) has defined several recovery actions for each species as listed below, relevant to the Project:

Desmodium acanthocladum

- Support local Landcare groups and bush regeneration teams.
- Provide stock watering points away from streams.
- Exclude stock by fencing off habitat areas.
- Protect known populations during roadworks.
- Control weeds.
- Protect known and potential habitat from clearing or development.
- Rehabilitate and expand streamside habitat.
- Notify DEC of any new records of Thorny Pea.

Sophora fraseri

- Support local Landcare groups and bush regeneration teams.
- Protect areas of habitat from frequent fire.
- Protect areas of habitat during timber harvesting activities.
- Control weeds in and near habitat.
- Protect known and potential habitat from clearing and development.
- Report new records of *Sophora fraseri* to OEH.

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that these species occur within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. If any individuals are found to occur within the easement during pre-clearance surveys or the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. Consequently, the proposed works would not interfere with the recovery of these species, as no known individuals would be impacted, nor would any known habitat.

Conclusion

The significant impact criteria assessment concludes that the proposal has the potential to significantly impact on *Desmodium acanthocladium* and *Sophora fraseri*. As such, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in Volume 2 of the EA. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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1.1.17 Creek Triplarina (*Triplarina imbricata*)

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

a) *lead to a long-term decrease in the size of a population*

Within the Project area, *Triplarina imbricata* (Endangered, EPBC Act; Endangered, TSC Act) is considered to have the potential to occur based on previous records (Atlas of NSW Wildlife,

EPBC Act Protected Matter Report) and habitats present. The Project may result in the clearing of potential habitat in the form of vegetation suitable for this species to occur in. The Project has, therefore, the potential to result in a long-term decrease in the size of the *Triplarina imbricata* population.

b) reduce the area of occupancy of the species

Triplarina imbricata is only found in a small number of locations in the ranges south-west of Glenreagh and near Tabulam in north-east NSW. This species is listed as likely to occur within the Project area, based on the presence of suitable habitat. No known records of this species would be impacted by the Project, and no known habitat for this species would be cleared. Consequently, it is considered unlikely that works associated with the Project would result in a long-term decrease in the size of a population of *Triplarina imbricata*.

c) fragment an existing population into two or more populations

Triplarina imbricata is considered to have the potential to occur within the Project area, based on the presence of suitable habitat. No known populations of this species have been recorded within the easement. Consequently, the Project is considered unlikely to result in the fragmentation of any existing populations into two or more populations.

Given the remoteness of current records from the Alignment, it is unlikely that the proposal would result in any populations of *Triplarina imbricata* being fragmented.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for *Triplarina imbricata*.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for this species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of a population

Triplarina imbricata is a newly recognised species previously thought to be the same as *Baeckea camphorate*. This species produces little white flowers borne in pairs. Little is known about the breeding cycle of this species. Without further information it is difficult to determine whether the Project would disrupt the breeding cycle of this population.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Triplarina imbricata occurs mainly along watercourses in low open forest with *Tristaniopsis laurina*. The main threats to the survival of this species include habitat loss and fragmentation, fire, weed infestation and damage to plants by visitors in riverside recreational areas. This species is at risk of local extinction because populations are small. Given this knowledge of the species current habitat, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Triplarina imbricata may be threatened in the Project area by invasive species including Small-leaved Privet and Lantana. It is possible that each of these invasive species already exist within the Project area.

Each of these invasive species may be accidentally spread via movement of plant and machinery within the Project area, or by transport of stockpiled construction material and organic matter during works undertaken in proximity to waterways. As such, the Project has the potential to result in disturbance to a number of areas.

Given the existing disturbances within the Project area, it is considered unlikely that the Project would result in invasive species that are harmful to *Triplarina imbricata* becoming established in the species habitat.

h) introduce disease that may cause the species to decline, or

There are no diseases known that are likely to cause *Triplarina imbricata* to decline.

i) interfere with the recovery of the species.

A recovery plan has been developed that encompasses *Triplarina imbricata* (DECCW 2010). Several recovery actions are recommended for the species which are relevant to the Project:

- Protect species and their habitats from the effects of clearing and fragmentation.
- To protect vegetation communities, ecosystems and habitats from inappropriate fire regimes.
- Protect the Region from the impact of weeds.
- Minimise human-induced disturbance and mortality of species.
- Reduce the impacts of domestic livestock on the natural environment.
- To engage the community and private landholders in biodiversity conservation.
- To establish effective monitoring of biodiversity related projects.

Additionally, DEC (2005) has identified 13 priority actions to help recover this species. The following are related to the Project:

- Take care to avoid damaging native vegetation at riverside recreation spots.
- Protect creekside habitat from fire.
- Protect creek-bank vegetation from disturbance.
- Assist with the control of introduced weeds in creekside habitats.
- Expand and connect remnants of creekside vegetation.
- Notify OEH of additional occurrences of Creek *Triplarina*.

Given the works proposed as part of the Project, there is potential for interference with the recovery of this species.

Conclusion

The significant impact criteria assessment concludes that the proposal has the potential to impact significantly on *Triplarina imbricata*. Consequently, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in Volume 2 of the EA. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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1.1.18 Slender Marsdenia (*Marsdenia longiloba*), Northern Clematis (*Clematis fawcettii*) and *Kardomia granitica*

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Marsdenia longiloba (Vulnerable, EPBC Act; Endangered, TSC Act) occurs in scattered sites on the north coast of NSW from Hastings River northwards to Nebo in Queensland. It is also conserved within the Lamington National Park (NP), Main Range NP, Mt Barney NP, and Toonumbar NP (DEWHA, 2008a). The Atlas of NSW Wildlife (DECCW, 2010) shows a *Marsdenia longiloba* population occurring in scattered locations, remote from the Alignment in both the East and West. Given that these populations are remote from the Alignment, it is unlikely that the proposed development would have an adverse effect on the species such that the local populations would be placed at risk of extinction.

Clematis fawcettii (Vulnerable, EPBC Act; Vulnerable, TSC Act) occurs from the Richmond River in north-east NSW to the Bunya Mountains in south-east Queensland. This species is conserved within the Lamington National Park (NP), Main Range NP, Mt Barney NP, and Toonumbar NP (DEWHA, 2008b). The Atlas of NSW Wildlife (DECCW, 2010) shows scattered *Clematis fawcettii* populations to the north and east of the alignment East. Given that these populations are remote from the Alignment, it is unlikely that the proposed development would have an adverse effect on the species such that the local populations would be placed at risk of extinction.

Kardomia granitica formerly *Babingtonia granitica* (Vulnerable, TSC Act; Vulnerable EPBC Act) is restricted to three small populations in the tableland granite country around Stanthorpe, Queensland. There are no records of this species from NSW, but it is likely to occur in Bald Rock National Park, within the Stanthorpe Plateau sub-region of the Northern Rivers CMA. It was not observed during URS field survey. It is considered unlikely that the Project would result in an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.

- b) reduce the area of occupancy of an important population

The known locations of *Marsdenia longiloba* have been mapped on the Atlas of NSW Wildlife (DECCW, 2010). The proposal's Alignment avoids all mapped locations. Furthermore, since the populations of *Marsdenia longiloba* were not located along the alignment during survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of an important population as there should not be any clearing of the species.

The known locations of *Clematis fawcettii* have been mapped on the Atlas of NSW Wildlife (DECCW, 2010). The proposal's Alignment avoids all mapped locations. Furthermore, since the populations of *Clematis fawcettii* were not located along the alignment during survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of an important population as there should not be any clearing of the species.

Kardomia granitica populations are located a significant distance from the Project area. Since *Kardomia granitica* was not located along the alignment during survey efforts, the proposed

action is not considered likely to reduce the overall area of occupancy of a population as there should not be any clearing of the species.

c) fragment an existing important population into two or more populations

Given the location and relative remoteness of current records from the Alignment West, it is unlikely that the proposal would result in any populations of *Marsdenia longiloba* being fragmented.

It is unlikely that the proposal would result in any populations of *Clematis fawcettii* being fragmented, particularly given the remoteness of current records of this species from the alignment East.

Given the remoteness of current records from northern NSW (DSEWPac 2012), it is unlikely that the proposal would result in any populations of *Kardomia granitica* being fragmented.

d) adversely affect habitat critical to the survival of a species

No Critical habitat for *Marsdenia longiloba* is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. Furthermore, no critical habitat for *Clematis fawcettii* or *Kardomia granitica* is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area.

No habitat critical to the survival of these species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for these species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of an important population

No areas of known habitat for *Marsdenia longiloba*, *Clematis fawcettii* or *Kardomia granitica* would be cleared and therefore there should be no disruption to the breeding cycle of the species.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

As the known locations of *Marsdenia longiloba* are remote from the proposed Alignment, it is considered very unlikely that potential habitat for this species would be removed or modified as a result of the proposed action (DECCW, 2010).

As the known locations of *Clematis fawcettii* are remote from the proposed Alignment, it is considered very unlikely that potential habitat for this species would be removed or modified as a result of the proposed action (DECCW, 2010).

As the known locations of *Kardomia granitica* are remote from the alignment and the species was not found during field surveys conducted within the study area it is considered unlikely that potential habitat for this species would be removed or modified as a result of the proposed action.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Due to the remoteness of the proposal from the known locations of *Marsdenia longiloba*, the proposed works are unlikely to result in the establishment of any additional invasive species that may result in increased competition to this species (DECCW, 2010). However, invasive species such as *Lantana camara* are listed as a threat within the species' Approved Conservation Advice and would need to be considered during the Project (DEWHA, 2008a).

Due to the remoteness of the proposal from the known locations of *Clematis fawcettii*, the proposed works are unlikely to result in the establishment of any additional invasive species

that may result in increased competition to this species (DECCW, 2010). However, invasive species including *Lantana camara*, *Ageratina riparia* (Mist Flower) and *A. adenophora* (Crofton Weed) are listed as a threat within the species' Approved Conservation Advice and would need to be considered during the Project (DEWHA, 2008b).

Given the remoteness of known populations of *Kardomia granitica* the proposed works are unlikely to result in the establishment of any additional invasive species that may result in increased competition to this species (DSEWPaC 2012).

h) introduce disease that may cause the species to decline, or

Given the remoteness of known specimens from the proposed easement, it is highly unlikely that diseases would be introduced into *Marsdenia longiloba* habitat through construction activities. The Approved Conservation Advice for *Marsdenia longiloba* does not identify disease as a threat to the species' survival (DEWHA, 2008a).

Given the remoteness of known specimens from the proposed easement, it is highly unlikely that diseases would be introduced into *Clematis fawcettii* habitat through construction activities. The Approved Conservation Advice for *Clematis fawcettii* does not identify disease as a threat to the species' survival (DEWHA, 2008b).

Given the remoteness of known specimens from the proposed easement, it is highly unlikely that diseases would be introduced into *Kardomia granitica* habitat through construction activities. The approved Conservation Advice for *Clematis fawcettii* does not identify disease as a threat to the species' survival (DSEWPaC, 2012).

i) interfere substantially with the recovery of the species.

There is no recovery plan currently in place for *Marsdenia longiloba*, however DECC has identified a number of strategies to assist in the recovery of this species (DECC, 2005a). Those relevant to the Project are:

- Site protection including fencing and signage.
- Weed control.
- Survey/mapping and habitat assessment.

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that *Marsdenia longiloba* occurs within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works would not interfere with the recovery of these species, as no known individuals would be impacted, nor would any known habitat.

There is no recovery plan currently in place for *Clematis fawcettii*, however DECC has identified a number of strategies to assist in the recovery of this species (DECC, 2005b). Those relevant to the Project are:

- Protect areas of known habitat
- Weed control.
- Survey/mapping and habitat assessment.

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that *Clematis fawcettii* occurs within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. If any individuals are found to

occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works would not interfere with the recovery of these species, as no known individuals would be impacted, nor would any known habitat.

There are no recovery plans for *Kardomia granitica* that have been prepared under NSW or Commonwealth legislation.

Conclusion

The significant impact criteria assessment concludes that the proposal is not likely to significantly impact *Marsdenia longiloba*, *Clematis fawcettii* or *Kardomia granitica*. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7**, **Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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<http://www.environment.gov.au/biodiversity/threatened/species/pubs/2794-conservation-advice.pdf>.

DEWHA (2008b) Threatened Species Scientific Committee. *Commonwealth Conservation Advice on Clematis fawcettii (Stream Clematis)*. Online. Department of the Environment, Water, Heritage and the Arts. Available from:

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1.1.19 Wandering Pepper Cress (*Lepidium peregrinum*)

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

- a) lead to a long-term decrease in the size of a population

Within the Project area, *Lepidium peregrinum* (Endangered, EPBC Act; Endangered, TSC Act) is likely to occur based on previous records (Atlas of NSW Wildlife, EPBC Act Protected Matter Report) and habitats present. The Project may result in the clearing of potential habitat in the form of vegetation. Given the species known populations and distribution, the Project has the potential to result in a long-term decrease in the size of a population of *Lepidium peregrinum*.

b) reduce the area of occupancy of the species

Lepidium peregrinum was thought to be extinct until recently rediscovered in NSW and Queensland. Research confirmed scattered populations in north-eastern NSW (near Tenterfield) and south-eastern Queensland. The largest population of this species has been identified in the Travelling Stock Reserve. This species has also been identified as being likely to occur within the Project area. As the Project would require the expansion of the existing 132kV easement to accommodate the proposed 330kV easement, it is considered likely that works associated with the Project would result in a long-term decrease in the size of a population of *Lepidium peregrinum*.

c) fragment an existing population into two or more populations

The Project would require the expansion of the existing 132kV easement to accommodate the proposed 330kV easement. The Project has the potential to result in the fragmentation of existing populations into two or more populations of *Lepidium peregrinum*.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for this species within NSW.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for this species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of a population

Lepidium peregrinum flowers from January to April. Studies have indicated that *Lepidium peregrinum* subpopulations have little to no recruitment, while others have juvenile plants in the absence of mature plants. This species may require specific triggers to break seed dormancy. It is possible the species persists in some location as dormant seed with no vegetative specimens being evident. Mature plant populations experience a boom and bust cycle.

There is little other known information about the breeding cycle of this species. The Project has the potential to have an impact on the breeding system of the *Lepidium peregrinum* population likely to exist within the Project area.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The largest population of *Lepidium peregrinum* occurs mainly in open riparian forest on the banks of the Tenterfield creek at Clifton. Sandy alluvium is the main soil type at this site. The main threats to the survival of this species include loss of habitat associated with clearing and fragmentation, grazing (considered to be the primary threat), weed infestation, extended drought periods and destruction of plants following mis-identification. Local extinction is also a risk due to populations being generally small. Given this knowledge of the species current habitat, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Little information exists as to the impact invasive species can have on existing populations of *Lepidium peregrinum* in the Project area, however it is noted that weed infestation is one of the main threats to this species.

It is possible that invasive species already exist within the Project area and could potentially displace populations of *Lepidium peregrinum*. Invasive species may also be accidentally spread via movement of plant and machinery within the Project area, or by transport of stockpiled construction material and organic matter during works undertaken.

Given the existing disturbances within the Project area, it is considered unlikely that the Project would result in invasive species that are harmful to *Lepidium peregrinum* becoming established in the species habitat.

h) introduce disease that may cause the species to decline, or

It is considered unlikely that the Project would introduce any diseases that may cause the above species to decline. Mitigation measures are recommended in **Section 7, Appendix D4** of this Report to minimise the risk of the introduction of the diseases into all areas associated with the Project.

i) interfere with the recovery of the species.

A recovery plan for *Lepidium peregrinum* has not yet been developed. However, DECCW (2005) has defined several relevant recovery actions such as the:

- Control rabbits and goats at the site
- Maintain the understorey of site through appropriate fire management
- Repair or restore fencing between Travelling Stock Route and adjacent freehold land
- Control weeds in riverine habitat at the site
- Monitor the site every six months

Conclusion

The significant impact criteria assessment concludes that the proposal has the potential to significantly impact on *Lepidium peregrinum*. As such, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in Volume 2 of the EA. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/pas_profile.aspx?id=10464
- Department of Environment, Water, Heritage and the Arts (2010) EPBC Act Protected Matters Report.
- NSW National Parks and Wildlife Service (2010) Atlas of NSW Wildlife Viewed online 26/11/2010. <http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp>
- DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

1.1.20 White-flowered Wax Plant (*Cynanchum elegans*) and Cryptic Forest Twiner (*Tylophora woollsii*)

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

a) lead to a long-term decrease in the size of a population

Within the Project area, *Cynanchum elegans* (Endangered, EPBC Act; Endangered, TSC Act) is likely to occur based on previous records and habitats present. The Project may result in the

clearing of potential habitat in the form of vegetation. Given the species known populations and distribution across NSW, the Project has the potential to result in a long-term decrease in the size of a population of *Cynanchum elegans*.

Tylophora woollsii (Endangered, EPBC Act; Endangered, TSC Act) is also likely to occur in the Project area based on previous records and habitats present. The Project may result in the clearing of potential habitat in the form of vegetation. The works associated with the Project has the potential to result in a long-term decrease in the size of a population of *Tylophora woollsii*.

b) reduce the area of occupancy of the species

Cynanchum elegans is restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. The species has been recorded as far west as Merriwa in the upper Hunter River valley. The species have been listed as likely to occur within the Project area (NSW National Parks and Wildlife Service, 2010). Given the species known populations and distribution across NSW, it is considered likely that works associated with the Project would result in a long-term decrease in the size of a population of *Cynanchum elegans*.

Tylophora woollsii is found in small populations from the NSW north coast and New England Tablelands to southern Queensland. This species is known to exist on the Tablelands from the Bald Rock and Boonoo Boonoo areas north of Tenterfield. It has also been listed as likely to occur within the Project area (EPBC Act Protected Matters Report, 2010). Given the species very rare populations in NSW, it is considered likely that works associated with the Project would result in a long-term decrease in the size of a population of *Tylophora woollsii*.

c) fragment an existing population into two or more populations

The Project would require the expansion of the existing 132kV easement to accommodate the proposed 330kV easement. The Project has the potential to result in the fragmentation of existing populations into two or more populations of *Cynanchum elegans* and *Tylophora woollsii* habitat.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for this species within NSW.

No habitat critical to the survival of these species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for these species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of a population

Little is known about the breeding cycle of *Cynanchum elegans*. Flowering occurs primarily between August and May, with the peak in November. Seed production is variable and unreliable and is wind-dispersed. Studies have shown that they are released in a non-dormant state and hence are unlikely to persist in the soil seedbank (adapted from NSW Parks and Wildlife Service, 2002). The Project has the potential to have an impact on the breeding system of the *Cynanchum elegans* population likely to exist within the Project area.

Tylophora woollsii grows in moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins. Flowering occurs in summer and autumn, generally between January and March. Fruit is likely to be fully developed between April and July. The seeds are likely to be wind dispersed. There is little other known information about the breeding cycle of this

species. The Project has the potential to have an impact on the breeding system of the *Tylophora woollsii* population likely to exist within the Project area.

f) *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Cynanchum elegans occurs mainly at the ecotone between dry subtropical rainforest and sclerophyll forest/woodland communities. This species has been recorded in dry subtropical rainforest, littoral rainforest, coastal scrub, open forest and woodland and scrub to open scrub. The main threats to the survival of this species include loss of habitat from clearing, degradation of habitat from weed invasion, grazing and inappropriate fire management, limited suitable habitat and small number of individuals per sub-population. Given this knowledge of the species current habitat, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Tylophora woollsii grows in wet sclerophyll forest and rainforest of the northern and central western slopes of NSW and into southern Queensland. A number of populations also occur along disturbed roadside verges. *Tylophora woollsii* is threatened by forestry activities, clearing for agriculture, grazing and trampling by cattle and road works. Road works in particular has destroyed a number of plants. Given this knowledge of the species current habitat, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) *result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*

Little information exists as to the impact invasive species can have on existing populations of *Cynanchum elegans* and *Tylophora woollsii* in the Project area. However, it is possible that invasive species already exist within the Project area and could potentially displace populations of *Cynanchum elegans* and *Tylophora woollsii*. Invasive species may also be accidentally spread via movement of plant and machinery within the Project area, or by transport of stockpiled construction material and organic matter during works undertaken.

Given the existing disturbances within the Project area, it is considered unlikely that the Project would result in invasive species that are harmful to *Cynanchum elegans* and *Tylophora woollsii* becoming established in the species habitat.

h) *introduce disease that may cause the species to decline, or*

It is considered unlikely that the Project would introduce any diseases that may cause *Cynanchum elegans* and *Tylophora woollsii* to decline. Mitigation measures are recommended in **Section 7, Appendix D4** of this Report to minimise the risk of the introduction of the diseases into all areas associated with the Project.

i) *interfere with the recovery of the species.*

Recovery plans for *Cynanchum elegans* and *Tylophora woollsii* have not yet been developed; however, a specific recovery plan for *Tylophora woollsii* is currently in preparation.

To date, no formal recovery plan has been developed for. In lieu of a formal recovery plan for *Cynanchum elegans*, DEC (2005) has identified the following priority actions to help recover this species. The following are related to the Project:

- Consider off-site impacts in the assessment of nearby developments.
- Prevent inappropriate water run-off entering sites.
- Install fencing to exclude livestock and machinery, and control access where required.
- Protect areas of known and potential habitat from clearing and further fragmentation.

Cynanchum elegans is predicted to occur within the Project area based on previous research. Given the presence of the existing 132kV easement the Project has the potential to interfere substantially with the recovery of *Cynanchum elegans*.

The recovery plan for *Tylophora woollsii* (in prep) would outline the management objectives for the effective conservation of the species. A priority of this plan would be to survey for additional populations and monitor known populations so that any threats or population declines can be determined. Where necessary, protection measures may include: prevention of further damage from roadworks, exclusion of cattle or exclusion of logging activities. The Project has the potential to interfere substantially with the recovery of *Tylophora woollsii*.

A broad recovery plan for the region has been developed that includes *Tylophora woollsii*. The following recovery actions are considered relevant to the species and the Project:

- Protect species and their habitats from the effects of clearing and fragmentation.
- To protect vegetation communities, ecosystems and habitats from inappropriate fire regimes.
- Protect the Region from the impact of weeds.
- Protect the Region from the impact of disease and Pathogens.
- Minimise human-induced disturbance and mortality of species.
- Reduce the impacts of domestic livestock on the natural environment.
- To engage the community and private land-holders in biodiversity conservation.
- To establish effective monitoring of biodiversity related projects.

Additionally, DEC (2005) has identified the following priority actions to help recover this species. The following are related to the Project:

- Undertake weed control works.
- Protect known habitat from disturbance, clearing or spraying.

Conclusion

The significant impact criteria assessment concludes that the proposal has the potential to significantly impact *Cynanchum elegans* and *Tylophora woollsii*. As such, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in Volume 2 of the EA. A number of measures are recommended in **Section 7**, **Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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<http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp>

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NSW National Parks and Wildlife Service (2002) Threatened Species Information – *Tylophora woollsii*. Viewed online 23/11/2010.

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NSW National Parks and Wildlife Service (2002) Environmental Impact Assessment Guidelines – *Cynanchums elegans*. Viewed online 23/11/2010.

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DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

1.1.21 Rod's Star Hair (*Astrotricha roddii*)

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

a) lead to a long-term decrease in the size of a population

Astrotricha roddii (Endangered, EPBC Act; Endangered, TSC Act) occurs in NSW in the Ashford area north of Inverell, including Kwiambal and Kings Plains National Parks, Severn River Nature Reserve and Severn River State Forest. (DECCW, 2005a). The Atlas of NSW Wildlife (DECCW, 2010) shows the closest mapped *Astrotricha roddii* populations approximately 7km to the south-east of the proposed Dumaresq substation. These records are remote enough from the alignment west that the likelihood of presence and impact is relatively low. As no individuals were identified in areas targeted in and around the study area it is unlikely that the proposed development would have an adverse effect on the species such that the local populations would be placed at risk of extinction.

b) reduce the area of occupancy of the species

The known locations of this species have been mapped on the Atlas of NSW Wildlife (DECCW, 2010). Alignment west avoids all mapped locations. Since *Astrotricha roddii* was not located along the alignment during survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of an important population as there should not be any clearing of the species.

c) fragment an existing population into two or more populations

Given the remoteness of current records from the Alignment West, it is unlikely that the proposal would result in any populations of *Astrotricha roddii* being fragmented.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for *Astrotricha roddii*.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for this species is unlikely to be impacted by the Project.

e) *disrupt the breeding cycle of a population*

No areas of known habitat for *Astrotricha roddii* would be cleared and therefore there should be no disruption to the breeding cycle of the species.

f) *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

As the known locations of *Astrotricha roddii* are remote from the proposed Alignment West, it is considered unlikely that potential habitat for this species would be removed or modified as a result of the proposed action (DECCW, 2010).

g) *result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*

Due to the remoteness of the Project from the known locations of *Astrotricha roddii*, the Project is unlikely to result in the establishment of any additional invasive species that may result in increased competition to this species (DECCW, 2010). The proposed works are unlikely to result in an alteration to the existing environment such that any invasive species become established in the species' habitat.

h) *introduce disease that may cause the species to decline, or*

There are no diseases known that are likely to cause *Astrotricha roddii* to decline.

i) *interfere with the recovery of the species.*

There are no existing recovery plans for *Astrotricha roddii*. However DECCW (2005) has proposed the following priority action for this species relevant to the Project:

- Develop standard survey and environmental assessment guidelines for *Astrotricha roddii* and distribute them to all relevant consent authorities.

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that the species occurs within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. Consequently, the proposed works would not interfere with the recovery of this species, as no known individuals would be impacted, nor would any known habitat.

Conclusion

The significant impact criteria assessment concludes that the proposal is not likely to significantly impact *Astrotricha roddii*. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DECCW (2005) *Astrotricha roddii* – Profile

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DECCW (2005) *Astrotricha roddii* - Priority Actions.

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1.1.22 Bordered Guinea Flower (*Hibbertia marginata*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of an important population of a species

Hibbertia marginata (Vulnerable, EPBC Act; Vulnerable, TSC Act) is confined to the Richmond Range of NSW (DSEWPaC, 2008). The Atlas of NSW Wildlife (DECCW, 2010) shows the closest mapped *Hibbertia marginata* populations approximately 24km to the south of the alignment East in Mount Belmore State Forest on the Richmond Range. These records are remote enough from the alignment west that the likelihood of presence and impact is relatively low. As no individuals were identified in areas targeted in and around the study area it is unlikely that the proposed development would have an adverse effect on the species such that the local populations would be placed at risk of extinction.

b) reduce the area of occupancy of an important population

The known locations of this species have been mapped on the Atlas of NSW Wildlife (DECCW, 2010). Alignment East avoids all mapped locations. Since *Hibbertia marginata* was not located along the alignment during survey efforts, the proposed action is not considered likely to reduce the overall area of occupancy of an important population as there should not be any clearing of the species.

c) fragment an existing important population into two or more populations

Given the remoteness of current records from the alignment East, it is unlikely that the proposal would result in any populations of *Hibbertia marginata* being fragmented.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for *Hibbertia marginata*.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for this species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of an important population

No areas of known habitat for *Hibbertia marginata* would be cleared and therefore there should be no disruption to the breeding cycle of the species.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

As the known locations of *Hibbertia marginata* are remote from the proposed alignment East, it is considered very unlikely that potential habitat for this species would be removed or modified as a result of the proposed action (DECCW, 2010).

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Due to the remoteness of the proposal from the known locations of *Hibbertia marginata*, the proposed works are unlikely to result in the establishment of any additional invasive species that may result in increased competition to this species (DECCW, 2010). The proposed works are unlikely to result in an alteration to the existing environment such that any invasive species become established in the species' habitat.

h) introduce disease that may cause the species to decline, or

The Approved Conservation Advice for *Hibbertia marginata* (DSEWPac, 2008) notes that the pathogen *Phytophthora cinnamomi* can pose a threat to this species and its habitat. Given the remoteness of known specimens from the proposed easement, it is highly unlikely that this pathogen would be introduced into *Hibbertia marginata* habitat through construction activities.

i) interfere substantially with the recovery of the species.

A recovery plan has been developed that incorporates *Hibbertia marginata* (DECCW 2010). The following recovery actions are considered relevant to the Project:

- Protect species and their habitats from the effects of clearing and fragmentation.
- To protect vegetation communities, ecosystems and habitats from inappropriate fire regimes.
- Protect the Region from the impact of pests.
- Protect the Region from the impact of disease and pathogens.
- Reduce the impacts of domestic livestock on the natural environment.
- To engage the community and private land-holders in biodiversity conservation.
- To establish effective monitoring of biodiversity related projects.

Additionally, DEC (2005) has identified the following priority actions to help recover this species. The following are related to the Project:

- Identify roadside populations and protect them during road-works.
- Protect areas of known habitat during timber harvesting activities.
- Protect known and potential habitat from clearing or development.

Given the assessment and field survey undertaken as part of this report, and current mapping of specimen records, it is considered unlikely that the species occurs within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock within the study area. If any individuals are found to occur within the easement during the construction phase, works would cease and appropriate government bodies contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works would not interfere with the recovery of this species, as no known individuals would be impacted, nor would any known habitat.

Conclusion

The significant impact criteria assessment concludes that the proposal is not likely to significantly impact *Hibbertia marginata*. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

DECCW (2005) *Hibbertia marginata* - Priority Actions.

http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/pas_speciestype_details.aspx?type=Shrubs&kingdom=Plant

DECCW (2010) NPWS – Atlas of NSW Wildlife.

<http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp>

Department of Environment, Climate Change and Water NSW 2010, Northern Rivers Region Biodiversity Management Plan, National Recovery Plan for the Northern Rivers Region - NSW Department of Environment, Climate Change and Water NSW, Sydney. Viewed online 9/2/2012.

<http://www.environment.gov.au/biodiversity/threatened/publications/recovery/pubs/northern-rivers.pdf>

DSEWPac (2008) Approved Conservation Advice for *Hibbertia marginata*.

<http://www.environment.gov.au/biodiversity/threatened/species/pubs/21970-conservation-advice.pdf>

DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

1.1.23 *Callistemon pungens*

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) *lead to a long-term decrease in the size of an important population of a species*

Within the Project area, *Callistemon pungens* (Vulnerable, EPBC Act) is likely to occur based on previous records (EPBC Act Protected Matter Report) and habitats present. The Project may result in the clearing of potential habitat in the form of vegetation. The Project therefore has the potential to result in a long-term decrease in the size of a population of *Callistemon pungens*.

b) *reduce the area of occupancy of an important population*

Callistemon pungens occurs in south-east Queensland and the northern tablelands of north-east NSW. In NSW, it is distributed from near Inverell to the eastern escarpment in New England. In southern Queensland it occurs in the Stanthorpe region. This species is also listed as likely to occur within the Project area. The works associated with the Project have the potential to result in a long-term decrease in the size of a population of *Callistemon pungens*.

c) *fragment an existing important population into two or more populations*

Callistemon pungens is likely to occur within the Project area. The Project would require the expansion of the existing 132kV easement to accommodate the proposed 330kV easement. The Project has the potential to result in the fragmentation of existing populations into two or more populations of *Callistemon pungens* habitat.

d) *adversely affect habitat critical to the survival of a species*

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for this species.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for this species is unlikely to be impacted by the Project.

e) *disrupt the breeding cycle of an important population*

Callistemon pungens flowers over spring and summer, mostly in November. There is little known information about the breeding cycle of this species. The Project has the potential to have an impact on the breeding system of the *Callistemon pungens* population likely to exist within the Project area.

f) *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Callistemon pungens occurs along rocky watercourses usually with sandy granite (or occasionally basalt) creek beds. It also occurs mainly amongst native species. The main threats to this species include habitat loss, weed infestation and excessive fragmentation. Fire is also a potential threat.

Given this knowledge of the species current habitat, this Project has the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

Callistemon pungens may be threatened by invasive species such as Japanese Honeysuckle (*Lonicera japonica*) and Blackberry (*Rubus* sp.). It is possible that each of these invasive species already exist within the Project area. These invasive species may be accidentally spread via movement of plant and machinery within the Project area, or by transport of stockpiled construction material and organic matter during works undertaken in proximity to waterways. As such, the Project has the potential to result in disturbance to a number of waterways throughout the Project area.

Given the existing disturbances within the Project area, it is considered unlikely that the Project would result in invasive species that are harmful to *Callistemon pungens* becoming established in the species habitat.

h) *introduce disease that may cause the species to decline, or*

There are no known diseases that are likely to cause these species to decline. There is no mention in the relevant literature of any potential disease-based threats to these species. Rather, illegal clearing of land in known habitat areas and grazing is more likely to pose a more serious threat.

i) *interfere substantially with the recovery of the species.*

There is no existing recovery plan for *Callistemon pungens*. However, DECCW (2008) has identified a number of regional and local priority actions. The local priority actions relate to habitat loss, disturbance and modification, invasive weeds and fire.

Given the expansion of the existing 132kV easement to accommodate the proposed 330kV easement, the Project has the potential to interfere substantially with the recovery of the above species.

Conclusion

The significant impact criteria assessment concludes that the proposal has the potential to significantly impact on *Callistemon pungens*. As such, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in Volume 2 of the EA. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Department of Climate Change and Water (2008) Approved Conservation Advice for *Callistemon pungens* Viewed online 26/11/2010.

<http://www.environment.gov.au/biodiversity/threatened/species/pubs/55581-conservation-advice.pdf>

Department of Environment, Water, Heritage and the Arts (2010) EPBC Act Protected Matters Report.

DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

1.1.24 Sandstone Rough-barked Apple (*Angophora robur*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of an important population of a species

Angophora robur (Vulnerable, EPBC Act; Vulnerable, TSC Act) occurs in a band from around Glenreagh, north-west of Coffs Harbour, to the Coaldale area north-west of Grafton, with an isolated occurrence farther west near Nymboida (NSW DEC 2005). The species was not detected during field surveys conducted within the study area. Therefore, it is considered unlikely that the Project would lead to a long-term decrease in the size of an important population of the species.

b) reduce the area of occupancy of an important population

Historical records of the species indicate that the range of the species occurs approximately 50km south of the Project area (NSW OEH 2012). As such, the proposed alignment avoids all mapped locations of the species within its range. Given the known locations of this species, it is considered unlikely that the Project would result in a reduction in the area of occupancy of the species.

c) fragment an existing important population into two or more populations

Within its range, *Angophora robur* can be locally common. However, as the species is not found in close proximity to the proposed alignment, it is considered highly unlikely that the Project would result in the fragmentation of an existing important population into two or more populations.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the project area. To date, no critical habitat has been declared for this species.

e) disrupt the breeding cycle of an important population

No areas of known habitat for *Angophora robur* would be cleared and therefore there should be no disruption to the breeding cycle of an important population of the species.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Angophora robur habitat includes dry open forest in sandy or skeletal soils on sandstone, or occasionally granite, with frequent outcrops of rock (DEC 2005). Due to the known range of the species, it is considered unlikely that the Project would require the clearing of vegetation that may constitute potential habitat. Therefore the Project is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Due to the remoteness of the proposal from the known locations of *Angophora robur*, the Project is unlikely to result in the establishment of any additional invasive species that may result in increased competition to this species. Furthermore, the proposed works are unlikely

to result in an alteration to the existing environment such that any invasive species become established in the species' habitat.

h) introduce disease that may cause the species to decline, or

A review of available literature fails to identify any known diseases that are likely to cause *Angophora robur* to decline.

i) interfere substantially with the recovery of the species.

Currently, there are no existing recovery plans for *Angophora robur*. However the following recovery actions have been proposed for the species (NSW DEC 2005), of which the following are relevant to the Project:

- Manage fire to promote regeneration;
- Identify populations and areas of habitat along roadside and protect them during road works;
- Protect trees and areas of habitat during timber harvesting; and
- Protected areas of habitat from clearing and development.

Given the species southerly distribution in relation to the proposed easement, and assessment and field survey undertaken as part of this report, it is considered highly unlikely that the species occurs within the easement. As such, it is not considered that the proposed works would interfere with the recovery of this species.

Conclusion

The significant impact criteria assessment concludes that the proposal is not likely to significantly impact *Angophora robur*. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

NSW DEC (2005) Threatened species profile – Sandstone Rough-barked Apple. Accessed online 9/2/2012 -

<http://threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10054>

NSW OEH (2012) NSW BioNet – the website for the Atlas of NSW Wildlife. NSW Office of Environment and Heritage. Accessed online - <http://www.bionet.nsw.gov.au/>

Department of the Environment, Water, Heritage and the Arts (2009). EPBC Act Policy Statement 1.1 Significant Impact Guidelines. Matters of National Environmental Significance. Commonwealth of Australia.

DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

Significant Impact Criteria

2.1 Threatened Ecological Communities

2.1.1 *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland)*

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

- a) reduce the extent of an ecological community

Box Gum Woodland (Critically Endangered Ecological Community, EPBC Act; Endangered Ecological Community, TSC Act) occurs in an arc along the western slopes and tablelands of the Great Dividing Range from Southern Queensland through NSW to central Victoria. It occurs in the Brigalow Belt South, Nandewar, New England Tableland, South Eastern Queensland, Sydney Basin, NSW North Coast, South Eastern Highlands, South East Corner, NSW South Western Slopes, Victorian Midlands and Riverina Bioregions (Threatened Species Scientific Committee, 2006). Given the large natural range of the community, and given the Project does not fall at the extent of its range, it is considered unlikely that the Project would result in a reduction in the extent of the community.

- b) *fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines*

The Project would require the clearing of an easement throughout the Project area to encompass the 300kV Alignment. This would result in some fragmentation of the Box Gum Woodland community within the Project area.

- c) *adversely affect habitat critical to the survival of an ecological community*

Habitat critical to the survival of this community, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within The Project area. The likely amount of clearing for this community is between 6.06 Ha (minimum) and 51.14 Ha (maximum) (Submission response, revised Table 6-2). Therefore The Project has the potential to adversely impact this habitat and the survival of the community.

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

Box Gum Woodland generally occurs on fertile lower parts of the landscape where resources such as water and nutrients are abundant (Threatened Species Scientific Committee, 2006). The Project would require the upgrade and installation of several water crossings associated with access tracks throughout the Project area.

It is considered unlikely that these works would result in any changes to the availability of water to the community. The community is reliant upon other specific abiotic conditions such as abundant nutrients on fertile plains, however assuming mitigation measures are adopted, it is considered unlikely that the Project would modify or destroy any abiotic factors necessary for the community's survival.

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

The species composition of Box Gum Woodland varies across the geographic distribution of the community, in response to changes in climate. Irrelevant of the distribution, the ground layer of intact stands is usually characterised by Kangaroo Grass (*Themeda australis*), Snow Grass (*Poa sieberiana*) and/or River Tussock (*Poa labillardieri*). As Box-Gum Grassy Woodland becomes degraded the dominance of *Themeda australis* and *Poa* species declines and other native grasses become dominant. With further degradation, native grasses are replaced by annual and perennial introduced species (Threatened Species Scientific Committee, 2006).

The Project would require the clearing of vegetation for an easement. This clearing would result in disturbance to Box Gum Woodland and would result in increased edge effect within the Project area. The Project has the potential to casue the establishment or spread of exotic grass species which may result in increased competition for native species.

Given the regional land use patterns, it is not considered likely that the Project would result in a substantial change in the species composition of the Box Gum Woodland outside the Project area; however there would be clearing of vegetation that constitutes this community within the Project area.

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

- *assisting invasive species, that are harmful to the listed ecological community, to become established, or*
- *causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community,*

The Project would result in the clearing of vegetation that forms part of the Box Gum Woodland community. This clearing would result in increased edge effect within the Project area, which in turn would increase the likelihood of invasive and exotic species becoming established within the Project area. As such, the Project has the potential to result in the establishment of invasive species that may be harmful to the community. Mitigation measures are recommended in **Section 7, Appendix D4** of this Report to reduce this potential impact.

g) *interfere with the recovery of an ecological community.*

A draft recovery plan for this community was placed on public exhibition for comment early in 2010; *Draft National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Department of Environment, Climate Change and Water NSW, 2010). This plan has not been finalised and adopted. The draft recovery plan outlines several recovery objectives and actions to assist in the recovery of the community, relevant to the Project:

- Achieving no net loss in extent and condition of the ecological community throughout its geographic distribution.
- Increasing protection of sites in good condition.
- Increasing landscape functionality of the ecological community through management and restoration of degraded sites.

The Project would result in the clearing of areas of this community (between 6.06 Ha (minimum) and 51.14 Ha (maximum)). Given the community's naturally widespread (although patchy) distribution, it is considered unlikely that the Project would significantly interfere in the recovery of the Box Gum Woodland community.

Conclusion

The significant impact criteria assessment concludes that the Project has the potential to significantly impact the Box Gum Woodland ecological community. Consequently, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in volume 2 of the EA.

A number of mitigation measures are recommended in **Section 7**, **Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Threatened Species Scientific Committee (2006). Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Viewed online 23/11/2010.

<http://www.environment.gov.au/biodiversity/threatened/communities/pubs/box-gum.pdf>

Department of Environment, Climate Change and Water NSW (2010). Draft National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Department of Environment, Climate Change and Water NSW, Sydney.

DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

2.1.2 *Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland (Natural Grasslands)*

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

- a) reduce the extent of an ecological community

Natural Grasslands (Critically Endangered Ecological Community, EPBC Act) are distributed mainly in the Darling Downs of southern Queensland and the Liverpool Plains and Moree Plains of northern NSW. This community occurs within the Brigalow Belt South Bioregion and Border Rivers-Gwydir, Central West, Namoi, Condamine, Burnett Mary and Fitzroy Basin Natural Resource Management Regions (Threatened Species Scientific Committee, 2008). Given the large natural range of the community, and given the Project does not fall at the extent of its range, it is considered unlikely that the Project would result in a reduction in the extent of the community.

- b) *fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines*

The Project would require the clearing of an easement throughout the Project area to encompass the 300kV Alignment. This would result in some fragmentation of the Natural Grasslands community within the Project area.

- c) *adversely affect habitat critical to the survival of an ecological community*

Habitat critical to the survival of this community, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within The Project area. The likely amount of clearing for this community is between 0.44 Ha (minimum) and 3.46 Ha (maximum) (Submission response, revised Table 6-2). Therefore The Project has the potential to adversely impact habitat for this community.

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

The Native Grasslands community is a dynamic ecosystem where species composition can change yearly and seasonally in response to rainfall, temperature, fire, grazing pressure and management (Threatened Species Scientific Committee, 2008). Threats to the community are noted to include:

- Conversion of native pastures to improved pastures and cropping and overgrazing by stock.
- Ploughing.
- Grading.
- Weed invasion.
- Salinity.
- Herbicide and fertiliser spraying.
- Over grazing by native herbivores.
- Trampling.
- Inappropriate management regimes of mowing, burning, tree regeneration and planting, rehabilitation and ecosystem recreation.

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

The species composition within the Native Grasslands community is primarily a result of climatic influences as well as soil properties, such as salinity, fertility or waterlogging (Threatened Species Scientific Committee, 2008). It is considered unlikely that the Project would result in alterations to the climate or soil properties such that the species composition is significantly altered.

The Project may result in the establishment or spread of exotic grass species that may result in increased competition for native species. It is not considered likely that the Project would result in a substantial change in the species composition of the Native Grasslands community outside the Project area. However, there would be clearing of vegetation that constitutes this community within the Project area.

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

- *assisting invasive species, that are harmful to the listed ecological community, to become established, or*
- *causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or*

The Project would result in the clearing of vegetation that includes the Native Grasslands community. This clearing would result in increased edge effect within the Project area, which in turn would increase the likelihood of invasive and exotic species becoming established within the Project area. As such, the Project has the potential to result in the establishment of invasive species that may be harmful to the community.

g) *interfere with the recovery of an ecological community.*

There are no existing recovery plans for the Native Grasslands community. However the Threatened Species Scientific Committee (2008) has outlined several priority actions for this community. Those relevant to the Project are:

- Monitor known occurrences to identify key threats or the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
- Identify occurrences of high conservation priority.
- Undertake survey work in potential habitat to locate remnants.
- Avoid slashing during peak flowering season from spring to summer.
- Ensure chemicals or other mechanisms used to eradicate weeds do not have a significant adverse impact on the ecological community.
- Ensure road widening and maintenance activities (or other infrastructure or development activities as appropriate) in areas where the ecological community occurs do not adversely impact on known sites.
- Manage disruptions to water flows and any changes to hydrology which may result in changes to the water table levels, increased salinity and increased run off or sediment.
- Investigate formal conservation arrangements such as the use of covenants, conservation agreements or inclusion in reserve tenure.
- Identify and remove weeds in the local area, which could become a threat to the ecological community, using appropriate methods.
- Develop and implement a management plan for the control of weeds such as Lippia (*Phyla canescens*), Coolatai Grass (*Hyparrhenia hirta*), African Love Grass (*Eragrostis curvula*) and Buffel Grass (*Cenchrus ciliaris*) in the region.
- Manage sites to prevent introduction of invasive weeds, which could become a threat to the ecological community, using appropriate methods.
- Implement good hygiene measures for mowing and grading equipment and observe appropriate state protocols for moving stock.
- Avoid burning (or grazing or slashing) during peak flowering season (spring to summer).

The Project would result in the clearing of areas of this community between 0.44 Ha (minimum) and 3.46 Ha (maximum). Given the community's natural distribution, it is considered unlikely that the Project would interfere in the recovery of the Native Grasslands community.

Conclusion

The significant impact criteria assessment concludes that the Project has the potential to significantly impact the Natural Grasslands community. As such, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in volume 2 of the EA.

A number of mitigation measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Threatened Species Scientific Committee (2008). *Commonwealth Listing Advice on Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland*. Department of the Environment, Water, Heritage and the Arts. Viewed online 23/11/2010.

<http://www.environment.gov.au/biodiversity/threatened/communities/pubs/88-listing-advice.pdf>

Threatened Species Scientific Committee (2008). *Commonwealth Conservation Advice on Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales*

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DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria
Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

Significant Impact Criteria

3.1 Fauna

3.1.1 Australian Painted Snipe (*Rostratula australis*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Rostratula australis (Vulnerable, EPBC Act; Endangered, TSC Act) is a migratory or nomadic wading bird which ranges across freshwater wetland habitats of south-eastern Australia. Populations are not confined to particular areas, and it is thought that the range of this species represents a single breeding population (DSEWPac, 2010). The species is known or predicted to occur through the Northern Rivers Catchment Management Region (DECCW, 2010) although there are no records for the region in the OEH Atlas of NSW Wildlife. There are no identified significant sites for this species within the study area and since The Project would not impact on any important wetland areas, there is no risk of any long term impacts on this species from the Project.

- b) reduce the area of occupancy of an important population

The current area of occupancy of this species is thought to be about 1000km/sq (DSEWPac 2010), although the species ranges over a much larger area. No important population has been identified within the study area so the risk of reduction in the area of occupancy of such a population is low.

- c) fragment an existing important population into two or more populations

Rostratula australis is a migratory or nomadic bird species which ranges widely across eastern Australia. There are no discrete populations at any sites, so there is no risk of fragmentation to any population.

- d) adversely affect habitat critical to the survival of a species

No areas of critical habitat, such as significant wetlands sites, are identified within the study area. To date, no critical habitat has been declared for this species.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within The Project area. Based on habitat requirements, habitat critical for this species such as freshwater wetlands and marshes, is unlikely to be impacted by The Project.

- e) disrupt the breeding cycle of an important population

The species has a breeding population across Australia. There are no identified breeding sites in the study area. Therefore, no disruption to any breeding cycle is anticipated.

- f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

No significant wetland associations suitable for this species have been mapped along the transmission line route. There is no likelihood that modifications to any minor wetland areas would result in a decline in this species.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Invasive species are not considered to be a threat to populations of *Rostratula australis* (DSEWPaC 2010; DECCW 2010). The Project is unlikely to result in the establishment of any invasive species that may result in a threat to this species.

h) introduce disease that may cause the species to decline, or

Introduction of a disease is not cited as a threatening process for this species (DSEWPaC 2010; DECCW 2010).

i) interfere substantially with the recovery of the species.

No formal recovery plan has been developed for this species. In lieu of a formal recovery plan, the following recovery options have been recommended for this species (DECCW 2010):

- control foxes, feral dogs and cats;
- protect swamps from fire during burning-off or hazard reduction activities;
- protect wetlands and watercourses from pollution;
- limit the use of pesticides and other chemicals near wetlands and consider alternatives where available; and
- protect wetlands and associated marshy areas from clearing or disturbance.

The Project would generally avoid wetland environments. Safeguards against fire and escape of any pesticides and chemicals used in The Project would be implemented as part of the Environmental Management Plan. None of the proposed recovery actions for this species are in conflict with the proposed Project, nor would The Project interfere with these recovery actions.

Conclusion

The significant impact criteria assessment concludes that the Project is not likely to significantly impact *Rostratula australis*. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Department of Sustainability, Environment, Water, Population and Communities (2010). *Rostratula australis* in Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: <http://www.environment.gov.au/sprat>. Accessed Tue, 23 Nov 2010 17:56:15 +1100.

DECCW (2010) Painted Snipe – Profile.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10734>

DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

3.1.2 Squatter Pigeon (*Geophaps scripta scripta*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Geophaps scripta scripta (Vulnerable, EPBC Act; Endangered, TSC Act) is a medium sized ground-dwelling pigeon. Total population size is estimated at 40 000 breeding birds and no populations have been identified as being especially important to the long-term survival or recovery of the species (DSEWPaC 2012). The species is thought to occur as a single, continuous population. The species is known or predicted to occur through the Border Rivers/Gwydir Catchment Management Region (DSEWPaC, 2012) and there is one record for the region in the OEH Atlas of NSW Wildlife. A large area of potential habitat for this species would be impacted by the Project potentially leading to the long term decrease in the population of this species.

- b) *reduce the area of occupancy of an important population*

The current area of occupancy of this species is thought to be about 10 000km/sq (DSEWPaC 2012). No important population has been identified so the risk of reduction in the area of occupancy of such a population is low. However, given the clearing of potential habitat for this species, there is the risk that the overall area of occupancy available for this species would be reduced as a result of the Project.

- c) *fragment an existing important population into two or more populations*

Geophaps scripta scripta is a resident bird throughout much of its known distribution (DSEWPaC 2012). If the species occurs within the Project area there is potential for the population to be fragmented.

- d) *adversely affect habitat critical to the survival of a species*

To date, no critical habitat has been declared for this species.

Areas of critical habitat as identified in the *EPBC Act Significant Impact Guidelines 1.1* such as grassy woodland and open forests dominated by eucalyptus, have been mapped within the Project area. Based on habitat requirements, habitat critical for this species, is likely to be impacted by the Project.

- e) *disrupt the breeding cycle of an important population*

Suitable habitat for this species occurs within the study area. Although there are no identified breeding sites in the study area, they do have the potential to occur. Therefore, there is potential for the Project to disrupt local breeding cycles of this species, particularly if nesting habitat is disturbed during the breeding season.

- f) *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Potential habitat for this species in the form of grassy woodlands and open forests has been mapped along the transmission line route. Works associated with the Project could result in the modification, destruction, isolation and/or reduction in the amount of available habitat for this species. As such, there is potential that works associated with the Project could impact on the species habitat to such an extent that the species would experience a decline within the region.

g) *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

Invasive species are considered to be a threat to populations of *Geophaps scripta scripta* (DSEWPaC 2012; DECCW 2012). The Project may result in an increase of foxes and cats (both of which have been seen throughout the Project area) within the Project area; both of these are a threat to *Geophaps scripta scripta*. As both foxes and feral cats are known to occur within the Project area, it is unlikely that the Project would result in either of these species becoming established, however the Project may result in increased hunting habitat for foxes and feral cats.

h) *introduce disease that may cause the species to decline, or*

Introduction of a disease is not cited as a threatening process for this species (DSEWPaC 2012; DECCW 2012).

i) *interfere substantially with the recovery of the species.*

No formal recovery plan has been developed for this species. In lieu of a formal recovery plan, the following recovery options have been recommended for this species (OEH 2012):

- control foxes, feral rabbits and cats;
- manage fire in areas of potential habitat to maintain native grass cover;
- exclude grazing during the spring breeding season at sites where the species has been seen;
- protect grass woodland areas from clearing, fragmentation or development;
- expand and reconnect smaller fragments of habitat; and
- report any sighting of the species to OEH.

The following actions are recommended by Department of Sustainability, Environment, Water, Population and Communities (2012) as being recommended to assist with species recovery:

- Determine the population size and distribution of the Squatter Pigeon (southern) in southern Queensland and New South Wales and assess the pigeon's conservation status and requirements.
- Establish conservation measures to protect grassy woodlands and forests.

The proposed action is inconsistent with several of the recommended recovery actions outlined above. While it is not known if the species occurs within the Project area, if it does occur, the Project has the potential to impact on the species chances of recovery within the study area.

Conclusion

The significant impact criteria assessment concludes that the Project is likely to significantly impact *Geophaps scripta scripta*. As such, a referral to the Minister has been completed; refer to **Appendix A** of **Appendix F** in Volume 2 of EA. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Department of Sustainability, Environment, Water, Population and Communities (2012). *Geophaps scripta scripta* in Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64440. Accessed Tue, 30 Jan 2012 .

OEH (2012) Squatter Pigeon - Profile.

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10350DEWH>
A.

2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines
1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

3.1.3 Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)

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

a) lead to a long-term decrease in the size of a population

Dasyurus maculatus maculatus (Endangered EPBC Act; Vulnerable TSC Act) is distributed widely but sparsely across coastal and subcoastal south-eastern Australia, including a population on the New England tablelands. The OEH Atlas of NSW Wildlife maps numerous records of this species in and near the study area, especially in the Tenterfield area (study area west). *Dasyurus maculatus maculatus* may be present in a range of habitats, but has a preference for mature wet forest. It is considered likely to range within the study area. This species is generally a ground-dwelling, nocturnal predator (DSEWPac 2010). It is likely that The Project would involve some removal of vegetation in habitats suitable for this species, but the impacts of this on the overall size of the population are considered to be insignificant.

b) reduce the area of occupancy of the species

There are no data on the area of occupancy for this species although it is distributed over a large area in Qld, NSW and Vic, with an isolated population in Tasmania. It is considered unlikely that The Project could impact on the area of occupancy of this species.

c) fragment an existing population into two or more populations

The existing population is already fragmented. No known existing populations extend across the study area although it is possible that they do occur. The Project has some potential to fragment habitats, although a mobile species such as this would not be obstructed by the width of the study area corridor. No known existing populations would be fragmented into two or more populations by the proposed Project.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area. To date, no critical habitat has been declared for this species.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within The Project area. Based on habitat requirements, habitat critical for this species such as mature wet forest, is unlikely to be impacted by The Project.

e) disrupt the breeding cycle of a population

Dasyurus maculatus maculatus breeds in dens during the winter months (June-August). These dens may be located in tree hollows, caves or amongst rocky outcrops. There is potential for some disruption to breeding if sites where a population was breeding were disturbed during the winter. The Project has some potential to disrupt a local breeding colony under these circumstances, although the extent of such a disruption would not affect the wider population.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project would result in loss or modification of potential habitat for this species. These effects would be of a linear nature and would not modify habitats to the extent that they would be unavailable to the species.

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Invasive weeds are not an identified threat to the survival of this species (DSEWPac 2010). The Project would result in the removal of small patches of vegetation, comprising both native and exotic species. Along much of the roadside areas, the understorey is dominated by exotic species due to ongoing disturbance. Species such as the cane toad and foxes are invasive species that are harmful to this species; the Project would potentially result in an increase in local population numbers of these species. Foxes and feral cats are known from within the Project area; hence the Project is unlikely to result in their establishment.

h) introduce disease that may cause the species to decline, or

There is no mention in the relevant literature of any potential disease-based threats to this species (DSEWPac 2010).

i) interfere with the recovery of the species

The identified threats to this species include: habitat loss and degradation; predation from foxes, dogs, etc; fire; direct killing; road mortality; cane toad poisoning; and 1080 baiting. No formal recovery plan has been developed for this species. In lieu of a formal recovery plan, the following recovery options have been recommended for this species:

- Changes to 1080 baiting regimes to reduce likelihood of quoll by-catch;
- Landscape-level land and habitat management; and
- Management of female territories.

The Project has some potential to interfere with land or habitat management programs if they occurred within the study area, but only at a minor local scale. The Project would not interfere with the recovery of this species in relation to all other identified threats.

Conclusion

The significant impact criteria assessment concludes that the Project is not likely to significantly impact on this species. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Department of Sustainability, Environment, Water, Population and Communities (2010).

Dasyurus maculatus maculatus (SE mainland population) in Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: <http://www.environment.gov.au/sprat>. Accessed Wed, 24 Nov 2010 10:54:48 +1100.

DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

3.1.4 Brush-tailed Rock-wallaby (*Petrogale penicillata*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Petrogale penicillata (Vulnerable, EPBC Act; Endangered, TSC Act) is rock-dwelling species which occurs in scattered colonies across Victoria, NSW and into southern Qld. Because *Petrogale penicillata* are specific to a particular habitat type, the colonies tend to be discrete, with little or no interaction or movement between colonies. The populations occurring in northern NSW, referred to as the Northern Evolutionary Significant Unit (ESU), form the largest group (DSEWPac 2010) and are distributed in suitable habitat across the region of study area. The OEH Atlas of NSW Wildlife contains numerous records of this species on or close to the study area, including locations at Dumaresq and north of Tenterfield (study area west), and in areas to the west of Casino (study area east). However, The Project corridor generally avoids areas of significant *Petrogale penicillata* habitat, such as sandstone ranges, escarpments and major rocky outcrops, and any populations of this species directly affected are likely to be minor. There is considered to be no likelihood that the Project would lead to a long term decrease in any population of this species.

- b) reduce the area of occupancy of an important population

The area of occupancy for *Petrogale penicillata* is not cited by DSEWPac (2010), but the Northern ESU is cited as having a population of between 10,000 and 25,000+ individuals in about 100 discrete colonies. No important populations have been identified within the study area so the risk of reduction in the area of occupancy of such a population is low.

- c) fragment an existing important population into two or more populations

Petrogale penicillata is a species with a naturally fragmented distribution, due to its specialised habitat requirements. Even with vegetation disturbance associated with The Project, the principle characteristics of the habitats that this species requires (rocky environments, caves; crevices, etc) would remain. This species is highly mobile and easily able to traverse open rocky ground. Where The Project corridor crosses potential areas of habitat for this species, the risk of fragmentation of populations is considered to be low.

- d) adversely affect habitat critical to the survival of a species

No Critical Habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area. To date, no critical habitat has been declared for this species.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, habitat critical for this species, such as sandstone ranges and escarpments, would not be affected by The Project.

- e) disrupt the breeding cycle of an important population

Petrogale penicillata live in family groups with a dominant male. The species apparently breeds year-round, usually in caves or rocky shelters. The Project would have little or no impact on the breeding cycle of this species, and no important populations are identified within the study area.

f) *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

The Project would not modify the habitat of *Petrogale penicillata* to any extent because it would generally avoid the sandstone ranges and escarpments which are the key habitats for this species. Even where The Project traverses rocky areas, the integrity of the habitat would largely remain intact. There is no likelihood that modifications to any minor rocky areas would result in a decline in this species.

g) *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

The invasion of grassy feeding areas by weed species such as *Lantana* is thought to reduce habitat quality for this species (DSEWPaC 2010). Control of weed species such as *Lantana* would be implemented as part of the management plan for this Project. With proper management, the proposed works are unlikely to result in an alteration to the existing environment such that any invasive plant species become established in the species' habitat. Invasive predators such as foxes and cats are a threat to this species, both of which have been seen within the study area. The Project has the potential to result in increased hunting habitat for these species; however both are already well established within the Project area.

h) *introduce disease that may cause the species to decline*

Petrogale penicillata has been found to be susceptible to diseases such as toxoplasmosis and hydatidosis, which are thought to be related to contact with cats and sheep respectively (DSEWPaC 2010). The Project would not lead to greater abundances of these introduced animals in the study area, so there is considered to be no additional risk of disease to this species from the Project activities.

i) *interfere substantially with the recovery of the species, or*

Identified threats to this species are cited (DSEWPaC 2010) as: habitat degradation; fires; small population size; low migration; bioclimatic pressures; drought; hunting; disease; and a range of native and introduced predators and competitors.

A range of recovery options have been cited within the approved NSW Recovery Plan for this species (DECC, 2008). Those most relevant to the Project include:

- Habitat management,
- Control of weeds and
- Fire management.

The environmental management aims of The Project are not inconsistent with these objectives, and would not interfere with any recovery program.

Conclusion

The significant impact criteria assessment concludes that the Project is not likely to significantly impact *Petrogale penicillata*. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Department of Sustainability, Environment, Water, Population and Communities (2010). *Petrogale penicillata* in Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: <http://www.environment.gov.au/sprat>. Accessed Wed, 24 Nov 2010 15:09:47 +1100.

DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

DECC 2008, Brush-tailed rock-wallaby (*Petrogale penicillata*) - Approved NSW Recovery Plan <http://www.environment.nsw.gov.au/resources/nature/recoveryPlanFinalBrushTailedRockWallabyWarrum.pdf> Accessed Thursday, 9 February 2012

3.1.5 Eastern Bristlebird (*Dasyornis brachypterus*)

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

- a) lead to a long-term decrease in the size of a population

Dasyornis brachypterus (Endangered EPBC Act; Endangered TSC Act) is now confined to three regional populations, one of which is located in the region of the study area. Here, it is confined to a few small populations within the regional parks network, to the north and south of the study area. There are records of this species (OEH Atlas of NSW Wildlife) from Boonoo Boonoo, about 15 km north of the study area west. The known populations are generally well documented and repeated surveys for this species have been conducted over many years and are continuing, so the current size of populations is well known (DSEWPaC 2010). The transmission line does not pass through any areas of known populations, therefore regional populations would be unaffected by the Project.

- b) reduce the area of occupancy of the species

The remaining population sites for this bird are already highly restricted (DSEWPaC 2010). There is no evidence that the species moves between population sites, or occupies any sites within the area of influence of the Project. Therefore, the risk of reduction of the area of occupancy for the species is considered remote.

- c) fragment an existing population into two or more populations

The existing population is already highly fragmented. No known existing population fragments extend across the study area. Therefore, no known existing population would be fragmented by the proposed Project.

- d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area. To date, no critical habitat has been declared for this species.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within The Project area. Based on habitat requirements, habitat critical for this species, such as dense coastal and mountain heath, is unlikely to be impacted by The Project.

- e) disrupt the breeding cycle of a population

No areas of known habitat for *Dasyornis brachypterus* would be affected and therefore there should be no disruption to the breeding cycle of the species.

- f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

No areas of known habitat for *Dasyornis brachypterus* would be disturbed by the Project and therefore the availability or quality of habitat for this species would not be affected.

- g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Populations of this species are threatened by invasive weeds and the dieback disease caused by the pathogenic fungus *Phytophthora* (DSEWPac 2010). The Project would result in the removal of small patches of vegetation, comprising both native and exotic species. Along much of the roadside areas, the understorey is dominated by exotic species due to ongoing disturbance. The Project is unlikely to result in the establishment of any additional invasive species that may result in a threat to this species.

h) introduce disease that may cause the species to decline, or

There is no mention in the relevant literature of any potential disease-based threats to this species (DSEWPac 2010).

i) interfere with the recovery of the species.

A specific recovery plan for this species has not been finalised. However, the defined recovery actions relevant to The Project are cited as follows (DSEWPac 2010):

- Surveys have been undertaken and continue to be undertaken at known and potential sites;
- Control measures for feral animals have been implemented at some sites;
- Critical habitat has been protected and rehabilitated through the erection of fencing;
- establishment of firebreaks and introduction of measures to remove and control the spread of noxious weeds;
- Access to some inhabited areas is restricted, open fires are prohibited in some inhabited areas, and signs have been erected to reduce the incidence of road deaths; and
- Fire management plans have been prepared and implemented and fire history mapping has been undertaken.

The following recovery actions have also been recommended:

- Protect occupied habitat on private land by land purchase or conservation agreements;
- Maintain sub-populations at all sites with more than one extant territory; and
- Map known and potential habitat.

DECCW (2010) lists additional recovery options for the NSW populations. Given the known distribution of this species, it is considered unlikely that the species would occur within the easement. The proposed works are unlikely to result in any change to the existing fire regime, and would not alter the presence of stock, feral animals or invasive weeds within the study area. None of the completed or proposed recovery actions determined by Commonwealth or NSW authorities are in conflict with the proposed Project, nor would the Project interfere with these recovery actions.

Conclusion

The significant impact criteria assessment concludes that the Project is not likely to significantly impact on the species. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Department of Sustainability, Environment, Water, Population and Communities (2010). *Dasyornis brachypterus* in Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: <http://www.environment.gov.au/sprat>. Accessed Tue, 23 Nov 2010 15:15:24 +1100

Dept. Environment Conservation Climate & Water (2010) Eastern Bristlebird – profile
<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10206>

DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria
Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

3.1.6 Grey-headed Flying-fox (*Pteropus poliocephalus*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Pteropus poliocephalus (Vulnerable, EPBC Act; Vulnerable, TSC Act) is distributed through coastal and subcoastal eastern Australia, from northern Queensland to Victoria. The species is highly mobile and the national population is fluid, moving up and down the east coast in search of food. This species roosts in defined “camps” typically in emergent trees close to water. It forages widely in search of fruit and nectar; up to 50 km from the roost site (*pers. com* Billie Roberts, *PhD Candidate, Griffiths University*). Within the Northern Rivers Catchment Management Region, it is known from 17 sub-regions and predicted to occur in 12 others (DECCW 2010). OEH Atlas of NSW Wildlife indicates several occurrences of this species are known both within and near to the study area.

Given the widespread distribution and movements in the region, and the known occurrence of the species on and near the study area, it is likely that the Project has some potential to interface with this species. **Figure 1** in **Appendix D5** of this Report shows the location of known roosts close to the Project area (Marcus Baseler, Environmental Resources Information Network, DSEWPac). Based on Figure 1, there is evidence to suggest that an important population at Mallanganee is located in close proximity to the Project. However, it is unlikely that this camp would be significantly affected by the Project, due to the historically cleared nature of the location of the proposed transmission line in this area (**Figure 1** in **Appendix D5** of this Report).

Furthermore, although there is considered to be a high likelihood for potential foraging habitat to occur within the Project area, due to the considerable distance of all other known camps from the Project, it is considered unlikely that the Project would lead to a long-term decrease in the size of an important population.

- b) *reduce the area of occupancy of an important population*

The area of occupancy for this species is not cited by DSEWPac (2010) or DEWCC (2010), but national counts conducted in 2005 indicate the population may be between 425,000 and 674,000 individuals spread across three States. The primary way that a disturbance to this species could impact on its area of occupancy, would be if an established and significant roost site were to be disturbed. Although, it is considered unlikely that the Project would result in the direct disturbance of any established and/ or significant roost sites, the location of flyways around the camp at Mallanganee should be taken into consideration when planning for infrastructure associated with the proposed 330kV transmission line, in order to reduce or prevent the electrocution and/ or collision of the species with powerlines, as outlined in (NSW DECC 2007).

c) fragment an existing important population into two or more populations

Pteropus poliocephalus is a highly mobile species and undertakes both local and seasonal long range migrations. There is no risk that The Project could lead to fragmentation of populations in this species as any habitat loss caused by The Project would be localised and linear in nature.

d) adversely affect habitat critical to the survival of a species

No Critical Habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area. To date, no Critical Habitat has been declared for this species.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within The Project area. **Figure 1** in **Appendix D5** of this Report shows the location of known camps within close proximity to the Project area. Based on this mapping and habitat requirements, habitat critical for this species, such as dense forested gullies, is unlikely to be impacted by The Project.

e) disrupt the breeding cycle of an important population

Mating in this species occurs in early autumn, with females giving birth around October. Young are fostered in maternal camps. The majority of known camps, as shown in **Figure 1** in **Appendix D5** of this Report, are not anticipated to be affected by the proposed alignment. However, due to the proximity of the Mallanganee camp to the Project area, the Project has the potential to disrupt the breeding cycle of individuals residing in this camp, in particular the birthing and subsequent crèche periods for the species which occur between October and March (Hall and Richards 2000). Therefore, in order to avoid disrupting the breeding cycle of this important population, it is recommended that works associated with the proposed alignment not be undertaken in this area, between October and March.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project may modify some areas of suitable foraging habitat for this species, but no important habitat in or around any camps or maternity sites would be affected (**Figure 1** in **Appendix D5** of this Report). The species is widely distributed and there is no indication that any sites within the study area are significant for this species. There is no likelihood that The Project would modify habitats to the extent that this species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

There are no identified threats to *Pteropus poliocephalus* from invasive species (DSEWPac 2010; DEWCC 2010) nor would the Project result in the spread of any invasive species.

h) introduce disease that may cause the species to decline

This species may be susceptible to Australian bat Lyssavirus, Bat Paramyxovirus and Menangle Pig virus, although these pathogens have not yet been recorded in this species (DSEWPac 2010). There is considered to be no additional risk of disease to this species from the Project activities.

i) interfere substantially with the recovery of the species, or

Identified threats to this species are cited (DSEWPac 2010, DECCW 2009) as: habitat loss; exploitation; competition with other species; pollutants and pathogens; fragmentation of habitats, deliberate destruction associated with commercial horticulture; negative public attitudes and conflict with humans; climate change and disease. An additional threat relevant to the Project is the threat of overhead power lines, and the potential for bats to be either electrocuted or entangled in them (DECCW 2010, DECCW 2009). For bats to become

electrocuted they must touch two strands of the power line. The proposed transmission line construction consists of a single circuit 330kV transmission line that requires three pairs of twin conductors underneath two overhead ground wires. Therefore there is potential for the electrocution of *P. poliocephalus* along the transmission line route.

Although the Project poses the potential risk of electrocution, and as such some potential for interference to a recovery from this threat, due to the lack of research and historical records documenting the electrocution of Flying-foxes on 330kV transmission lines (as opposed to power-lines), it is thus considered unlikely that such interference would be substantial. However, post-construction monitoring of the transmission line in and around the Mallanganee camp is recommended to provide further information on the potential for electrocution of Flying-foxes by 330kV transmission lines.

Identified recovery actions (DECCW 2010, DECCW 2009) for this species are:

- Protect roost sites, particularly avoid disturbance September through November;
- An appropriate fire regime which protects the species from frequent fire;
- Identify and protect key foraging areas off areas supporting the species to preclude stock;
- Weed control;
- Identify powerline blackspots and implement measures to reduce deaths;
- To sustainably reduce deliberate destruction of flying foxes in fruit crops;
- To reduce negative public attitudes and reduce conflict with humans;
- Monitor population trends and improve knowledge on demographics;
- Increase effectiveness and efficiency of recovery initiatives; and
- Provide long term economic benefits associated with the protection of the species.

The environmental management aims of The Project are not inconsistent with these objectives, and would not interfere with any recovery program.

Conclusion

The significant impact criteria assessment concludes that the Project is not likely to significantly impact *Pteropus poliocephalus*. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

- Department of Sustainability, Environment, Water, Population and Communities (2010). *Pteropus poliocephalus* in Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: <http://www.environment.gov.au/sprat>. Accessed Thu, 25 Nov 2010 11:51:31 +1100.
- Department of Environment, Climate Change and Water NSW. (2009). Draft National Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus*. Prepared by Dr Peggy Eby. Department of Environment, Climate Change and Water NSW, Sydney.
- DECCW (2010) Grey-headed Flying-fox – Profile
<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10697>
- Hall L and Richards G (2000) *Flying Foxes and Fruit and Blossom Bats of Australia*. UNSW Press, Australia.
- NSW DECC (2007) Flying-fox Camp Management Policy. NSW Department of Environment and Climate Change. Accessed online 20/12/2011 -
<http://www.environment.nsw.gov.au/resources/threatenedspecies/ffcmp07281.pdf>

3.1.7 Hastings River Mouse (*Pseudomys oralis*)

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

- a) lead to a long-term decrease in the size of a population

Pseudomys oralis (Endangered EPBC Act; Endangered TSC Act) is a small native rodent occurring in north-eastern NSW and south-eastern Qld. Populations are widely distributed but are restricted to areas above 500 m in elevation (DSEWPaC 2010). Based on mapping data provided in the OEH Atlas of NSW Wildlife, a population of this species is located in the range country about 20 km south of the central part of the study area. Given the altitudinal and habitat requirement of this species, and the known distribution, the most likely area where there is potential for this species to occur within the Project area would be in the elevated section near Tabulam, in the study area east. The species occurs in habitats with an open canopy and a shrub layer, often associated with creeks or soakages.

This species may be present within the study area in areas of suitable habitat and elevation, although no populations are currently known within the study area. Any impacts on a species such as this would be at a local level only and the Project actions would not lead to a long term decrease in the size of any population.

- b) *reduce the area of occupancy of the species*

The area of occupancy for this species is not cited in DSEWPaC (2010) or DECCW (2010), but in NSW, it is reported as “known” from 13 subregions of the Northern Rivers Catchment Management Region, and four subregions of the Hunter/Central Rivers Catchment Management Region (DECCW 2010). It is restricted in all areas to higher elevations. It is considered unlikely that The Project could impact on the area of occupancy of this species because none of the known localities occur within the study area and the Project would not disturb sufficient areas of habitat for such an impact to be relevant.

- c) *fragment an existing population into two or more populations*

The current population is fragmented due to habitat requirements, particularly elevational requirement. Where the Project passes through potential habitat area, some vegetation clearing would take place, but a shrub layer would persist. Therefore, it is likely that microhabitat for this small terrestrial species may remain suitable for it to live or move through these areas. No known existing populations would be fragmented into two or more populations by the proposed Project.

- d) *adversely affect habitat critical to the survival of a species*

No Critical Habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area. To date, no Critical Habitat has been declared for this species.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within The Project area. Based on habitat requirements, habitat critical for this species, such as dense, damp fern or sedge understorey along drainage lines, is unlikely to be impacted by The Project.

e) disrupt the breeding cycle of a population

There are few data available on breeding in this species. *Pseudomys oralis* is reported to breed between August and March, with a litter of two to three young (DEC 2005). A population has not been identified within the study area to date and the likelihood of the Project having any significant impacts on breeding in this species is considered to be remote.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project would result in loss or modification of potential habitat for this species. These effects would be of a linear nature and would not modify habitats to the extent that they would be unavailable to the species. The possibility of a decline in the species due to Project activities is remote.

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Invasive weeds are not an identified threat to the survival of this species although changes in the composition of native grasses/herbs caused by grazing may impact habitats. Feral cats and foxes are cited as predator threats harmful to this species DEC (2005). These species are already well established in the region and the Project would not result in the establishment of these species, however has the potential to create additional hunting habitat for these species. The Project is unlikely to result in the establishment of any additional invasive species that may result in a threat to *Pseudomys oralis*.

h) introduce disease that may cause the species to decline, or

There is no mention in the relevant literature of any potential disease-based threats to this species (DSEWPac 2010; DEC 2005).

i) interfere with the recovery of the species.

The identified threats to this species include: loss of habitat through clearing; reduced groundwater and stream flow as a result of clearing or canopy reduction; cattle grazing and trampling of preferred habitat, especially close to water; too frequent fires, which may destroy or severely reduce species diversity ground cover; and predation by foxes and feral cats (DECCW 2010).

A recovery plan for this species is in effect (DEC 2005). Key elements of the recovery program include: research into genetics and populations; research into ecology and management, particularly in relation to habitat disturbance, fire, feral animals and habitat modelling; population surveys; and mapping of dispersal corridors.

The Project has some potential to interfere with land or habitat management programs if they occurred within the study area, but only at a minor local scale. The Project would not interfere with the recovery of this species in relation to all other identified threats.

Conclusion

The significant impact criteria assessment concludes that the Project is not likely to significantly impact on the species. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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DECCW (2010) Hastings River Mouse – Profile
<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10689>

DEC (2005) Approved NSW and National Recovery Plan. Hastings River Mouse (*Pseudomys oralis*).

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3.1.8 Long-nosed Potoroo (*Potorous tridactylus tridactylus*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Potorous tridactylus tridactylus (Vulnerable, EPBC Act; Vulnerable, TSC Act) is a medium sized marsupial species which is widely but sparsely distributed through south-eastern Australia, including Tas, Vic, NSW and southern Qld. The population in northern NSW and southern Qld is considered secure (DSEWPaC 2010). In the region of the study area, this species has been recorded from the Cambridge Plateau (study area east) and the Bluff River area, south of Tenterfield (study area west) (OEH Atlas of NSW Wildlife). Habitat preferences for this species in northern NSW are variable, but it generally prefers wet sclerophyll forest, coastal heaths and scrubs. Key habitat requirements are the availability of dense vegetation cover for shelter, and an abundance of fungi, the main food source. No important populations have been identified in the study area, and it is considered there is no likelihood that The Project would lead to a long term decrease in any population of this species.

- b) reduce the area of occupancy of an important population

The area of occupancy for this species is not cited by DSEWPaC (2010). No important populations have been identified within the study area so the risk of reduction in the area of occupancy of such a population is low.

- c) fragment an existing important population into two or more populations

Populations of this species appear to be scattered and there is no evidence that a discrete population occurs within the study area. The Project has the potential to cause fragmentation of habitats where it crosses wet sclerophyll forests with dense understory, and in these areas, if populations of *Potorous tridactylus tridactylus* were present, they may be affected. However, this is a nocturnal species and would be able to traverse open areas with little difficulty. The risk of fragmentation of important populations of this species is considered to be low.

- d) adversely affect habitat critical to the survival of a species

No Critical Habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area. To date, no Critical Habitat has been declared for this species.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within The Project area. Based on habitat requirements, habitat critical for this species, such as dense rainforest adjacent to wet sclerophyll forest, is unlikely to be impacted by The Project.

e) disrupt the breeding cycle of an important population

This species breeds year round, and has a life span of up to 10 years. The Project would have little or no impact on the breeding cycle of this species, and no important populations are identified within the study area.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project may modify some areas of habitat suitable for this species, but the species is widely distributed and there is no indication that any sites within the study area are significant for this species. There is no likelihood that The Project would modify habitats to the extent that this species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Invasive plant species are not an identified threat to *Potorous tridactylus tridactylus*. Predators, including foxes and cats have been identified as a threat but The Project would not result in the establishment of these species as they are already well established within the Project area. The Project is unlikely to result in the establishment of any additional invasive species that may result in a threat to this species, however may result in increased hunting habitat for species such as foxes and feral cats.

h) introduce disease that may cause the species to decline, or

There are no identified disease threats cited for this species (DSEWPaC 2010; DECCW 2010). There is considered to be no additional risk of disease to this species due to the Project activities.

i) interfere substantially with the recovery of the species.

Identified threats to this species are cited (DSEWPaC 2010) as: predation by cats and foxes; residential and industrial development; and natural disasters. The Project could be considered as an industrial development, but the impacts of this Project are relatively minor and spread over a long narrow corridor, rather than expanding over a discrete wide area such as would occur with more traditional industrial development. Past threats to the species also include baiting and hunting.

No formal recovery plan has been developed for this species. In lieu of a formal recovery plan, the primary recovery actions for this species reported by DECC (2010) include protection and maintenance of habitat, the establishment of conservation reserves to protect critical populations, and the baiting of foxes to reduce predator pressure. The environmental management aims of The Project are not inconsistent with these actions, and would not interfere with any recovery program.

Conclusion

The significant impact criteria assessment concludes that the Project is not likely to significantly impact *Potorous tridactylus tridactylus*. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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DECCW (2010) Long-nosed Potoroo – Profile

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DEWHA 2009, Matters of National Environmental Significance, Significant Impact Criteria Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

3.1.9 Microbats – Large-eared Pied Bat (*Chalinolobus dwyeri*) South-eastern Long-eared Bat (*Nyctophilus corbeni*) (South-eastern form)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) *lead to a long-term decrease in the size of an important population of a species*

Chalinolobus dwyeri (Vulnerable, EPBC Act; Vulnerable, TSC Act) occurs from near Rockhampton in Queensland south to Ulladulla in NSW. OEH records of this species exist within the study area east. The Department of Sustainability, Environment, Water, Population and Communities (2010) identifies important populations as being:

- Those present in the sandstone escarpments of the Hunter Valley, Sydney Basin and Southern Tablelands of NSW;
- Those in the sandstone escarpments of Carnarvon, Expedition Ranges and Blackdown Tablelands Queensland; and
- Those in limestone caves and caves and mines in rocks of volcanic origin in the western and north eastern parts of its range in NSW, south eastern Queensland, as well as Shoalwater Bay north of Rockhampton.

The Project area is within the north-eastern range of *Chalinolobus dwyeri* within NSW. The species is predicted to occur within the alignment east, based on habitats present. Given the existing 132kV easement, it is considered that works associated with the Project could lead to disturbance to the population predicted to occur within the study area, and hence, lead to a long-term decrease in the size of an important population of *Chalinolobus dwyeri*.

*Nyctophilus corbeni*² (Vulnerable, EPBC Act; Vulnerable, TSC Act) occurs from the Expedition Range and Dawson River areas of Queensland south through much of NSW into Victoria and parts of South Australia. Although no important populations of this species have been formally declared, and the species is considered to be rare throughout most of its distribution, there are some areas however, where it is more commonly recorded. These areas include the Brigalow Belt South and Nandewar Bioregions in north-eastern NSW, which may indicate areas of stronghold for the species (Department of Sustainability, Environment, Water, Population and Communities, 2010; Schulz and Lumsden, 2010). *Nyctophilus corbeni* is predicted to occur within the alignment west, based on habitats present. Given that there are no declared important populations of this species, the Project is not likely to lead to a long-term decrease in the size of an important population, however has the potential to impact upon the local populations of the species through proposed habitat clearing and vegetation removal associated with the Project.

b) *reduce the area of occupancy of an important population*

² Originally the South-eastern Longed-eared Bat was considered a subspecies of the Greater Long-eared Bat, *Nyctophilus timoriensis*. Recent studies have described the bat as a separate species, *Nyctophilus corbeni* (Parnaby 2009).

Chalinolobus dwyeri is predicted to occur within the alignment east, based on habitats present, however was not found during field surveys conducted of the study area. The species seems to persist in the locality despite the existing 132kV easement, based on records approximately 10 km from the Project area from OEH Atlas of NSW Wildlife. It is considered that any additional disturbance associated with the Project may reduce the area of occupancy of the population through vegetation and habitat clearing.

Nyctophilus corbeni is predicted to occur within the alignment west based on habitats present. No important populations of this species have been formally declared, however, there is considered to be potential for the Project to result in a reduction in the area of occupancy of a local population of this species through the associated vegetation and habitat clearing associated with the Project.

c) fragment an existing important population into two or more populations

Records of *Chalinolobus dwyeri* exist more than 10km to the north and south of the eastern portion of the Project area (NSW NPWS Atlas, 2010). These records could be considered to constitute part of a declared important population of the species. Given the presence of the existing 132kV easement within this portion of the Project area, the Project has the potential to increase fragmentation of an existing population.

Nyctophilus corbeni is predicted to occur within the alignment west, based on habitats present. There are no declared important populations of this species. As such, the Project would not fragment an existing important population into two or more populations, although there is the possibility of the Project to fragment areas of potential stronghold for the species.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area. To date, no critical habitat has been declared for this species.

Due to the broad habitat requirements of these species it is impossible to rule out the occurrence of habitat critical to their survival, as identified in the *EPBC Act Significant Impact Guidelines 1.1* within The Project area. Therefore The Project has the potential to adversely affect habitat critical to the survival of these species.

e) disrupt the breeding cycle of an important population

Chalinolobus dwyeri appear to mate in early winter, with nursery colonies established in September. Most males leave the colony prior to young being born in early summer. Juveniles typically leave the roost by early spring, with some roost sites abandoned during winter, and other roosts being used year round (Department of Sustainability, Environment, Water, Population and Communities, 2010). The Project has the potential to impact on roost sites such as caves indirectly, through increased disturbance in the region during construction activities. As such, the Project has the potential to disrupt the breeding cycle of the species.

There is little information currently available on the life cycle or social structure of *Nyctophilus corbeni*, although they are known to roost solitarily under exfoliated bark and in the crevices on trees. The species are believed to form maternal roosting colonies in larger tree cavities (Department of Sustainability, Environment, Water, Population and Communities, 2010). Although there are no declared important populations of this species, the works associated with the Project have the potential to disrupt the breeding cycle of an important population, should any disturbance be caused to a maternity roost in the Project area.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Detailed habitat requirements of *Chalinolobus dwyeri* habitat are not well known, however they may depend on sandstone outcrops. Additionally, the species has been known to use disused mine shafts, caves, overhangs, disused Fairy Martin (*Hirundo ariel*) nests and tree hollows for shelter and roost sites. In NSW this species has been recorded from a large range of vegetation types (Department of Sustainability, Environment, Water, Population and Communities, 2010). The Project would require the clearing of vegetation that constitutes *Chalinolobus dwyeri* habitat within the alignment east. Therefore, the Project is considered to have the potential to modify, remove and further isolate potential habitat to the extent that the species is likely to decline.

Nyctophilus corbeni occurs in a range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands (Department of Sustainability, Environment, Water, Population and Communities, 2010). There are areas of potential habitat in the study area west, and the alignment west that would require the removal of some areas of potential *Nyctophilus corbeni* habitat. Only a small portion of the alignment west falls within potential habitat for this species, with the majority of records for this species to the west and south of the Project area (NSW NPWS Atlas, 2010). However, the species distribution is considered to be scattered and it is rarely recorded (Department of Sustainability, Environment, Water, Population and Communities, 2010). Given the lack of records from the Project area and small area of anticipated impact within close proximity to previous records of the species, the Project is considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat such that the species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

There is a lack of information on the potential impact of invasive species on *Chalinolobus dwyeri* (Department of Sustainability, Environment, Water, Population and Communities, 2010). It is possible that predation by invasive species may be harmful to the species. Foxes, cats and dogs have all been observed within the Project area, along with European honeybees. Competition for roost sites in tree hollows may also have the potential to be harmful to the species, with invasive bird species and European honeybees competing with *Chalinolobus dwyeri* for suitable hollows. However it is considered unlikely that the Project would result in any invasive species becoming established in *Chalinolobus dwyeri* habitat that are not already present within the Project area.

It is unknown what the impact of predation by invasive species may be on *Nyctophilus corbeni*; however it is documented as a threat for the species (Department of Sustainability, Environment, Water, Population and Communities, 2010). Additionally, competition for tree hollows is noted to be a threat to the species, with invasive species such as the Common Starling (*Sturnus vulgaris*) known to evict bat species from tree hollows. Although, it is considered unlikely that the Project would facilitate the establishment of any invasive species in *Nyctophilus corbeni* habitat that are not already present within the Project area.

h) introduce disease that may cause the species to decline, or

There are no diseases listed as being relevant to *Chalinolobus dwyeri* (Department of Sustainability, Environment, Water, Population and Communities, 2010). As such, the Project is considered unlikely to introduce disease that may cause this species to decline.

Threats to *Nyctophilus corbeni* do not include disease as there are no diseases listed as being relevant to *Nyctophilus corbeni* (Department of Sustainability, Environment, Water, Population and Communities, 2010). As such, the Project is considered unlikely to introduce disease that may cause this species to decline.

i) *interfere substantially with the recovery of the species.*

A number of recovery objectives have been recommended for *Chalinolobus dwyeri* in the *Recovery plan for the large-eared pied bat Chalinolobus dwyeri* (Hoye, 2005). The following objective is relevant to the Project:

- Identify priority roost and maternity sites for protection.

Ten recovery objectives have been developed to aid in the recovery of *Nyctophilus corbeni* as part of the *Draft National Recovery Plan for the South-eastern Long-eared Bat Nyctophilus corbeni* (Schulz and Lumsden, 2010). The following are relevant to the Project:

- Identify key populations and protect these from habitat loss and fragmentation; and
- Identify the extent of population fragmentation and instigate measures to increase habitat connectivity where recent isolation has occurred.

Based on the listed recovery objectives, the Project is considered to have the potential to interfere with the recovery of both species.

Conclusion

The significant impact criteria assessment concludes that the Project has the potential to significantly impact *Chalinolobus dwyeri* and *Nyctophilus corbeni*. As such, a referral to the Minister has been completed; refer to **Appendix A** of **Appendix F** in Volume 2 of the EA. A number of measures are recommended in **Section 7**, **Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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3.1.10 Parrots – Coxen's Fig-Parrot (*Cyclopsitta diophthalma coxeni*) and Swift Parrot (*Lathamus discolor*)

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

a) *lead to a long-term decrease in the size of a population*

Within the Project area, *Cyclopsitta diophthalma coxeni* (Endangered, EPBC Act; Critically Endangered, TSC Act) and *Lathamus discolor* (Endangered, EPBC Act; Endangered, TSC Act) are predicted to occur within the alignment based on previous records and habitats present. The Project may result in the clearing of potential habitat for each of these species in the form of vegetation from within the easement east. It is considered that works associated with the Project have the potential to result in a long-term decrease in the size of a population of *Cyclopsitta diophthalma coxeni* or *Lathamus discolor*, through habitat clearing and modification.

b) *reduce the area of occupancy of the species*

Cyclopsitta diophthalma coxeni is limited to about five populations scattered between Bundaberg in Queensland and the Hastings River in NSW. Given the existing 132kV easement, the species current limited distribution, and the preference of lowland subtropical rainforests it is considered unlikely that works associated with the Project would further reduce the area of occupancy of *Cyclopsitta diophthalma coxeni*.

Lathamus discolor 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, the species mostly occurs on the coast and south west slopes. Given the species extensive natural distribution, and the presence of several known areas of occupancy along the East Coast, it is considered that works associated with the Project would have the potential to reduce the area of occupancy of *Lathamus discolor*, through removal or modification of foraging habitat.

c) *fragment an existing population into two or more populations*

Cyclopsitta diophthalma coxeni and *Lathamus discolor* are considered likely to occur within the alignment based on suitable habitats present. The Project would require the expansion of the existing 132kV easement to accommodate the proposed 330kV easement. Given the presence of the existing 132kV easement, it is considered that the expansion works associated with the Project have the potential to increase fragmentation of *Cyclopsitta diophthalma coxeni* and *Lathamus discolor* habitat.

d) *adversely affect habitat critical to the survival of a species*

No Critical Habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area. To date, no Critical Habitat has been declared for this species within NSW.

Due to the broad habitat requirements of these species it is impossible to rule out the occurrence of habitat critical to their survival, as identified in the *EPBC Act Significant Impact Guidelines 1.1* within The Project area. As such, impacts associated with the Project have the potential to impact on habitat that may be critical to the survival of these species.

e) *disrupt the breeding cycle of a population*

The total population of *Cyclopsitta diophthalma coxeni* is estimated at 100 breeding birds. The breeding biology of Coxen's Fig-Parrot is almost entirely unknown. The breeding season is thought to extend from October to December or January. The nest is palced in a chamber that

is excavated in the rotting wood of a decaying limb or trunk of a living or dead tree (Department of Sustainability, Environment, Water, Population and Communities, 2010). Works associated with the Project have the potential to impact on potential habitat of *Cyclopsitta diophthalma coxeni*. Given the species small population size and limited distribution, and potential of the Project to impact on habitat for this species, there is considered to be high potential to disrupt the breeding cycle of this species.

Lathamus discolor breeds in Tasmania and for this reason, it is considered unlikely that the Project would have any adverse effects on the breeding cycle of a population of this species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Habitat within the study area and Project area is already modified and fragmented in places, due to existing and previous land uses, and historical vegetation clearing. Works associated with the Project have the potential to further modify and remove additional potential habitat for both *Cyclopsitta diophthalma coxeni* and *Lathamus discolor* from within the Project area. The construction of access tracks for the Project also has the potential to decrease the quality of potential habitat for both species. As such, it is considered that works associated with the Project have the potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that could cause a decline in either species.

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

It is unclear what invasive species are harmful to *Cyclopsitta diophthalma coxeni* and *Lathamus discolor*. Foxes and feral cats may target the species if they land on the ground; however each of these invasive species is already established throughout the Project area. It is considered unlikely that the Project would result in any additional invasive species becoming established within the study area.

h) introduce disease that may cause the species to decline, or

Cyclopsitta diophthalma coxeni and *Lathamus discolor* are susceptible to Psittacine Beak and Feather Disease *Psittacine Circoviral* which is an infectious and potentially fatal disease that is common in Australian parrots (Department of Sustainability, Environment, Water, Population and Communities, 2010). Each of these species is known to be particularly susceptible to the disease. The definite causes and methods of disease spread are not well understood. As such, there is the potential for the introduction of the disease *Psittacine Circoviral* into areas associated with the Project. It is possible that works associated with the Project could introduce or cause the disease to spread within the Project area, and in turn, cause *Cyclopsitta diophthalma coxeni* and *Lathamus discolor* numbers to decline.

i) interfere with the recovery of the species.

Two recovery plans have been developed for *Cyclopsitta diophthalma coxeni*; Coxen's Fig-Parrot Recovery Team (2001) and NSW National Parks and Wildlife Service (2002). These recovery plans set out specific recovery actions to assist with the recovery of the species. The following are relevant to the current Project:

- locate one or more remaining populations;
- protect remaining populations and their habitat from human-induced threatening processes, thereby maintaining the populations and habitat;
- increase the extent, quality and connectivity of the habitat of Coxen's fig-parrot.
- Habitat assessment; and
- Habitat protection and enhancement.

The Tasmanian Department of Primary Industries, Water and Environment (2001) released a recovery plan that sets out six specific recovery objectives and five recovery actions for *Lathamus discolor*, of which the following are relevant to the current Project:

Recovery objectives

- Identify the extent and quality of foraging habitat.
- Identify the extent and quality of foraging habitat within the overwintering range.
- Mapping of foraging and breeding habitat.
- Develop a strategy to provide for a continued supply of suitable nest hollows.
- Management and protection of habitat.
- Manage swift parrot habitat at a landscape scale.
- Reduce the incidence of collisions.
- Population and habitat monitoring.

Cyclopsitta diophthalma coxeni and *Lathamus discolor* are predicted to occur within the alignment east based on habitats present, in areas currently traversed by the existing 132kV easement. Given the presence of the existing 132kV easement and associated disturbances, it is considered that the Project has the potential to further impact on populations of *Cyclopsitta diophthalma coxeni* and *Lathamus discolor* that occur within the Project area through increased levels of disturbance and vegetation clearing. Furthermore, the Project is inconsistent with several of the recovery actions identified for each species.

Conclusion

The significant impact criteria assessment concludes that the Project has the potential to significantly impact *Cyclopsitta diophthalma coxeni* and *Lathamus discolor*. As such, a referral to the Minister has been completed, refer to **Appendix A** of **Appendix F** in Volume 2 of the EA. A number of measures are recommended in **Section 7**, **Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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3.1.11 Regent Honeyeater (*Anthochaera phrygia*)

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

a) lead to a long-term decrease in the size of a population

Anthochaera phrygia (Endangered EPBC Act; Critically Endangered TSC Act) is distributed sparsely across south-eastern Australia. There are three main breeding areas; Capertee Valley, NSW; the Bundarra-Barraba area, NSW; and around Chiltern, Victoria. The study area does not traverse these sites. There is some potential for this species to occur, at least occasionally, in the study area, as there are potentially suitable habitats and the species is either known or predicted to occur in nearby areas (DECCW 2010). In particular, there are records in the Atlas of NSW Wildlife from near the study area (west) (DECCW 2010).

It is likely that The Project would involve some removal of vegetation in habitats suitable for this species, but the impacts of this on the overall size of the population would be insignificant.

b) reduce the area of occupancy of the species

The extent of occurrence of this species is estimated at 300 000 km², with an area of occupancy estimated at 250 km² (DSEWPac 2010). It is considered unlikely that The Project could impact on the area of occupancy of this species.

c) fragment an existing population into two or more populations

The existing population is already fragmented. No known existing population fragments extend across the study area. The Project has some potential to fragment habitats, although for a highly mobile species such as *Anthochaera phrygia*, this is unlikely to be an issue. No known existing populations would be fragmented by the proposed Project.

d) adversely affect habitat critical to the survival of a species

No Critical Habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area. To date, no Critical Habitat has been declared for this species.

Due to the broad habitat requirements of this species and its migratory nature it is impossible to rule out the occurrence of habitat critical to its survival, as identified in the *EPBC Act Significant Impact Guidelines 1.1* within The Project area.

e) disrupt the breeding cycle of a population

No areas of known breeding habitat for *Anthochaera phrygia* would be affected and therefore there should be no disruption to the breeding cycle of the species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Some areas of potential habitat would be affected by The Project, but the effects would be of a linear nature and would not modify habitats to the extent that they would be unavailable to the species.

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Invasive weeds are not an identified threat to the survival of this species (DSEWPac 2010), as its primary foraging and breeding habitat is in the canopy of larger trees. The Project would result in the removal of small patches of vegetation, comprising both native and exotic species. Along much of the roadside areas, the understorey is dominated by exotic species due to ongoing disturbance. The Project is unlikely to result in the establishment of any additional invasive species that may result in a threat to this species.

h) introduce disease that may cause the species to decline, or

There is no mention in the relevant literature of any potential disease-based threats to this species (DSEWPac 2010).

i) interfere with the recovery of the species.

A recovery plan for this species is in effect (Department of Natural Resources and Environment 1999). Actions identified in the plan that are relevant to the Project are summarised below:

- Habitat management including rehabilitation and revegetation projects;
- Population monitoring, including initiation of a population monitoring program at the three main breeding areas, taking advantage of the existing sightings database and the Birds Australia Bird Atlas Project to elucidate distribution patterns and the magnitude of the range reduction over recent decades; and
- Community education and participation.

The Project has some potential to interfere with habitat management and revegetation actions in the recovery plan if these actions are planned to occur within the study area. Therefore, consultation with the *Anthochaera phrygia* recovery team would be required to ensure that no interference would occur.

Conclusion

The significant impact criteria assessment concludes that the Project is likely to significantly impact on *Anthochaera phrygia*. As such, a referral to the Minister has been completed; refer to **Appendix A** of **Appendix F** in volume 2 of the EA. A number of measures are recommended in **Section 7**, **Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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3.1.12 Reptiles - Three-toed Snake-tooth Skink (*Coeranoscincus reticulatus*) and Border Thick-tailed Gecko (*Uvidicolus sphyrurus*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of an important population of a species

There are no declared important populations of *Coeranoscincus reticulatus* (Vulnerable, EPBC Act; Vulnerable, TSC Act). However much of the lowland closed forest within the species range has been cleared for agriculture and grazing, pasture improvement, crop production, tropical fruit production and native forest logging. As such suitable habitat has generally been reduced to patches, especially in lowland areas (Department of (Department of Sustainability, Environment, Water, Population and Communities, 2010). The Project would require disturbance and fragmentation of land within the known range of *Coeranoscincus reticulatus*, within areas that may constitute potential habitat for this species. For this reason, the Project is considered to have the potential to contribute to a long term decrease in the size of a population of this species.

There are no declared important populations of *Uvidicolus sphyrurus* (Vulnerable, EPBC Act; Vulnerable, TSC Act) (Department of Sustainability, Environment, Water, Population and Communities, 2010). This species is predicted to occur within the western section of the Project area, based on habitats present and previous records. The Project would result in disturbance within the known range of the species, within areas that may constitute potential habitat for this species. As such, the Project has the potential to contribute to a long term decrease in the size of a population of this species.

b) reduce the area of occupancy of an important population

Coeranoscincus reticulatus occurs in the ranges and lowlands from Cooloola in south east Queensland to Grafton in north east NSW (Department of Sustainability, Environment, Water, Population and Communities, 2010). The Project would involve disturbance to vegetation and areas that constitute potential habitat for this species, and in doing so, may reduce the area of occupancy of a population of this species.

Uvidicolus sphyrurus is found throughout the north-west slopes and northern tablelands of NSW and the Stanthorpe region of southern Queensland. The Project would involve disturbance to vegetation and areas that constitute potential habitat for this species, and in doing so, may reduce the area of occupancy of a population of this species.

c) fragment an existing important population into two or more populations

While the majority of known records of *Coeranoscincus reticulatus* are located some distance from the Project area (NSW OEH Bionet, 2012), works associated with the Project have the potential to impact large expanses of suitable habitat for this species, and may result in some fragmentation of populations within the study area.

The majority of known records of *Uvidicolus sphyrurus* are located to the south of the Project area, adjacent to the western portion of the alignment (NSW OEH Bionet, 2012). Due to the proximity of previous records to the western portion of the Project area, it is considered that works associated with the Project would have the potential to impact habitat for this species, and may result in some fragmentation of populations within the study area.

d) *adversely affect habitat critical to the survival of a species.*

No Critical Habitat is listed on the register of Critical Habitat kept by the Director General, OEH or DPI within the Project area. To date, no Critical Habitat has been declared for these species.

No habitat critical to the survival of these species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within The Project area. Based on habitat requirements, critical habitat for these species is unlikely to be impacted by the Project.

e) *disrupt the breeding cycle of an important population*

There is limited information on the breeding cycle of *Coeranoscincus reticulatus*. Gravid females have been found in October to December, and one nest has been found in March, in moist soil beneath a rotten log in a rainforest gap, although it is uncertain whether the nest represents a single clutch or a communal nesting effort (Department of Sustainability, Environment, Water, Population and Communities, 2010). Given the lack of information available on the breeding cycle of the species, and the potential disturbance to habitat of this species as a result of the Project, it must be considered that the Project has the potential to disrupt the breeding cycle of this species within the Project area.

Little is known of the breeding cycle of *Uvidicolus sphyrurus* (Department of Sustainability, Environment, Water, Population and Communities, 2010). Given the lack of information available on the breeding cycle of the species, and the potential disturbance to habitat of this species as a result of the Project, it must be considered that the Project has the potential to disrupt the breeding cycle of this species within the Project area.

f) *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Coeranoscincus reticulatus is typically found in closed forest and to a lesser extent, open layered Eucalyptus forest. Generally recorded in moist layered forest on loamy basaltic soils, but also found in closed forest overlying silica sand dunes at Cooloola. Within forests, this species is often found in well-mulched, loose, friable rainforest soil in leaf litter, often immediately adjacent to fallen tree trunks. There are published records of individuals found in logged forest which had tall softwood regrowth (Department of Sustainability, Environment, Water, Population and Communities, 2010). The Project would require the removal and disturbance to vegetation and habitat that would be considered suitable for *Coeranoscincus reticulatus*. Due to the size of the Project and correlation of proposed works with the species range distribution, it is considered likely that the Project would potentially result in the modification or removal of habitat to the extent that the species may decline.

Uvidicolus sphyrurus utilises dry sclerophyll open forest and woodland associated with outcrops of granite, basalt, sandstone and metamorphic rocks. The majority of sites are associated with granite outcrops. Surveys conducted in north-eastern NSW indicate that geckos may show a preference for easterly aspects and the base of rock scarps. Shelter sites include rocks, decaying logs, bark, and litter in rocky rubble (Department of Sustainability, Environment, Water, Population and Communities, 2010). The Project would require the clearing of some areas of habitat associated with this species. It is considered The Project would potentially result in the modification or removal of habitat to the extent that the species would decline.

g) *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

The Department of Sustainability, Environment, Water, Population and Communities (2010) does not list any invasive species known to be harmful to *Coeranoscincus reticulatus*. However several invasive species are listed as being a threat to *Uvidicolus sphyrurus*, namely:

- Grazing and trampling of habitat by domestic stock and feral goats (*Capra hircus*) and
- Predation by feral cats (*Felis catus*) and European red foxes (*Vulpes vulpes*) (Department of Sustainability, Environment, Water, Population and Communities, 2010).

It is likely that these invasive species also pose a threat to *Coeranoscincus reticulatus*.

Capra hircus, *Felis catus* and *Vulpes vulpes* are known to occur throughout the Project area, and have been observed during field surveys conducted of the study area. However, it is considered that the Project would not be responsible for the establishment of any harmful invasive species within these species habitat, as each of the potentially harmful invasive species already exists throughout the Project area.

h) introduce disease that may cause the species to decline, or

The Department of Sustainability, Environment, Water, Population and Communities (2010) does not list any diseases that are relevant to *Coeranoscincus reticulatus* or *Uvidicolus sphyrurus*. Rather, illegal collection and inappropriate fire regimes are considered a more serious threat. Hence it is considered unlikely that the Project would introduce disease that may cause the species to decline.

i) interfere substantially with the recovery of the species.

There are no existing recovery plans for the *Coeranoscincus reticulatus*. In lieu of a formalised recovery plan, DECCW (2005) has defined several recovery actions for this species, of which the following is relevant to the Project:

- Retain and protect areas of rainforest and moist eucalypt forest.

Given the species range distribution is greatly restricted to areas of suitable habitat within the coastal subsection of the Queensland and NSW border (Department of Sustainability, Environment, Water, Population and Communities, 2010), the Project is considered to have the potential to interfere substantially with the recovery of this species in the Project area and local region.

There are no existing recovery plans for the *Uvidicolus sphyrurus*. In lieu of a formal recovery plan, DECCW (2005) has developed several recovery actions for this species, of which the following is relevant to the Project:

- Retain bushrock in its natural setting; and
- Retain and protect areas of rocky dry open forest and woodland from clearing, fragmentation and disturbance.

Given the species range distribution overlaps with the Project area, the Project is considered to have the potential to interfere with the recovery of these species within the Project area and local region.

Conclusion

The significant impact criteria assessment concludes that the Project has the potential to significantly impact *Coeranoscincus reticulatus* and *Uvidicolus sphyrurus*. As such, a referral to the Minister has been completed; refer to **Appendix A** of **Appendix F** in volume 2 of the EA. A number of measures are recommended in **Section 7**, **Appendix D4** of the Submissions

Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

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3.1.13 Murray Cod (*Maccullochella peelii peelii*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Maccullochella peelii peelii (Vulnerable, EPBC Act) occurs throughout the Murray-Darling Basin. Its range throughout the Basin includes South Australia, Victoria, NSW, ACT and Queensland. There are numerous records of this species within several rivers in close proximity to the Project area. There are no declared important populations of the species (Environment Australia, 2003; Threatened Species Scientific Committee, 2003; Department of Sustainability, Environment, Water, Population and Communities, 2010).

The Project would require some disturbance to areas of watercourses that may provide potential suitable habitat for this species. However the disturbance would be short-term and only occur in areas requiring water-course crossings. Impacts would be limited to the construction and installation phases of the waterway crossings within the proposed alignment. Consultation with Fisheries (NSW DPI) would be ongoing to ensure fish-friendly crossings are installed, in order to minimise disturbance to fish habitat. Therefore, it is considered unlikely that the proposed action would lead to a long-term decrease in the size of a population of the species.

- b) reduce the area of occupancy of an important population

Maccullochella peelii peelii occurs throughout the Murray Darling Basin, from Queensland through to South Australia and Victoria.

The Murray Cod is found extensively throughout the south-eastern region of Australia in the Murray Darling Basin. Its range throughout the Basin includes South Australia, Victoria, NSW, ACT and Queensland. Historically the species occurred throughout the entire Basin, with the

exception of the upper reaches of some tributaries. The species still occurs throughout most of the Basin with the exception of some localised extinctions. The Murray Darling Basin contains approximately 13 245 km of waterways that may encompass areas of suitable habitat for the species. The estimated extent of occurrence is 660 km². Some translocated populations exist outside the species' natural distribution in impoundments and waterways in NSW and Victoria (DSEWPac 2010).

Within its range, *Maccullochella peelii peelii* occurs naturally in the following IBRA bioregions: Murray-Darling Depression, Riverina, NSW South western slopes, South Eastern Highlands, Cobar Peneplain, Darling Riverine Plains, Brigalow Belt South and Nandewar (DSEWPac 2010).

Given that there are no declared important populations of this species, and that the proposed works would not permanently remove habitat for the species, it is unlikely that the Project would reduce the area of occupancy of an important population. Additionally, works associated with the Project should not result in any restrictions on movement of this species, due to commitment by TransGrid to ensure fish-friendly crossings are installed, in order to minimise disturbance to fish habitat.

c) fragment an existing important population into two or more populations

Maccullochella peelii peelii occurs throughout the Murray Darling Basin. Works associated with the Project would involve the upgrade and construction of various water crossings within the Project area. The majority of waterways throughout the Project area are already subject to various levels of disturbance, with many spanned by informal and/or formal waterway crossing structures, including bridges, causeways, farm tracks etc. Given that there are recent records of this species within waterways that are already subject to disturbance and crossings, works associated with the Project are unlikely to further fragment existing populations into two or more populations. Waterway crossings within the Project area would be designed and constructed in accordance with the NSW DPI *Policy and Guidelines for Fish Friendly Waterway Crossings* and *Why Do Fish Need to Cross the Road?* (2003), and relevant TransGrid specifications. Furthermore, all works would be carried out in accordance with industry guidelines developed by Landcom (2008) *Managing Urban Stormwater: Soils and Construction Volume 1*, and (DECC, 2008) Volume 2, (The blue book Volumes 1 and 2). As such, fragmentation of a population of this species is unlikely.

d) adversely affect habitat critical to the survival of a species

No Critical Habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area. To date, no Critical Habitat has been declared for this species.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for these species is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of an important population

Maccullochella peelii peelii reaches sexual maturity at 4 to 5 years of age and at 2 to 3 kg in weight. The species has relatively low fertility compared to many other freshwater fish. A female weighing around 3 kg can produce approximately 10 000 eggs whereas a female around 23 kg produces up to 90 000 eggs (DSEWPac 2010).

The species migrates upstream prior to spawning in late spring and early summer when the water reaches a temperature of between 16-21°C. This change in temperature provides the stimulus for spawning. *Maccullochella peelii peelii* form pairs prior to breeding. A spawning site is selected, usually a sunken red gum log in lowland rivers, or a submerged rock in upland

streams, although *Maccullochella peelii peelii* have been recorded excavating and laying eggs in depressions in clay banks as well. The female is believed to clean the breeding site with her tail before laying her large adhesive eggs as a large mat on the spawning surface. The male then squirts his milt over the eggs fertilising them. Hatching usually occurs 5-7 days after fertilisation, and a batch of eggs takes 3-4 days to hatch. The larvae then drift downriver, prior to the fry settling out in suitable protected habitat (DSEWPaC 2010).

The species is sedentary during late summer, autumn and winter, staying within its "territory", which usually consists of a specific hole, snag or area of a river or lake. During spring and early summer, when the water reaches a temperature of between 16–21°C, the species migrates upstream prior to spawning. A radio-tracking project in the early 1990s, in which large *Maccullochella peelii peelii* were fitted with transmitting radio tags, revealed that migratory tendencies and distances travelled vary considerably between individual fish, but many fish travel 40 or 50 km upstream and some travel up to 120 km upstream. Floods are important in stimulating these migrations; fish tend not to migrate if there are no floods.

Following spawning, the species moves back downstream, returning to the same territory occupied before. This homing behaviour is almost unknown in freshwater fish and emphasises the importance of snags to *Maccullochella peelii peelii*. Young *Maccullochella peelii peelii* become territorial and behave aggressively towards other cod from 40–50 mm in length, and adults are considered solitary and highly territorial, although anglers report the capture of several similar size cod from the one location, indicating aggregations may occur.

Given all upgrades and installations of waterway crossings within the Project area would be undertaken in consultation with DPI to ensure fish friendly crossings are installed, it is considered unlikely that the Project would disrupt the breeding cycle of a population of the species.

f) *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Maccullochella peelii peelii occurs in a diverse range of habitats, including clear rocky streams (such as those found in the upper western slopes of NSW), to slow flowing, turbid rivers and billabongs. Within the large range of habitats, *Maccullochella peelii peelii* is usually found near complex structural cover such as large rocks, snags, overhanging vegetation and other woody structures. The species is considered a main channel specialist as it is frequently found in river channels and larger tributaries. It is found in floodplain channels when they contain water; although this usage appears limited. Juveniles are most commonly found in the main river channel until about one year of age, after which they branch out (DSEWPaC, 2010). The Project would require the modification to, and addition of a number of waterway crossings within the Project area, many of which constitute potential *Maccullochella peelii peelii* habitat. Given all disturbance to waterways within the Project area would be undertaken in consultation with DPI to ensure fish friendly crossings are installed, it is considered unlikely that the Project would result in modifications, destruction, removal, isolation or reduction in available habitat for the species such that it is likely to decline.

g) *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

Eleven introduced (or alien) species of fish are known to occur within the Murray Darling Basin. Invasive species that can impact *Maccullochella peelii peelii* habitat include: Carp (*Cyprinus carpio*), Redfin Perch (*Perca fluviatilis*) and Goldfish (*Carassius auratus*). It is possible that *Cyprinus carpio* can result in reduced numbers of *Maccullochella peelii peelii*. Although there is little scientific evidence to support the claim, there is a correlation between high numbers of Carp and low numbers of *Maccullochella peelii peelii*. Young Carp may

provide a food source for the *Maccullochella peelii peelii*; and increasing *Maccullochella peelii peelii* numbers in NSW has corresponded to low numbers of Carp and Redfin Perch. The possible impacts of introduced species include predation, competition, habitat alteration, diseases and parasites. High densities of Carp may reduce aquatic vegetation through their feeding habitats (DSEWPac, 2010).

Cyprinus carpio were observed in several waterways during field surveys in the Project area west, suggesting that they may already be established within the Project area. It is considered unlikely that the Project would create a means for any of these invasive species that are not already established within the Project area to become established in *Maccullochella peelii peelii* habitat.

h) introduce disease that may cause the species to decline, or

(DSEWPac 2010) notes that the “occurrence and impact of diseases on [*Maccullochella peelii peelii*] is not well known, however, the major concern relates to exotic diseases carried by introduced species”. Diseases and pathogens of particular concern include:

- Epizootic Haematopoietic Necrosis virus.
- Viral Encephalopathy and Retinopathy.
- Goldfish Ulcer Disease.
- Asian Fish Tapeworm (*Bothriocephalus acheilognathis*).
- Parasitic copepod Anchorworm (*Lernaea cyprinacea*).

It is considered unlikely that works associated with the Project would result in an increase in potential exposure of *Maccullochella peelii peelii* to any of the diseases noted as being of concern to the species. Any diseases that may be carried by introduced species are unlikely to be spread by any works associated with the Project, as several species of exotic fish already exist within the locality.

i) interfere substantially with the recovery of the species.

Several management plans and strategies have been developed that aim to assist in the recovery of the *Maccullochella peelii peelii* summarised by the Department of Sustainability, Environment, Water, Population and Communities (2010):

- The Native Fish Strategy for the Murray-Darling Basin 2003–2013;
- The Action Plan for South Australian Freshwater Fishes 2009;
- National Recovery Plan for the Murray Cod *Maccullochella peelii peelii*. National Murray Cod Recovery Team (2010); and
- The Living Murray.

A range of recovery actions are outlined in each of these documents, with the more direct recovery options relating to the provision of fish friendly crossings across waterways where this species occurs. Given all upgrades and installations of waterway crossings within the Project area would be undertaken in consultation with DPI to ensure fish friendly crossings are installed, it is considered unlikely that the Project would interfere substantially with the recovery of *Maccullochella peelii peelii*.

Conclusion

The significant impact criteria assessment concludes that the Project is unlikely to significantly impact *Maccullochella peelii peelii*. As such, a referral to the Minister is not required. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved. For this reason, all access track works associated with the currently proposed 37 waterway crossing upgrades and 27 new waterway installations (**Table 7-4** of this Appendix)

to be designed and constructed in accordance with the NSW DPI *Policy and Guidelines for Fish Friendly Waterway Crossings* and *Why Do Fish Need to Cross the Road?* (2003), and relevant TransGrid specifications. Furthermore, all works would be carried out in accordance with industry guidelines developed by Landcom (2008) *Managing Urban Stormwater: Soils and Construction* Volume 1, and (DECC, 2008) Volume 2, (The blue book Volumes 1 and 2).

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3.1.14 Eastern Freshwater Cod (*Maccullochella ikei*)

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

- a) lead to a long-term decrease in the size of a population

Maccullochella ikei (Endangered, FM Act; Endangered EPBC Act) was historically widely distributed in the Clarence, Richmond and Brisbane River systems of coastal north-eastern NSW and southern Queensland. However, the species suffered a dramatic decline, with the last authenticated capture of the species in 1971. Thus, an artificial breeding program was developed in the late 1980s, and over 130, 000 artificially bred juveniles were released into the Clarence and Richmond River systems between 1996 and 1999 (DSEWPac 2012).

The Project would require some disturbance to areas of watercourses that may provide potential suitable habitat for this species. However the disturbance would be short-term and only occur in areas requiring water-course crossings. Impacts would be limited to the construction and installation phases of the waterway crossings within the proposed alignment. Consultation with Fisheries (NSW DPI 2012) would be ongoing to ensure fish-friendly crossings are installed, in order to minimise disturbance to fish habitat. Therefore, it is considered unlikely that the proposed action would lead to a long-term decrease in the size of a population of the species.

- b) reduce the area of occupancy of the species

The approximate current extent of occurrence of this species is estimated to be around 300 (river kms) (Lintermans *et al* 2004). The species was once abundant in both the Clarence and

Richmond River systems downstream of tablelands waterfalls, with fish up to 27kg being frequently caught in the Clarence and Orara Rivers. Late in the 1920s and 1930s the species apparently declined in the Richmond River and much of the Clarence River system.

Wild fish are now currently considered to be extinct in the Richmond River system and very rare or absent in the major northern tributaries of the Clarence River system. Since the late 1960s small numbers of eastern freshwater cod have only been recorded from tributaries such as the Nymboida, Guy Fawkes, Boyd and Mann Rivers where some pristine habitat still exists. Re-stocking with hatchery-bred cod has been undertaken since 1989. These stockings took place in numerous locations throughout the Clarence and Richmond River systems. Angler reports and recent surveys indicate that stocked fish have survived at many locations (NSW Fisheries 2004).

The Project would require some disturbance to watercourses that may provide potential suitable habitat for this species. However the disturbance would be short-term and only occur in areas requiring water-course crossings, which would be concentrated during the construction and installation phases of the proposed alignment. Consultation with Fisheries (NSW DPI 2012) would be ongoing to ensure fish-friendly crossings are installed, in order to minimise disturbance to fish habitat. Therefore, it is considered unlikely that the Project would impact on the area of occupancy of this species.

c) fragment an existing population into two or more populations

The distribution of the natural population of *Maccullochella ikei* is considered to be highly fragmented, due to a dramatic decline in the species population size in the 1930s. As a result only small numbers of the species were caught in tributaries supporting areas of pristine habitat. The re-stocking program began in the late 1990s. Since this time there has been no large scale survey of the species distribution to determine the connectivity of populations throughout it's range (NSW Fisheries 2004). Due to the short-term impacts anticipated as a result of the works associated with the Project, and the manner in which water crossings would be constructed and upgraded, it is considered unlikely that the Project would lead to the fragmentation of a population into two or more populations.

d) adversely affect habitat critical to the survival of a species

No Critical Habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area. To date, no Critical Habitat has been declared for this species.

e) disrupt the breeding cycle of a population

Riparian vegetation, large boulders and snags provide a complex array of habitats for each stage of the cod life cycle and influence the quality and quantity of food and shelter. Eastern freshwater cod are sexually mature at 4 or 5 years old, when 700g to 1.5kg. The breeding season is in spring and spawning commences when water temperatures rise above 16°C. Breeding fish are territorial and aggressive. Cod lay large (3mm) strongly adhesive eggs onto hard surfaces, probably rocks and logs in the wild (DSEWPaC 2012). The number of eggs produced is relatively low and similar to Murray cod (3.2 – 7.6 eggs/gram of female bodyweight). Hatching begins at 8 days and is complete 12 days after fertilisation at 17°C – 20°C. Larvae start feeding on zooplankton 12 days after hatching.

Stocking programs³ have been initiated south (~6km) and south-west (~11km) of the proposed alignment. A third stocking site is understood to be considerably closer to the Project (~150m)

³ Fish stocking is the practice of raising fish in a hatchery and releasing them into a river, lake, or the ocean to supplement existing populations, or to create a population where none exists. Stocking may be done for the benefit of commercial, recreational, or tribal fishing, but may also be done to restore or increase a population of threatened or endangered fish in a body of water closed to fishing.

around Yellow Creek (John E Purcy *pers. comm.*) (**Figure 2 series** in **Appendix C** of this Report).

Given all upgrades and installations of waterway crossings within the Project area would be undertaken in consultation with DPI to ensure fish friendly crossings are installed, it is considered unlikely that the Project would disrupt the breeding cycle of a population of the species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Maccullochella ikei prefer slow-flowing, clear rocky streams and rivers an abundance of in-stream rock cover, timber or tussocks. The species shows a preference for deeper parts of the river near cover, especially around rocky islands and large boulders in fast-flowing water. Habitat resources such as large woody debris are likely to provide shelter and important spawning sites for the species (DSEWPaC 2012).

The Project would require the upgrade or installation of water crossings throughout the Project area, which may result in some disturbance to potential *Maccullochella ikei* habitat. Several waterways within the Project area are already spanned by various crossings. Given the presence of existing crossings, and assuming mitigation measures are adopted for the construction of fish friendly passage, it is considered unlikely that the Project would result in significant fragmentation or isolation of *Maccullochella ikei* habitat from other areas of habitat.

Furthermore, the habitat that may be impacted by the Project is not considered to be of high importance to the long-term survival of the species in the locality, as the disturbance would be limited to waterway crossing construction, and impact likelihood reduced through adoption of mitigation measures recommended in **Section 7, Appendix D4** of this Report.

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

No invasive species have been documented as posing a threat to the species or its habitat. However, a number of introduced feral species have been documented as posing a threat to the species. For example, the Tropical Banded Grunter (*Amniataba percoides*) which was introduced into the Clarence River catchment is considered to pose a significant threat to *Maccullochella ikei*. This species was probably accidentally introduced with other stocked fish. It can breed and recruit in very large numbers and may induce similar impacts relating to competition and predation, to that of the introduced species Redfin. There are other introduced species, such as gambusia and goldfish, in the Clarence and Richmond rivers with unknown effects on *Maccullochella ikei* (NSW Fisheries 2004). It is considered unlikely that works associated with the Project would result in the establishment of any additional invasive species that may result in a threat to this species.

h) introduce disease that may cause the species to decline, or

The literature outlines a number of diseases which have been observed in the species in captive and wild conditions. In captivity, infestations by the protozoan parasite *Chilodonella hexasticha* (which causes the disease chilodonelliasis) and *Ichthyophthirius multifiliis* (white spot) can cause disease and death if left untreated. While the fungal infection, *Saprolegnia* sp. can develop if cod are roughly handled. Whereas, in wild-caught specimens, the most common disease recorded in the species, is the ecto-parasite anchor worm *Lernaea* sp. recorded (NSW Fisheries 2004). Therefore, it is considered unlikely that the works associated with the Project would result in the introduction of any disease that may cause the species to decline.

i) *interfere with the recovery of the species.*

A recovery plan exists for *Maccullochella ikei* (NSW Fisheries 2004), that outlines a number of habitat protection and restoration based recovery actions for the species, of which the following are relevant to the Project:

- Ensure that the risk of degradation of existing Eastern Cod habitat is minimised; and
- Protect and enhance identified sites.

In addition to these recovery plan actions, it has been recommended that waterway crossings be constructed to allow fish friendly passage, and in doing so reducing the likelihood of the Project interfering with the recovery strategies for this species.

Conclusion

The significant impact criteria assessment concludes that the Project is unlikely to significantly impact *Maccullochella ikei*. A number of measures have been recommended in **Section 7, Appendix D4** of this Report which aim to minimise the potential impact of the Project, to ensure that biodiversity values within the Project area are maintained or improved. All access track works associated with the currently proposed 37 waterway crossing upgrades and 27 new waterway installations (**Table 7-4** of this Appendix) to be designed and constructed in accordance with the NSW DPI *Policy and Guidelines for Fish Friendly Waterway Crossings* and *Why Do Fish Need to Cross the Road?* (2003), and relevant TransGrid specifications. Furthermore, all works would be carried out in accordance with industry guidelines developed by Landcom (2008) *Managing Urban Stormwater: Soils and Construction* Volume 1, and (DECC, 2008) Volume 2, (The blue book Volumes 1 and 2).

References

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- NSW Fisheries (2004) Eastern Freshwater Cod (*Maccullochella ikei*) Recovery Plan. NSW Fisheries Threatened Species Recovery Planning Program. Viewed online 10/2/2012 - <http://www.environment.gov.au/biodiversity/threatened/publications/recovery/m-ikei/pubs/m-ikei.pdf>
- Wager R and Jackson P (1993) The Action Plan for Australian freshwater fishes: Species Recovery outline for the Purple Spotted Gudgeon (Murray-Darling stock). Viewed online 10/2/2012 - <http://www.environment.gov.au/biodiversity/threatened/publications/action/fish/8-22.html>

3.1.15 Peppered Frog (*Litoria piperata*) and Stuttering Frog (*Mixophyes balbus*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

The Project would require disturbance to the north of the known distribution range of *Litoria piperata* (Vulnerable, EPBC Act; Critically Endangered, TSC Act) The closest known record of

the species is approximately 25km south-east of the Project area (NSW OEH Bionet, 2012). No individuals of this species were observed during field surveys conducted throughout the study area, nor has this species been recorded historically within the Project area. Given the lack of known or historical populations of this species within the Project area, it is considered unlikely that the Project has the potential to impact habitat of this species, to the extent that an important population of *Litoria piperata* declines.

The Project would require disturbance approximately 6 km to the north of the known range of *Mixophyes balbus* (Vulnerable, EPBC Act; Endangered TSC Act); however there would be no impact on any known *Mixophyes balbus* habitat. *Mixophyes balbus* is known to occur within Girard State Forest, approximately 6 km from the proposed Alignment and easement. Given the lack of known or historical populations of this species within the Project area, it is considered unlikely that the Project would lead to a long-term decrease in the size of any important population of *Mixophyes balbus*.

b) reduce the area of occupancy of an important population

Litoria piperata is predicted to occur in the Stanthorpe Plateau sub-region of the Northern Rivers CMA, restricted to elevations 800m ASL. Given the habitat restrictions, and lack of records from around the Project area suggest that this species is unlikely to occur within the Project area, and hence, the Project would not reduce the area of occupancy of any important population of *Litoria piperata*.

Mixophyes balbus is known to occur within the Cataract, Stanthorpe and Rocky River Gorge sub-regions of the Northern Rivers CMA. This species occurs from the QLD border south to the Victorian border, along coastal ranges and within Girard State Forest. However, there are no records of this species from within the Project area. Given the lack of records from within the Project area, and the existing 132kV easement in the study area east, it is not considered likely that the Project would result in any reduction to the area of occupancy of any important populations of *Mixophyes balbus*.

c) fragment an existing important population into two or more populations

The known range distribution of *Litoria piperata* does not extend into the Project area, and the closest known record of the species is some distance from the Project area (> 25km) (NSW OEH Bionet, 2012). As such, it is considered unlikely that the Project would fragment an existing important population into two or more populations.

The known range distribution of *Mixophyes balbus* is known to occur to the south of the Project area. However, there are no records of this species from within the Project area itself. Given the lack of records from within the Project area, and the existing 132kV easement in the study area east, it is not considered likely that the Project would fragment an existing important population into two or more populations.

d) adversely affect habitat critical to the survival of a species

No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area. To date, no critical habitat has been declared for either of these species.

No habitat critical to the survival of these species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within The Project area. Based on habitat requirements, critical habitat for these species, such as dense vegetation, large rocks and boulders adjacent to fast flowing streams, is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of an important population

No areas of known habitat for *Litoria piperata* or *Mixophyes balbus* would be cleared and therefore there should be no disruption to the breeding cycle of these species.

f) *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Litoria piperata habitat includes streamside vegetation and shelter sites under rocks and fallen timber along rocky streams flowing eastward from the Tablelands, at an altitude above 800m (NSW National Parks and Wildlife Service, 2001). Within the study area the River Oak riparian woodland vegetation community may provide habitat for this species, however there are no records of this species within the Project area. Clearing a small amount of this vegetation within the alignment is not considered likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Mixophyes balbus habitat includes rainforest, Antarctic Beech and wet sclerophyll forests. The species depends on freshwater streams and riparian vegetation for breeding and habitation (NSW Scientific Committee, 2002). These habitats are typical of much of the bushland found within the study area, particularly within the study area east, which contains the existing 132kV easement. Clearing vegetation, some of which is consistent with *Mixophyes balbus* habitat is not considered likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

Litoria piperata and *Mixophyes balbus* may be harmed by the introduced species Cane Toad (*Rhinella marina*) and Plague Minnow (*Gambusia holbrooki*). It is possible that these invasive species already exist within the Project area. Each of these invasive species may be accidentally spread via movement of plant and machinery within the Project area, or by transport of stockpiled construction material and organic matter during works undertaken in proximity to waterways. As such, the Project has the potential to result in disturbance to a number of waterways throughout the Project area; however it is unlikely to result in the introduction of any invasive species into areas where they do not already occur.

Given the existing disturbances within the Project area, it is considered unlikely that the Project would result in invasive species that are harmful to *Litoria piperata* or *Mixophyes balbus* becoming established in the species habitat.

h) *introduce disease that may cause the species to decline, or*

Litoria piperata and *Mixophyes balbus* are both susceptible to the disease chytridiomycosis, which is typically fatal to amphibians. Mitigation measures are recommended in **Section 7, Appendix D4** of this Report to minimise the risk of the introduction of the disease chytridiomycosis into all areas associated with the Project. It is therefore considered unlikely that the Project would introduce any diseases that may cause *Litoria piperata* and *Mixophyes balbus* to decline.

i) *interfere substantially with the recovery of the species.*

Seven recovery objectives and twenty one recovery actions have been identified for *Litoria piperata* as part of the *Yellow-spotted Bell Frog (Litoria castanea) and Peppered Tree Frog (Litoria piperata) recovery plan* (NSW National Parks and Wildlife Service, 2001), of which the following are relevant to the Project:

- Encourage the location and identification of any remaining extant populations in the wild;
- Increase protection of potential habitat through community awareness and involvement;
- and

- Effectively protect and manage any extant populations which may be located in the future.

The Project would not interfere with any of these recovery objectives for *Litoria piperata*.

A draft recovery plan (currently on public exhibition) has been developed for *Mixophyes balbus*; *National Recovery Plan for the Stuttering Frog Mixophyes balbus* (Hunter and Gillespie, 2010). This plan outlines three recovery objectives and fifteen recovery actions for the species, of which the following are relevant to the Project:

- Implement effective hygiene protocols;
- Incorporate markers for site recognition; and
- Promote public education and awareness.

The Project is considered to be consistent with the recovery actions listed within the draft recovery plan. Given the lack of records of *Mixophyes balbus* within the Project area, and that works associated with the Project are consistent with the recovery actions, the Project is not considered likely to interfere substantially with the recovery of *Mixophyes balbus*.

Conclusion

The significant impact criteria assessment concludes that the Project is unlikely to significantly impact *Litoria piperata* or *Mixophyes balbus*. As such, a referral to the Minister is not required for this species. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

The Project is not likely to significantly impact *Mixophyes balbus*. As such, a referral to the Minister is not required for this species. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

NSW National Parks and Wildlife Service (2001). Yellow-spotted Bell Frog (*Litoria castanea*) and Peppered Tree Frog (*Litoria piperata*) recovery plan. NPWS, Hurstville, NSW.

NSW Scientific Committee (2002). Final determination. Stuttering frog - endangered species listing. Viewed online 11/11/2010.

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3.1.16 Giant Barred Frog (*Mixophyes iteratus*)

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

- a) lead to a long-term decrease in the size of a population

Within the Project area, *Mixophyes iteratus* (Endangered, EPBC Act; Endangered, TSC Act) is predicted to occur within the alignment east, based on previous records and habitats present. The Project may result in the clearing of potential habitat in the form of vegetation from within

the easement east. It is possible that works associated with the Project could potentially result in a long-term decrease in the size of a population of *Mixophyes iteratus*.

b) reduce the area of occupancy of the species

Mixophyes iteratus occupies coastal lowland ranges, and occurs from south east Queensland to the Hawkesbury River in NSW. Within the Far North Coast, *Mixophyes iteratus* is known from the Mebbin, Nightcap Range and Richmond Range areas. In relation to the Project area, the species could be predicted to occur within the alignment east. Given the species natural distribution, and the presence of several known areas of occupancy within the Far North Coast, it is considered that works associated with the Project have the potential to reduce the area of occupancy of *Mixophyes iterates*, through impacts to potential habitat and increased levels of disturbance.

c) fragment an existing population into two or more populations

Mixophyes iteratus could be predicted to occur within the alignment east, with populations known from the Mebbin, Nightcap Range and Richmond Range areas. The Project would require the expansion of the existing 132kV easement to accommodate the proposed 330kV easement. Given the presence of the existing 132kV easement, it is considered that any expansion works associated with the Project could result in increased fragmentation of an existing population into two or more populations, as the existing easement already fragments potential *Mixophyes iteratus* habitat.

d) adversely affect habitat critical to the survival of a species

No Critical Habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area. To date, no Critical Habitat has been declared for this species within NSW.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area. Based on habitat requirements, critical habitat for this species, such as dense rainforest, is unlikely to be impacted by the Project.

e) disrupt the breeding cycle of a population

Mixophyes iteratus breed around shallow, flowing rocky streams from late spring to summer. Females lay eggs onto moist creek banks or rocks above water level, from where tadpoles drop into the water when hatched. Tadpoles grow to a length of 80mm and take up to 14 months before undergoing metamorphosis into frogs. When not breeding, the frogs disperse hundreds of metres away from streams.

Given the existing 132kV easement and associated access tracks, construction activities associated with the Project have the potential to disturb habitat for this species, in turn resulting in further disruptions to the breeding cycle of *Mixophyes iteratus*.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Mixophyes iteratus forage and live amongst deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000m. The species also occurs in farmland, with populations previously found in disturbed areas with vegetated riparian strips on cattle farms and in regenerated logged areas. Many known sites where *Mixophyes iteratus* occurs feature within the lower reaches of streams which have been affected by major disturbances such as clearing, timber harvesting and urban development in their headwaters (Department of Sustainability, Environment, Water, Population and

Communities, 2010). While the species is able to survive in areas prone to some disturbance, works associated with the Project have the potential to modify, destroy, isolate and decrease the quality of habitat to such an extent that the species may be at risk of declining.

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Mixophyes iteratus may be harmed by invasive species such as the Cane Toad (*Rhinella marina*) and Plague Minnow (*Gambusia holbrooki*). It is possible that each of these invasive species already exist within the Project area. Each of these invasive species may be accidentally spread via movement of plant and machinery within the Project area, or by transport of stockpiled construction material and organic matter during works undertaken in proximity to waterways. As such, the Project has the potential to result in disturbance to a number of waterways throughout the Project area.

Given the existing disturbances within the Project area, it is considered unlikely that the Project would result in invasive species that are harmful to *Mixophyes iteratus* becoming established in the species habitat, as they are already likely to occur within the area.

h) introduce disease that may cause the species to decline, or

Mixophyes iteratus is susceptible to the disease chytridiomycosis, which is typically fatal to amphibians. Mitigation measures are recommended in **Section 7, Appendix D4** of this Report to minimise the risk of the introduction of the disease chytridiomycosis into all areas associated with the Project. It is considered unlikely that the Project would introduce any diseases that may cause *Mixophyes iteratus* to decline.

i) interfere with the recovery of the species.

There are no existing recovery plans for *Mixophyes iteratus* within NSW. However, the species is covered within the *National recovery plan for Stream Frogs of South-east Queensland 2001-2005* (Hines and the South-east Queensland Threatened Frogs Recovery Team, 2002). This recovery plan sets out five specific recovery objectives and five recovery actions for this species, of which the following are relevant to the current Project:

- Monitor populations;
- Protect populations and manage habitat; and
- Provide education and information.

Mixophyes iteratus is predicted to occur within the alignment east based on habitats present, in areas currently traversed by the existing 132kV easement. Given the presence of the existing 132kV easement and associated disturbances, it is considered that the Project and the associated increased disturbance, fragmentation and vegetation clearing may have a significant impact on any populations of *Mixophyes iterates* that occur within the Project area

Conclusion

The significant impact criteria assessment concludes that the Project has the potential to significantly impact *Mixophyes iteratus*. As such, a referral to the Minister has been completed; refer to **Appendix A** of **Appendix F** in volume 2 of the EA. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

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Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

3.1.17 Australasian Bittern (*Botaurus poiciloptilus*)

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

- a) lead to a long-term decrease in the size of a population

Botaurus poiciloptilus (Endangered, EPBC Act; Endangered TSC Act) is known to occur within the Clarence Lowlands and Richmond - Tweed sub-regions of the Northern Rivers CMA. No individuals of this species were observed during URS field surveys. There is a historical record of this species approximately 10km to the north of the alignment near Piora, and a more recent record near the Lismore Substation in Tatham. Given the mobile nature of this species, the presence of suitable habitat outside of the Project area, and the species preference for wetland areas it is considered unlikely that the Project would lead to a long term decrease in the size of a population.

- b) reduce the area of occupancy of the species

Botaurus poiciloptilus occurs from south-east Queensland to south-east South Australia, Tasmania and in the southwest of Western Australia (DSEWPac, 2012). The species is widespread in NSW and Victoria. In NSW, it occurs along the coast and is frequently recorded in the Murray-Darling Basin, notably in floodplain wetlands of the Murrumbidgee, Lachlan, Macquarie and Gwydir Rivers. Aggregations of Australasian Bittern consistently occur at wetlands such as Fivebough Swamp (at Leeton, NSW), where habitat is actively managed for this species. While there are records of this species within 10km of the Project area, it is considered unlikely that the Project would result in a reduction in the area of occupancy of the species.

- c) fragment an existing population into two or more populations

Botaurus poiciloptilus favours permanent freshwater wetlands with tall, dense vegetation particularly bull rushes and spike rushes. The species breeds and forages in emergent vegetation in freshwater or brackish waters. These habitats are typical of some small areas within the study area. The disturbance associated with the Project, some of which may be within areas consistent with *Botaurus poiciloptilus* habitat, is not considered likely to further fragment any existing populations, given the existing 132kV easement across alignment east, the mobile nature of this species and the presence of suitable habitat outside of the Project area.

- d) adversely affect habitat critical to the survival of a species

No Critical Habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the Project area. To date, no Critical Habitat has been declared for this species within NSW.

No habitat critical to the survival of this species, as identified in the *EPBC Act Significant Impact Guidelines 1.1* has been mapped within the Project area.

e) disrupt the breeding cycle of a population

Knowledge of the breeding ecology of *Botaurus poiciloptilus* is poor. Available information indicates that the Bittern breeds in relatively deep, densely vegetated freshwater swamps and pools, building its nests in deep cover over shallow water (DSEWPac 2012). It is considered unlikely that the Project has the potential to impact on the breeding cycle of a population of this species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Works associated with the Project may take place in habitat that constitutes potential habitat for this species. Works associated with the Project have the potential to result in short term disturbance to this potential habitat, however are unlikely to result in long term reduction in available habitat, or long term reduction in the quality of available habitat. As such, it is unlikely that the Project would impact potential habitat for this species such that it is likely to decline.

g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Predation by foxes is noted to be a threat to juvenile *Botaurus poiciloptilus*, as well as to eggs and nests (DSEWPac 2012). Foxes are present throughout the Project area, and were observed during URS surveys of the study area. As such, it is considered unlikely that the Project would result in the establishment of foxes within the Project area; however it may result in increased access to nests of the species if they occur within the Project area.

h) introduce disease that may cause the species to decline, or

There are no diseases listed within the literature that have the potential to threaten *Botaurus poiciloptilus* (DSEWPac 2012). As such, it is unlikely that the Project would result in the introduction of a disease into the Project area that would cause the species to decline.

i) interfere with the recovery of the species.

No recovery plan has been developed for the species; however DSEWPac (2012) recommends the following actions to assist with the species recovery, that are relevant to the Project:

- Identification, protection and management of habitat, including principal breeding wetlands.
- Rehabilitation of selected former breeding habitats.
- Control of feral animals, particularly foxes and cats.
- Development of appropriate guidelines for wetland management.

Botaurus poiciloptilus is predicted to occur within the alignment east based on habitats present and previous records. Given the presence of the existing 132kV easement and associated disturbances, it is considered that the Project is unlikely to have a significant impact on any populations of *Botaurus poiciloptilus* that occur within the Project area

Conclusion

The significant impact criteria assessment concludes that the Project is *unlikely* to significantly impact *Botaurus poiciloptilus*. As such, a referral to the Minister is not required for this species. A number of measures are recommended in **Section 7, Appendix D4** of this Report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

References

Department of Sustainability, Environment, Water, Population and Communities (2012). *Botaurus poiciloptilus* in Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities, Canberra.
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Appendix D3 – Revised Outcomes Tables

As part of the response to Submissions, **Tables 6-1, 6-2, 6-4, 6-5 of Appendix F**, Volume 2 of the Environmental Assessment (EA) have been revised and replaced with the tables below. In addition there have also been revisions to the NSW Assessment of Significance (AOS) and Commonwealth Significant Impact Criteria (SIC) assessment outcomes for some of the NSW and Commonwealth listed threatened species, populations and ecological communities considered within **Appendix F, Volume 2** of the EA. AOS and SIC assessments as they appeared in the EA have been replaced with **Appendix D1 and D2** which have resulted in the addition of information to **Tables 6-1, 6-2, 6-4 and 6-5** (as outlined below), as well as some minor edits. Where changes to the AOS and SIC assessments have resulted in a change to the threatened biota assessment outcome, these changes have been highlighted within the tables below.

Given that AOS and SIC assessments are developed using Project area knowledge, ecological expertise, the 'precautionary principle', and the other principles of ecologically sustainable development (ESD) (Volume 1, Chapter 20 of the EA) as well as *EPBC Act Policy Statement 1.1 Significant Impact Guidelines Matters of National Environmental Significance* (2009) and the *Threatened Species Assessment Guidelines – The Assessment of Significance* (DEC 2007) the amended outcomes do not alter the relative impacts associated with the Project. AOS and SIC edits were triggered by agency submissions to provide greater consistency and to provide additional information where relevant or recently available.

Additional information has been added to **Tables 6-1, 6-2, 6-4 and 6-5** to include the vegetation formations known to occur within the Project area that threatened species, populations and ecological communities are likely to inhabit, along with the maximum clearing amounts for these formations. The tables present the maximum area of clearing for each threatened biota (based on the vegetation formations they are likely to inhabit); however, multiple biota may inhabit the same vegetation formations and therefore the maximum clearing area figures do not necessarily provide an overall clearing estimate. In addition to the seven vegetation formations identified in the EA, various threatened biota may be found in vegetation formations yet to be identified across un-surveyed areas. These areas would be targeted during pre-clearance surveys.

As noted within the EA, potential impacts to threatened biota have been described according to the following definitions:

NSW AOS (TSC Act/FM Act) outcomes:

- **None:** The results of the AOS indicate that the Project would not have an impact on the species, population or ecological community.
- **Potential:** The results of the AOS indicate that the Project has the potential to impact on the species or the associated habitat for the species, population and community.
- **Adverse:** The results of the AOS indicate that the Project would have an adverse impact on the species or the associated habitat for the species, population and community.

Commonwealth SIC (EPBC Act) outcomes:

- **Significant** impact, or
- **Not significant** impact.

As described in **Section 4.2.7 of Appendix F**, Volume 2 of the EA, it should be noted that there is an additional area of "Un-surveyed Wooded Vegetation". This vegetation would be surveyed as part of the pre-clearance surveys, however at this stage the maximum amount of "Un-surveyed Wooded Vegetation" to be cleared is estimated to be 52 Ha. Once surveyed, this additional vegetation may alter the estimates for relative threatened TECs in the tables below.

Appendix A of the Supplementary DGRs for the Project (16.03.10) outlines a range of threatened biota to be addressed as part of this broader EA. All biota from the Supplementary DGRs has been addressed in the EA (Appendix F, I and/or J of Appendix F of Volume 2) or via **Appendix D4** with the exception of the following two species:

- *Diuris sheaffiana* (taxonomic name change to *Diuris tricolor*, 2010) (TSC Act listed and no longer EPBC Act listed), this species was not identified as likely to occur within the Project area through any of the online searches (CMA/NSW or Commonwealth) and has been assumed to not be relevant to the Project area.

- *Pultenaea stuartiana* (taxonomic name change to *Pultenaea foliolosa*) is no longer listed under the TSC Act or EPBC Act.

Note, there are some changes reflected in the tables below, compared with the original tables in **Appendix F, Volume 2** of the EA, due to taxonomic changes to species names, such as; *Xanthomyza phrygia* (Regent Honeyeater), is now *Anthochaera Phrygia*, *Underwoodisaurus sphyrurus* (Border Thick-tailed Gecko), is now *Uvidicolus sphyrurus*, *Rapanea* sp. Richmond River is now *Myrsine richmondensis* and *Babingtonia granitica* is now *Kardomia granitica*. Such changes have resulted in some rows being deleted and/or species re-named accordingly. In addition one population has been added based on comments received from NSW DPI, namely the *Tandanus tandanus* (Eel tailed Catfish) population of the Murray Darling Basin.

Table 6-1 Threatened Flora Assessment Outcomes

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
<i>Acacia macnuttiana</i>	MacNutt's Wattle	Potential	Not Significant	Semi Arid Woodlands (shrubby sub formation)	117.1	181.81
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
<i>Acalypha eremorum</i>	Acalypha	None	N/A	Suitable vegetation formations to be targeted during pre-clearance surveys, does not inhabit currently mapped formations.	N/A	N/A
<i>Almaleea cambagei</i>	Torrington Pea	None	Not Significant	Wet Sclerophyll Forest (shrubby formation)	2.77	10.74
				Forested Wetland	7.97	
<i>Angophora exul</i>	Gibraltar Rock Apple	None	N/A	Grassy Woodland	103.94	103.94
<i>Angophora robur</i>	Sandstone Rough-barked Apple	None	Not Significant	Suitable vegetation formations to be targeted during pre-clearance surveys, does not inhabit currently mapped formations.	N/A	N/A
<i>Archidendron hendersonii</i>	White Laceflower	None	N/A	Forested Wetland	7.97	10.74
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Arthraxon hispidus</i>	Hairy Jointgrass	None	Not Significant	Forested Wetland	7.97	10.74
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Arthropteris palisotii</i>	Lesser Creeping Fern	None	N/A	Suitable vegetation formations to be targeted during pre-clearance surveys, does not inhabit currently mapped formations.	N/A	N/A
<i>Astrotricha roddii</i>	Rod's Star Hair	None	Not Significant	Grassland	3.46	107.4
				Grassy Woodland	103.94	
<i>Kardomia granitica</i>	Granite Babingtonia	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	145.87
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
<i>Belvisia mucronata</i>	Needle-leaf Fern	None	N/A	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Boronia granitica</i>	Granite Boronia	None	Not Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	249.81
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
<i>Cadellia pentastylis</i>	Ooline	Potential	Not Significant	Suitable vegetation formations to be targeted during pre-clearance surveys, does not inhabit currently mapped formations.	N/A	N/A
<i>Caladenia atroclavia</i>	Black-clubbed Spider-orchid	N/A	Not Significant	Suitable vegetation formations to be targeted during pre-	N/A	N/A

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
				clearance surveys, does not inhabit currently mapped formations.		
<i>Callistemon linearifolius</i>	Netted Bottlebrush	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	148.64
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
<i>Callistemon pungens</i>	-	N/A	Significant	Suitable vegetation formations to be targeted during pre-clearance surveys, does not inhabit currently mapped formations.	N/A	N/A
<i>Callitris baileyi</i>	Bailey's Cypress Pine	Adverse	N/A	Forested Wetland	7.97	91.9
				Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Callitris oblonga</i>	Pygmy Cypress Pine	Adverse	Significant	Grassy Woodland	103.94	193.07
				Forested Wetland	7.97	
				Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	
<i>Centranthera cochinchinensis</i>	Swamp Foxglove	None	N/A	Forested Wetland	7.97	115.37
				Grassy Woodland	103.94	
				Grassland	3.46	
<i>Clematis fawcettii</i>	Northern Clematis	None	Not Significant	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Corchorus cunninghamii</i>	Native Jute	Adverse	Significant	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	None	Not Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	252.58
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Cynanchum elegans</i>	White-flowered Wax Plant	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	185.1
				Grassy Woodland	103.94	
<i>Dendrobium melaleucaphilum</i>	Spider orchid	None	N/A	Forested Wetland	7.97	111.91
				Grassy Woodland	103.94	
<i>Desmodium acanthocladum</i>	Thorny Pea	Adverse	Significant	Forested Wetland	7.97	10.74
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Dichanthium setosum</i>	Bluegrass	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	261.24
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassland	3.46	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
<i>Digitaria porrecta</i>	Finger Panic Grass	None	Not Significant	Grassland	3.46	224.5
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Endiandra hayesii</i>	Rusty Rose Walnut	None	Not Significant	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Eucalyptus caleyi subsp. ovenidii</i>	Ovenden's Ironbark	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	145.87
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
<i>Eucalyptus glaucina</i>	Slaty Red Gum	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	185.1

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
				Grassy Woodland	103.94	
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	249.81
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
<i>Eucalyptus rubida subsp. barbigerorum</i>	Blackbutt Candlebark	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	187.87
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Grassy Woodland	103.94	
<i>Eucalyptus scoparia</i>	Wallangarra White Gum	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	249.81
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
<i>Eucalyptus tetrapleura</i>	Square-fruited Ironbark	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	249.81
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
<i>Euphrasia orthocheila subsp. peraspera</i>	Tenterfield Eyebright	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	264.01
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
				Forested Wetland	7.97	
				Grassland	3.46	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Geijera paniculata</i>	Axe-Breaker	None	N/A	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Geodorum densiflorum</i>	Pink Nodding Orchid	None	N/A	Dry Sclerophyll Forest (shrubby sub formation)	64.71	179.39
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Forested Wetland	7.97	
<i>Gossia fragrantissima</i>	Sweet Myrtle	Potential	Significant	Forested Wetland	7.97	10.74
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Grammitis stenophylla</i>	Narrow-leaf Finger Fern	None	N/A	Dry Sclerophyll Forest (shrubby sub formation)	64.71	64.71
<i>Grevillea beadleana</i>	Beadle's Grevillea	None	Not Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	145.87
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
<i>Hibbertia marginata</i>	Bordered Guinea Flower	None	Not Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	148.64
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Homoranthus binghiensis</i>	Binghi Homoranthus	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	249.81
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
<i>Homoranthus lunatus</i>	Crescent-leaved Homoranthus	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	249.81
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
<i>Lepidium peregrinum</i>	Wandering Pepper Cress	Adverse	Significant	Forested Wetland	7.97	7.97
<i>Leucopogon confertus</i>	Torrington Beard-heath	None	Not Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	249.81
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
				Grassy Woodland	103.94	
<i>Lindsaea incisa</i>	Slender Screw Fern	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Macadamia tetraphylla</i>	Rough-shelled Bush Nut	None	Not Significant	Forested Wetland	7.97	10.74
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Marsdenia longiloba</i>	Slender Marsdenia	None	Not Significant	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Melaleuca irbyana</i>	Weeping Paperbark	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	195.84
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Muehlenbeckia costata</i>	Scrambling Lignum	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	252.58
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Myrsine richmondensis</i>	Ripple-leaf Muttonwood	Potential	Significant	Forested Wetland	7.97	10.74
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Niemeyera whitei</i>	Rusty Plum	None	N/A	Dry Sclerophyll Forest (shrubby sub formation)	64.71	67.48
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Oldenlandia galioides</i>	Sweet False Galium	None	N/A	Forested Wetland	7.97	111.91
				Grassy Woodland	103.94	
<i>Owenia cepiodora</i>	Onion Cedar	None	Not Significant	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Persicaria elatior</i>	Tall Knotweed	Adverse	Significant	Forested Wetland	7.97	111.91
				Grassy Woodland	103.94	
<i>Phebalium glandulosum</i> subsp. <i>glandulosum</i>	Rusty Desert Phebalium	None	Not Significant	Dry Sclerophyll Forest (shrubby sub formation)	64.71	64.71
<i>Phebalium whitei</i>	-	N/A	Not Significant	Grassy Woodland	103.94	103.94
<i>Phyllanthus microcladus</i>	Brush Sauropus	None	N/A	Dry Sclerophyll Forest (shrubby sub formation)	64.71	176.62
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
<i>Plectranthus nitidus</i>	Nightcap Plectranthus	None	Not Significant	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Polygala linariifolia</i>	Native Milkwort	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	312.94
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Pomaderris notata</i>	McPherson Range Pomaderris	None	N/A	Suitable vegetation formations to be targeted during pre-clearance surveys, does not inhabit currently mapped formations.	N/A	N/A

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
<i>Prostanthera staurophylla</i> sensu stricto	Torrington Mint-bush	None	Not Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	249.81
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
<i>Rotala tripartita</i>	-	None	N/A	Forested Wetland	7.97	111.91
				Grassy Woodland	103.94	
<i>Rutidosis heterogama</i>	Heath Wrinklewort	Adverse	Significant	Dry Sclerophyll Forest (shrubby sub formation)	64.71	68.17
				Grassland	3.46	
<i>Sarcophilus hartmannii</i>	Hartman's Sarcophilus	None	Not Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	148.64
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Senna acclinis</i>	Rainforest Cassia	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	91.9
				Forested Wetland	7.97	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Sophora fraseri</i>	Brush Sophora	Potential	Significant	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Syzygium hodgkinsoniae</i>	Red Lilly Pilly	Adverse	Significant	Forested Wetland	7.97	10.74
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Tephrosia filipes</i>	-	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	252.58
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Grassy Woodland	103.94	
<i>Thesium australe</i>	Austral Toadflax	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	373.14
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Grassland	3.46	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Tinospora smilacina</i>	Tinospora Vine	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	83.93
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Triplarina imbricata</i>	Creek Triplarina	Adverse	Significant	Forested Wetland	7.97	7.97
<i>Tylophora woolfsii</i>	Cryptic Forest Twiner	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	83.93
				Wet Sclerophyll Forest (shrubby formation)	2.77	

Table 6-2 Threatened Ecological Community Assessment Outcomes

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Total (Ha) (Min. Scenario)	Total (Ha) (Max. Scenario)
<i>Aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River</i>	Darling River EEC	Adverse	N/A	No relevant associated vegetation formation. Refer to spatial mapping indicating the distribution of the TEC (Figures 8a-8m , Threatened Ecological Communities of Appendix F of the EA).	N/A	N/A
<i>Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion</i>	Sub-tropical Coastal Floodplain Forest	Adverse	N/A	Grassy Woodland	1.39	10.39
<i>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast; Sydney Basin and South East Corner Bioregions</i>	Swamp sclerophyll forest on coastal floodplains	Adverse	N/A	Forested Wetland	0.15	1.64
<i>White box - yellow box - Blakely's red gum grassy woodland and derived native grassland</i>	Box Gum Woodland	Adverse	Significant	Grassy Woodland	3.63 (TSC Act ONLY)	24.51 (TSC Act ONLY)
					6.06 (TSC Act & EPBC Act)	51.14 (TSC Act & EPBC Act)
<i>Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland</i>	Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	N/A	Significant	Grassland	0.44	3.46

Table 6-4 Threatened Fauna Assessment Outcomes

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
<i>Aepyprymnus rufescens</i>	Rufous Bettong	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	304.97
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Amaurornis olivaceus</i>	Bush-hen	None	N/A	Wet Sclerophyll Forest (shrubby formation)	2.77	10.74
				Forested Wetland	7.97	
<i>Anthochaera phrygia</i>	Regent Honeyeater	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	312.94
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Forested Wetland	7.97	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Anseranas semipalmata</i>	Magpie Goose	None	N/A	Forested Wetland	7.97	128.53
				Grassland	3.46	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Forested Wetland	7.97	
<i>Botaurus poiciloptilus</i>	Australasian Bittern	None	Not Significant	Semi Arid Woodlands (shrubby sub formation)	117.1	7.97
				Forested Wetland	7.97	
<i>Burhinus grallarius</i>	Bush Stone-curlew	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	381.11
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassland	3.46	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Forested Wetland	7.97	
<i>Cacophis harriettae</i>	White-crowned Snake	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	264.01
				Forested Wetland	7.97	
				Grassland	3.46	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
<i>Calyptorhynchus banksii banksii</i>	Red-tailed Black-Cockatoo (coastal subspecies)	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	381.11
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassland	3.46	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Wet Sclerophyll Forest (shrubby formation)	2.77	

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
				Forested Wetland	7.97	
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	377.65
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	377.65
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	374.88
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
				Forested Wetland	7.97	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Forested Wetland	7.97	
<i>Circus assimilis</i>	Spotted Harrier	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	313.63
				Forested Wetland	7.97	
				Grassland	3.46	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Climacteris picumnus victorae</i>	Brown Treecreeper (eastern subspecies)	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	257.78
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
<i>Coeranoscincus reticulatus</i>	Three-toed Snake-tooth Skink	Adverse	Significant	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Coracina lineata</i>	Barred Cuckoo-shrike	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
<i>Cyclopsitta diophthalma coxeni</i>	Coxen's Fig-Parrot	Adverse	Significant	Suitable vegetation formations to be targeted during pre-clearance surveys, does not inhabit currently mapped formations.	N/A	N/A
<i>Daphoenositta chrysoptera</i>	Varied Sittella	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	377.65
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Forested Wetland	7.97	
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	None	Not Significant	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Dasyurus maculatus maculatus</i>	Spotted-tailed Quoll	Potential	Not Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Grassy Woodland	103.94	
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	Potential	N/A	Forested Wetland	7.97	11.43
				Grassland	3.46	
<i>Erythrorhynchus radiatus</i>	Red Goshawk	Potential	N/A	Forested Wetland	7.97	260.55
				Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Forested Wetland	7.97	
<i>Geophaps scripta scripta</i>	Squatter Pigeon	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	370.37
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Grassland	3.46	
<i>Glossopsitta pusilla</i>	Little Lorikeet	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	377.65
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Forested Wetland	7.97	
<i>Grantiella picta</i>	Painted Honeyeater	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	374.88
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
<i>Grus rubicunda</i>	Brolga	None	N/A	Grassy Woodland	103.94	11.43
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Grassland	3.46	
				Forested Wetland	7.97	
<i>Hieraaetus morphnoides</i>	Little Eagle	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	381.11
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassland	3.46	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	377.65
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	Potential	N/A	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Irediparra gallinacea</i>	Comb-crested Jacana	None	N/A	Suitable vegetation formations to be targeted during pre-clearance surveys, does not inhabit currently mapped formations.	N/A	N/A
<i>Ixobrychus flavicollis</i>	Black Bittern	None	N/A	Forested Wetland	7.97	7.97
<i>Kerivoula papuensis</i>	Golden-tipped Bat	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	91.9
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Forested Wetland	7.97	
<i>Lathamus discolor</i>	Swift Parrot	Adverse	Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	374.88
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Limosa limosa</i>	Black-tailed Godwit	None	N/A	Suitable vegetation formations to be targeted during pre-clearance surveys, does not inhabit currently mapped formations.	N/A	N/A
<i>Litoria brevipalmata</i>	Green-thighed Frog	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Litoria piperata</i>	Peppered Frog	None	Not Significant	Forested Wetland	7.97	7.97
<i>Litoria subglandulosa</i>	Glandular Frog	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	264.01

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassland	3.46	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Lophoictinia isura</i>	Square-tailed Kite	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	381.11
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassland	3.46	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Maccullochella peelii peelii</i>	Murray Cod, Cod, Goodoo	N/A	Not Significant	<i>Maccullochella peelii peelii</i> has been recorded in waterways within the broader Project area however the Significant Impact Criteria assessment notes that due to proposed Project mitigation measures, this species is not likely to be significantly impacted and hence will not be the subject of targeted pre-clearance survey effort.	N/A	N/A
<i>Maccullochella ikei</i>	Easter Freshwater Cod	None	Not Significant	<i>Maccullochella ikei</i> has been 'stocked' by NSW DPI and has also been recorded in a single record in the tributary of the Clarence River (2003), however the Significant Impact Criteria assessment notes that due to proposed Project mitigation measures, this species is not likely to be significantly impacted and hence will not be the subject of targeted pre-clearance survey effort.	N/A	N/A
<i>Macropus dorsalis</i>	Black-striped Wallaby	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	252.58
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Macropus parma</i>	Parma Wallaby	None	N/A	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	374.88
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	374.88
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Menura alberti</i>	Albert's Lyrebird	None	N/A	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
<i>Miniopterus australis</i>	Little Bentwing-bat	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	381.11
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassland	3.46	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Mixophyes balbus</i>	Stuttering Frog	Potential	Not Significant	Wet Sclerophyll Forest (shrubby formation)	2.77	10.74
				Forested Wetland	7.97	
<i>Mixophyes iteratus</i>	Giant Barred Frog	Potential	Significant	Forested Wetland	7.97	10.74
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Mogurnda adspersa</i>	Purple Spotted Gudgeon	None	N/A	<i>Mogurnda adspersa</i> has been recorded in waterways within the broader Project area however the Assessment of Significance notes that due to proposed Project mitigation measures, this species is not likely to be significantly impacted and hence will not be the subject of targeted pre-clearance survey effort.	N/A	N/A
<i>Monarcha leucotis</i>	White-eared Monarch	None	N/A	Forested Wetland	7.97	10.74
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Mormopterus beccarii</i>	Beccari's Freetail-bat	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
				Forested Wetland	7.97	
<i>Mormopterus eleryi</i>	Hairy-nosed Freetail Bat	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	366.91
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Myotis macropus</i>	Large-footed Myotis	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
<i>Neophema pulchella</i>	Turquoise Parrot	Adverse	N/A	Dry Sclerophyll Forest (shrubby sub formation)	64.71	374.88
				Forested Wetland	7.97	
				Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
<i>Ninox connivens</i>	Barking Owl	Potential	N/A	Semi Arid Woodlands (shrubby sub formation)	117.1	377.65
				Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Ninox strenua</i>	Powerful Owl	Potential	N/A	Wet Sclerophyll Forest (shrubby formation)	2.77	260.55
				Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Nyctimene robinsoni</i>	Eastern Tube-nosed Bat	Potential	N/A	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	Potential	N/A	Forested Wetland	7.97	10.74
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Nyctophilus corbeni</i>	South-eastern Long-eared Bat	Adverse	Significant	Grassy Woodland	103.94	103.94
<i>Pachycephala olivacea</i>	Olive Whistler	Potential	N/A	Grassy Woodland	103.94	106.71
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Petaurus australis</i>	Yellow-bellied Glider	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Petaurus norfolcensis</i>	Squirrel Glider	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	None	Not Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Petroica boodang</i>	Scarlet Robin	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Petroica phoenicea</i>	Flame Robin	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	381.11
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassland	3.46	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Phascolarctos cinereus</i>	Koala	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	377.65
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Philoria loveridgei</i>	Loveridge's Frog	Potential	N/A	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Philoria pughi</i>	Philoria pughi	Potential	N/A	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Philoria richmondensis</i>	Philoria richmondensis	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	83.93
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Planigale maculata</i>	Common Planigale	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	160.07
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassland	3.46	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	374.88
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Potorous tridactylus tridactylus</i>	Long-nosed Potoroo	None	Not Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	156.61
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Pseudomys</i>	Eastern Chestnut Mouse	None	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	264.01

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
<i>gracilicaudatus</i>				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassland	3.46	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Pseudomys oralis</i>	Hastings River Mouse	None	Not Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	148.64
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Potential	Not Significant	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	381.11
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassland	3.46	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	None	N/A	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Ptilinopus regina</i>	Rose-crowned Fruit-Dove	None	N/A	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	None	N/A	Forested Wetland	7.97	10.74
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Pyrrholaemus saggitatus</i>	Speckled Warbler	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	374.88
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Rostratula benghalensis australis</i>	Australian Painted Snipe	None	Not Significant	Forested Wetland	7.97	11.43
				Grassland	3.46	
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	Potential	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	381.11
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassland	3.46	
				Grassy Woodland	103.94	
				Semi Arid Woodlands (shrubby sub formation)	117.1	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	260.55
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	
				Grassy Woodland	103.94	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Stagonopleura guttata</i>	Diamond Firetail	Adverse	N/A	Dry Sclerophyll Forest (shrub/grass sub formation)	81.16	270.94
				Dry Sclerophyll Forest (shrubby sub formation)	64.71	
				Forested Wetland	7.97	

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
				Semi Arid Woodlands (shrubby sub formation)	117.1	
<i>Stictonetta naevosa</i>	Freckled Duck	None	N/A	Grassland	3.46	3.46
<i>Syconycteris australis</i>	Common Blossom-bat	None	N/A	Forested Wetland	7.97	7.97
<i>Thylogale stigmatica</i>	Red-legged Pademelon	None	N/A	Suitable vegetation formations to be targeted during pre-clearance surveys, does not inhabit currently mapped formations.	N/A	N/A
<i>Turnix maculosa</i>	Red-backed Button-quail	None	N/A	Forested Wetland	7.97	7.97
<i>Tyto capensis</i>	Grass Owl	None	N/A	Forested Wetland	7.97	11.43
				Grassland	3.46	
<i>Tyto novaehollandiae</i>	Masked Owl	Potential	N/A	Grassy Woodland	103.94	103.94
<i>Tyto tenebricosa</i>	Sooty Owl	Potential	N/A	Suitable vegetation formations to be targeted during pre-clearance surveys, does not inhabit currently mapped formations.	N/A	N/A
<i>Uvidicolus sphyrurus</i>	Border Thick-tailed Gecko	Adverse	Significant	Semi Arid Woodlands (shrubby sub formation)	117.1	117.1
<i>Vespadelus trougtoni</i>	Eastern Cave Bat	Adverse	N/A	Wet Sclerophyll Forest (shrubby formation)	2.77	2.77

Table 6-5 Threatened Population Assessment Outcomes

Scientific Name	Common Name	AOS Outcome	SIC Outcome	Associated Vegetation Formations	Vegetation Clearing	
					Per Formation (Ha)	Total (Ha) (Max. Scenario)
<i>Adelotus brevis</i> - endangered population	<i>Tusked Frog population in the Nandewar and New England Tableland Bioregions</i>	Potential	N/A	Forested Wetland	7.97	14.2
				Grassland	3.46	
				Wet Sclerophyll Forest (shrubby formation)	2.77	
<i>Tandanus tandanus</i>	Eel-tailed Catfish	None	N/A	<i>Tandanus tandanus</i> has been recorded in waterways within the broader Project area however the Assessment of Significance notes that due to proposed Project mitigation measures, this species is not likely to be significantly impacted and hence will not be the subject of targeted pre-clearance survey effort.	N/A	N/A
<i>Ambassis agassizii</i>	Olive Perchlet	None	N/A	<i>Ambassis agassizii</i> has been recorded in waterways within the broader Project area however the Assessment of Significance notes that due to proposed Project mitigation measures, this species is not likely to be significantly impacted and hence will not be the subject of targeted pre-clearance survey effort.	N/A	N/A

Appendix D4 – Revised Section 7 of Appendix F of the EA

Appendix D4 – Revised Section 7 of the Biodiversity Report

Appendix D4 replaces **Section 7** of **Biodiversity Report, Appendix F**, Volume 2 of the Environmental Assessment (EA) and has been provided here to address in further detail impact mitigation measures for the Project. Changes made to this document have been based on liaison with NSW and Commonwealth agencies and as a result of submission responses. For ease of reference the additions and changes that have been made to **Section 7**, since exhibition of the EA, have been highlighted.

Biodiversity Maintenance and Improvement

The following section identifies measures that prepare to avoid, mitigate and offset impacts on biodiversity values associated with the Project. This section has been structured according to the principles stated in DECC (2005) guidelines for Part 3A biodiversity assessments.

7.1 Impact Avoidance

Impacts on biodiversity have been avoided where possible, through the following means:

- a detailed route selection process was undertaken to identify and assess environmental constraints within the study area (*Constraints Identification and Preferred Corridor Report*, URS, 2009). The route selection process identified: ecological, heritage, visual, social, surface water and ground water, geology, soils and topography, so as to guide the final location of the Project to avoid impacting on these features;
- wherever possible, the Project has been located in cleared areas to avoid native vegetation and habitat, specifically to avoid threatened species, populations and ecological communities;
- where possible, at spans where topography allows (i.e. gullies and escarpments) vegetation would be retained where conductor height is sufficient to make clearing unnecessary;
- access track locations have been selected with consideration of minimising disturbance to vegetation and protected ecological features;
- where possible the alignment has been selected to cross drainage lines at right angles to minimise the need for riparian vegetation removal; and
- use of the existing easement within Study Area East reduces the clearing requirement for the Project by avoiding potential clearing requirements by seventy-five percent.

The alignment and associated easement was developed based on the constraints identified and the recommendations contained within the URS (2009) *Constraints Identification and Preferred Corridor Report* as well as ongoing discussions with property owners, community and stakeholders.

7.2 Impact Mitigation

A full description of the measures proposed to mitigate adverse effects of the Project on threatened species, populations and ecological communities is provided below. Most of these measures form part of threat abatement plans, recovery plans and priority actions recommended by NSW OEH and DSEWPac for threatened species, populations and ecological communities.

Table 7-1 details the commitments that would form part of the conditions of approval for the Project.

Section 7.2.1 of this Appendix provides the proposed pre-clearance survey steps and trigger points required for remaining threatened flora, fauna, ecological communities and populations' surveys, together with the requirements for pre-clearance surveys, for all 91 threatened species, populations and ecological communities that have the potential to occur within the Project area (including alignment and associated access tracks).

Section 7.2.2 of this Appendix provides the biodiversity related management strategies, which have been revised to take into account the amendments in **Section 7.2.1**, and other revisions made following exhibition.

Table 7-1 TransGrid Statement of Commitments

Mitigation Measures and Commitment	Implementation			Location for Pre-Clearance Assessment
	Design	Construction	Operation	
Biodiversity - General				
An Environmental Management Representative would be appointed by TransGrid to oversee the implementation of mitigation measures and commitments.	✓			N/A
Biodiversity – Vegetation Clearing				
A suitably qualified ecologist (botanist or fauna specialist, as relevant) would be engaged to conduct pre-clearance surveys in line with Section 7.2.1 of Appendix D4 below. These surveys would: - target threatened biota that have the potential to occur in areas not yet surveyed - target potentially occurring/impacted threatened flora (Table 7-3) across the Project area, and - target additional, more recently listed fauna, populations and ecological communities across the Project area, considered within the EA, but not surveyed for in the 2009/2010 surveys. Threatened biota identified along the Project area to be avoided, protected, offset, or adaptively managed/monitored according to OEH, DPI and/or DSEWPaC advice, depending on biota level of protection.	✓	✓		Project area
A Flora Management Plan would be developed and included in the CEMP. The Flora Management Plan would identify measures and management protocols designed to assist in the avoidance and mitigation of impacts on flora as a result of vegetation clearing associated with the Project. Mitigation measures would be implemented to maximise the avoidance of threatened plants during clearing, to ensure the protection of local populations, to promote long-term connectivity of populations within the landscape and to control weed invasion where necessary. The Flora Management Plan would also identify offset measures proposed for unavoidable impacts.	✓	✓		N/A
In vegetated areas the extent of clearing required would be clearly demarcated. Flagging tape would be used during construction to identify the edge of the area to be cleared. The Flora Management Plan and the pre-clearance assessments would identify those areas to be demarcated and avoided.	✓	✓		Project area

Mitigation Measures and Commitment	Implementation			Location for Pre-Clearance Assessment
	Design	Construction	Operation	
A suitably qualified ecologist would undertake surveys to locate habitat resources (hollow bearing trees, stags, coarse woody debris and rocky outcrops) across the Project area to determine the habitat resources that may require protection or offset. Where practical, hollow bearing trees would be selectively retained. This would be assessed on a case by case basis as part of the pre-clearance assessments.	✓			Project area
For TECs listed under the TSC, FM and EPBC Act, the construction footprint associated with access tracks and transmission line structures would be minimised as far as possible. Access tracks would occur at restricted points and would be located in areas with minimal canopy cover where practical. If ground cover removal is required, all top soil removed from the area would be stockpiled separately and re-established following completion of construction activities.	✓	✓	✓	N/A
For TECs listed under the TSC, FM and EPBC Act, and important threatened species habitat, constrained clearing and maintenance practices (Appendix C TransGrid Policies in Volume 2 of EA) would be implemented wherever possible, taking into consideration TransGrid's clearance requirements (GD AS G3 015 'Principles for the Clearing of Transmission Line Easements'). Wherever possible, bands of understorey vegetation would be retained. Intact habitat features such as hollow logs would be placed in these bands of vegetation.	✓	✓	✓	N/A
Biodiversity - Weed Management				
Weed surveys, focusing on noxious weeds, listed by local control authorities (Noxious Weeds Act 1993 (NW Act)), would be undertaken by a qualified ecologist/botanist prior to construction. These surveys would identify and record the noxious weeds occurring along the alignment, along associated access tracks and in surrounding areas. This information would then be utilised to prepare the Weed Management Plan that is part of the CEMP.	✓	✓		Project area
A Weed Management Plan would be developed as part of the CEMP and would include specific measures for the minimisation, management, mitigation and monitoring of noxious/ environmental weeds within all work areas.		✓		N/A
Once construction is complete, noxious weeds within the alignment and associated work areas would be controlled as per TransGrid Standard GM EN G2 010 Noxious Weed Control, and as per the most recent information available from the I&I NSW (formerly called DPI, NSW Department of Primary Industries).			✓	N/A
Biodiversity - Fauna Management				
Clearing of vegetation would follow best practice methods for fauna rescue (as per NSW National Parks and Wildlife Service (2001) Policy for the Translocation of Threatened Fauna in NSW).		✓		N/A
A Fauna Management Plan would be developed as a part of the CEMP to minimise impacts to resident native and threatened species. This would include the	✓	✓		See Section 7.2.1 threatened biota pre-

Mitigation Measures and Commitment	Implementation			Location for Pre-Clearance Assessment
	Design	Construction	Operation	
following procedures: - targeted pre-clearance surveys for breeding / nesting / primary habitat for threatened biota (in line with Section 7.2.1 below); - two stage clearing process for hollow bearing trees; - management of fauna for translocation and rescue; - coarse woody debris relocation plan; - rehabilitation and revegetation plan to re-establish fauna passageways; and - habitat replacement plan, including nest box, bat roosts and glider pole allocation and placement.				clearance survey requirements.
Vegetation would be cleared using the two-stage approach in areas identified as containing habitat features (hollow bearing trees, stags, coarse woody debris and rocky outcrops). Areas containing habitat trees would be identified during targeted pre-clearance assessments of structure locations and access tracks proposed for construction in areas of intact native vegetation. This approach involves the following process: - Initially all non-habitat trees would be removed, leaving 2-3m wide connections between stands of habitat trees. - All habitat trees would be knocked (gently tapped with plant equipment) once all non-habitat trees have been removed at the end of each day. - At least 48 hours after partial clearing, habitat trees would be removed and checked for fauna in the presence of a suitably qualified ecologist, fauna rescue personnel or certified wildlife handler. - Suitably qualified personnel would guide the plant equipment operators on 'how' and to what side to fell habitat trees to facilitate fauna observation and rescue.	✓	✓		N/A
All fauna habitat features (hollow bearing trees, stags, coarse woody debris and rocky outcrops), would be relocated to the edge of the easement subject to safety and fire risk considerations.		✓		N/A
Any rescued fauna would be transferred to appropriate areas within adjacent habitat or placed in the care of WIRES or other certified wildlife rescue organisations within the local area, if injured.		✓		N/A
If injured microbats are found during vegetation clearing procedures, only a vaccinated ecologist with the rabies inoculation suitable for Australian Bat Lyssavirus would handle these species.		✓		
During targeted pre-clearance assessments, ecologists would undertake targeted searches for the presence of gliders as well as the habitat suitability along the Project area to determine whether there is a requirement for installation of glider poles.	✓	✓		See Figure 11 and Section 7.2.1 threatened biota pre-clearance survey requirements.

Mitigation Measures and Commitment	Implementation			Location for Pre-Clearance Assessment
	Design	Construction	Operation	
Biodiversity – Connectivity, Fragmentation and Edge Effects				
A Flora Management Plan would be developed as part of the CEMP and would include revegetation protocols which would be established following construction to re-connect potential wildlife corridors where possible. Provision would be made to reconnect remnant patches of vegetation along creek lines and floodplains. In all areas locally occurring species would be used to replace habitat.		✓	✓	N/A
Stockpiling of material would avoid TECs		✓		N/A
Soil erosion and sedimentation controls in accordance with the Soil and Water Management Plan and the Erosion and Sediment Control Management Plan would be implemented prior to vegetation clearing work commencing in an area.		✓		N/A
Biodiversity - Offset Strategy				
A Biodiversity Offset Strategy is currently being developed in consultation with NSW OEH and the Commonwealth DSEWPaC in order to offset for clearing and associated impacts on threatened flora, ecological communities, fauna and populations or the resources for such species, associated with the Project. Following information obtained from pre-clearance surveys, the final offset package would be determined in discussion with DP&I, OEH and DSEWPaC.	✓	✓		Project area

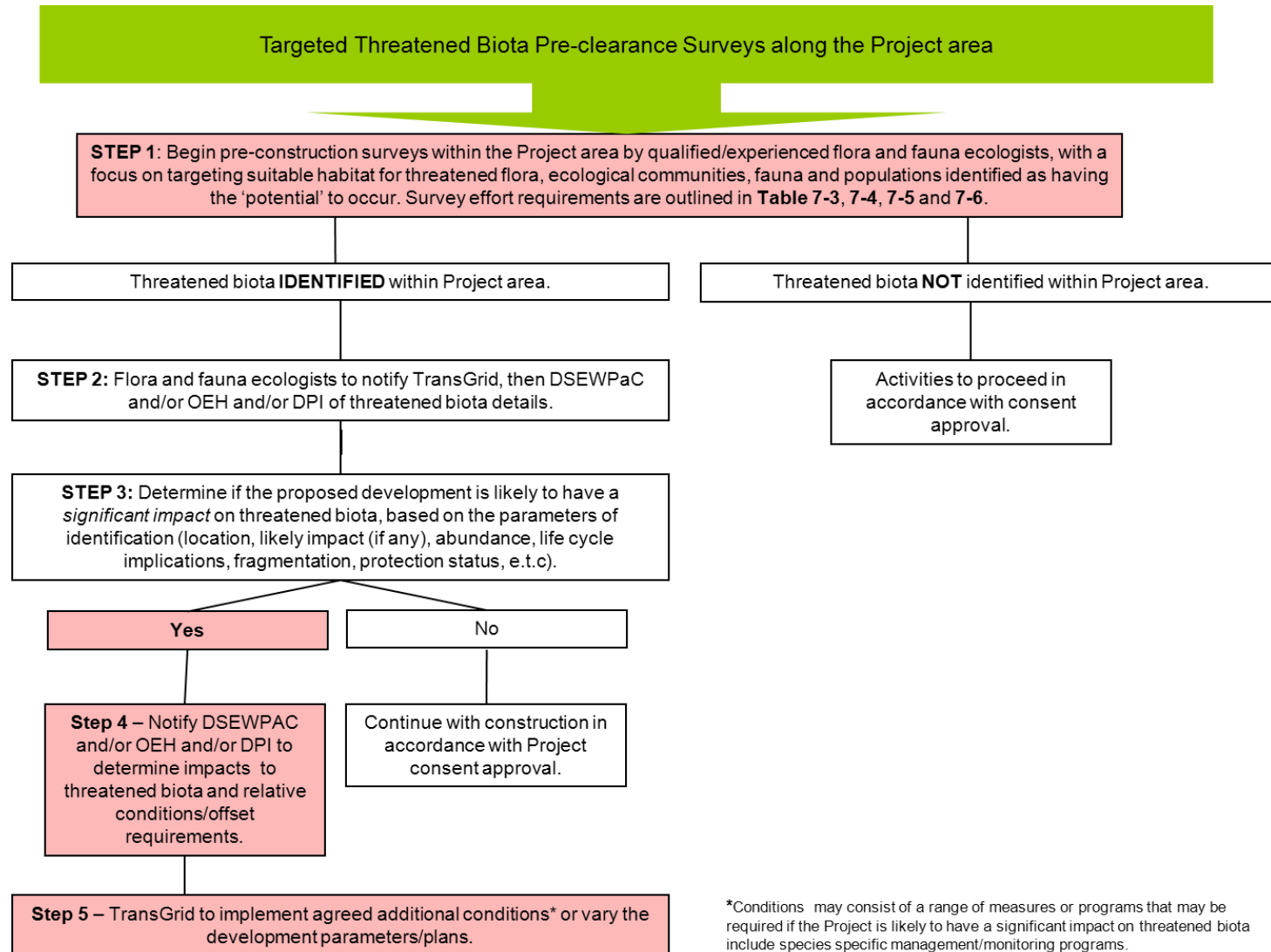
7.2.1 Threatened Biota Pre-Clearance Surveys¹

In tandem with the Biodiversity Statement of Commitments (**Table 7-1**), following Project approval pre-clearance surveys would be conducted in accordance with NSW and Commonwealth requirements. There are a broad range of NSW requirements contained within the OEH Threatened Species Profile database and Commonwealth requirements contained within the DSEWPaC Species Profile and Threats Database. **Chart 1** below outlines the survey requirements and associated trigger points which may influence the Project's development and offset arrangements.

In addition to **Chart 1**, **Table 7-3**, **7-4**, **7-5** and **7-6** below detail the survey specifics in terms of suitable habitat, timing and general methodology required to target a total of 91 threatened biota that have the potential to occur. These tables also provide survey specifics for the 23 more recently listed/recorded threatened biota, considered within the EA, but not surveyed for in 2009 and 2010.

¹ **Table 7-2** from the EA has been replaced with **Section 7.2.1**. This section outlines the requirements for pre-clearance surveys. These surveys are required to target threatened flora (**Table 7-3**) in areas of suitable habitat across the Project area, as well as threatened fauna, populations and ecological communities (listed in the EA) that have the potential to occur in areas not yet surveyed, as well as more recently listed/recorded threatened biota, considered within the EA, but not surveyed for in the 2009/2010 surveys.

Chart 1 Targeted pre-clearance surveys – all threatened biota



Threatened Flora

In addition to **Chart 1, Table 7-3** of this appendix outlines the specific requirements for pre-clearance surveys for 27 threatened flora species that have the potential to occur across the Project area.

Included in the 27 species listed in **Table 7-3** are ten threatened flora species (refer to the shaded rows in **Table 7-3**) that were newly listed/recorded from the area under the TSC Act and/or EPBC Act since the surveys were completed in 2009 and 2010. Whilst no surveys were completed for these species, they were considered in the EA and now form part of the pre-clearance flora survey targets. Where suitable habitat exists for the ten species, surveys would be conducted as part of the pre-clearance surveys along the Project area.

The surveys outlined in **Table 7-3** are to be undertaken in areas of suitable habitat, as defined by NSW and Commonwealth threatened flora profiles and to be focused around known flowering periods and plant specific requirements, as well as detailed information provided in NSW and Commonwealth threatened flora profiles. Survey effort to be guided by OEH/DSEWPaC threatened species profiles utilising NSW DEC Threatened Biodiversity survey and Assessment guidelines (2004) and random meander (Cropper 1993).

Surveys are also to be conducted by suitably qualified botanists and carried out “*in areas of preferred habitat for these species*” (DEC 2004), i.e. in all relevant vegetation formations as identified in **Appendix D3**.

Table 7-3 Threatened Flora Pre-clearance Survey Requirements

Scientific Name	Common Name	Listing Status		Optimum Pre-clearance Survey Timing Requirement	Required Survey Method
		TSC Act	EPBC Act		
<i>Acacia macnuttiana</i>	MacNutt's Wattle	V	V	July to September	Surveys should target dry forest or woodland and heath vegetation, with a focus on granite or metasediments and areas near streams.
<i>Bothriochloa biloba</i>	Lobed Blue-grass	De:listed in 2004	V	November - June	Surveys should target cleared eucalypts forests and relict grasslands, where the species prefers heavier-textured soils such as brown or black clay soils. This species is also commonly found in roadsides and travelling stock routes.
<i>Cadellia pentastylis</i>	Ooline	V	V	October to January <i>Note that flowering periods can vary significantly.</i>	Surveys should target dry rainforest, semi-evergreen vine thickets and sclerophyl ecological communities, including but not limited to White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland).
<i>Callistemon pungens</i>	-	N/A	V	October to February	Surveys should target rocky water courses with sandy granite creek beds and generally naturalised sites. Species known to occur within communities including but not limited to Box Gum Woodland and Upland Wetlands of the New England Tablelands and the Monaro Plateau.
<i>Callitris baileyi</i>	Bailey's Cypress Pine	E	N/A	Any	Surveys should target open grassy woodland near creeks, rocky, hilly or mountainous areas, usually near creeks, and on shallow and clay soils.
<i>Callitris oblonga</i>	Pygmy Cypress Pine	V	V	Any	Surveys should target sandy watercourses in shrubland and open woodland in granite country. The species can also be found in drier sites, including exposed ridges.
<i>Corchorus cunninghamii</i>	Native Jute	E	E	October-May	Surveys should target the ecotone between wet sclerophyll forest and dry to dry subtropical rainforest on sheltered slopes and gullies, and grassy open forest on exposed slopes and ridges.

Scientific Name	Common Name	Listing Status		Optimum Pre-clearance Survey Timing Requirement	Required Survey Method
		TSC Act	EPBC Act		
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	August-May, flowering usually peaks in November	Surveys should target dry rainforest vegetation, as well as other associated vegetation types including Forest Red Gum <i>Eucalyptus tereticornis</i> aligned open forest and woodland; Spotted Gum <i>Eucalyptus maculata</i> aligned open forest and woodland; and Bracelet Honeymyrtle <i>Melaleuca armillaris</i> scrub to open scrub.
<i>Desmodium acanthocladum</i>	Thorny Pea	V	V	Summer flowering	Surveys should target Wet Sclerophyll Forest (shrubby formation), dry rainforest and fringes of riverine subtropical rainforest on basalt-derived soils at low elevations.
<i>Dicanthium setosum</i>	Bluegrass	V	V	Summer flowering	Surveys should target moderately disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pastures with heavy basaltic black soils and stoney red-brown hard-setting loam with clay subsoil (TSSC 2008).
<i>Eucalyptus caleyi</i> subsp. <i>ovendenii</i>	Ovenden's Ironbark	V	V	July - September	Surveys should target grassy woodland habitat between 610 and 820m elevation. Associated species include <i>Eucalyptus melliodora</i> , <i>Eucalyptus dealbata</i> , <i>Eucalyptus albens</i> , <i>Eucalyptus melanophloia</i> and <i>Geijera parviflora</i> .
<i>Eucalyptus glaucina</i>	Slaty Red Gum	V	V	September - November	Surveys should target grassy woodland and dry eucalypt forest on deep, moderately fertile and well watered soils.
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	V	V	March - April	Surveys should focus on dry grassy woodland, on shallow and infertile soils.
<i>Eucalyptus rubida</i> subsp. <i>barbigerorum</i>	Blackbutt Candlebark	V	V	January – March	Surveys should target woodland on medium or high fertile soils.

Scientific Name	Common Name	Listing Status		Optimum Pre-clearance Survey Timing Requirement	Required Survey Method
		TSC Act	EPBC Act		
<i>Eucalyptus scoparia</i>	Wallangarra White Gum	E	V	November – December	Surveys should focus on open eucalypt forest and woodland on well-drained granite hilltops, slopes and rocky outcrops.
<i>Eucalyptus tetrapleura</i>	Square-fruited Ironbark	V	V	August - October	Surveys should focus on dry or moist eucalypt forest on moderately fertile soil in areas with poor drainage.
<i>Gossia fragrantissima</i>	Sweet Myrtle	E	E	September - February	Surveys should focus dry subtropical and riverine rainforest, with a focus on basalt-derived soils.
<i>Homoranthus lunatus</i>	Crescent-leaved Homoranthus	V	V	November - January.	Surveys should target sandy soil pockets in open and exposed situations on and around the margins of isolated granitic outcrops in heath and shrubby patches at altitudes of 700 to 950 m. Associated species include <i>Eucalyptus prava</i> , <i>Eucalyptus dealbata</i> and <i>Callitris endlicheri</i> . Associated vegetation types include; Grassy Woodland, Dry Sclerophyll Forest (shrubby sub formation) and Dry Sclerophyll Forest (shrub/grass sub formation).
<i>Lepidium peregrinum</i>	Wandering Pepper Cress	E	E	January - April	Surveys should focus on open riparian forest. Associated species include <i>Eucalyptus camaldensis</i> and <i>Casurina cunninghamiana</i> . The main known population in NSW occurs on sandy alluvium soil. Optimum survey method is random meander (Cropper 1993).
<i>Myrsine richmondensis</i>	Ripple-leaf Muttonwood	E	E	September - February	Surveys should target subtropical and dry rainforest and swamp forest on creek flats and slopes on basalt derived soils.

Scientific Name	Common Name	Listing Status		Optimum Pre-clearance Survey Timing Requirement	Required Survey Method
		TSC Act	EPBC Act		
<i>Persicaria elatior</i>	Tall Knotweed	V	V	Mostly occurs in summer. Germination and seeding triggered by rain. Flowers and set seeds within six months of germinating.	Surveys should target damp places, particularly beside streams and lakes, or in swamp forest.
<i>Rutidosia heterogama</i>	Heath Wrinklewort	V	V	November - May	Surveys should target heath on sandy soils and moist areas in open forest, and disturbed roadsides. Associated vegetation types include: Dry Sclerophyll Forest (shrubby sub formation) and grassland.
<i>Sophora fraseri</i>	Brush Sophora	V	V	September - November	Surveys should focus on moist locations, near rainforest.
<i>Syzygium hodgkinsoniae</i>	Red Lilly Pilly	V	V	January to May	Surveys should focus on riverine and subtropical rainforest on rich alluvial or basaltic soils.
<i>Thesium australe</i>	Austral Toadflax	V	V	September - February	Surveys should focus on grassland and grassy woodland, especially in damp locations where <i>Themeda australis</i> (Kangaroo Grass) occurs.
<i>Triplarina imbricata</i>	Creek Triplarina	E	E	November – December	Surveys should focus on watercourses in low open forest with Water Gum (<i>Tristanopsis laurina</i>).
<i>Tylophora woollsii</i>	Cryptic Forest Twiner	E	E	January - April	Surveys should focus on moist eucalypt forest, moist sites in dry eucalypt forests and rainforest margins.

Threatened Ecological Communities

In addition to **Chart 1, Table 7-4** of this appendix outlines the specific requirements for pre-clearance surveys required for each of the five threatened ecological communities (TECs) that have the potential to occur in areas not yet surveyed.

Typically, survey timing outlined in **Table 7-4** of this appendix is focused around known flowering periods of diagnostic species and/or detailed information provided in NSW and Commonwealth TEC profiles. During pre-clearance surveys a number of generic survey methods would be used to target TECs, including reviewing regional vegetation mapping such as; Keith, CMA, NPWS, State Forests or similar as a base before survey. Survey would then be guided NSW DEC Threatened Biodiversity survey and Assessment guidelines (2004) and random meander (Cropper 1993) methodologies.

Surveys would be conducted by suitably qualified botanists and carried out “in areas of preferred habitat for these species” (DEC 2004), i.e. in all relevant vegetation formations as identified in **Appendix D3**.

The threatened aquatic TEC assessed in **Appendix D1** (Darling River EEC) would not be the focus of targeted pre-clearance surveys. Instead, all works associated with vegetation clearance or proposed waterway crossing upgrades and new waterway installations in areas of mapped Darling River EEC would be undertaken in consultation with NSW DPI. The mitigation measures outlined in **Section 7.2.2** would ensure impacts to this TEC are minimised.

Table 7-4 Threatened Ecological Community Pre-clearance Survey Requirements

Scientific Name	Common Name	Listing Status		Optimum Pre-clearance Survey Timing Requirement	Required Pre-clearance Survey Method
		TSC Act / FM Act	EPBC Act		
<i>Aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River</i>	Darling River EEC	EEC (FM Act)	N/A	Year round	Spatial mapping indicating the distribution of this TEC has been provided by NSW DPI and is presented in the Biodiversity Figures (Figures 8a-8m, Threatened Ecological Communities of Appendix F of the EA). Hence as the TEC locations are known, there are no requirements for targeted pre-clearance surveys.
<i>Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion</i>	Sub-tropical Coastal Floodplain Forest	EEC	N/A	Survey should ideally correlate with flowering of dominant canopy trees. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include <i>Eucalyptus tereticornis</i> (April - October), <i>E. siderophloia</i> (June - September), and <i>Corymbia intermedia</i> (Jan - March) Experienced botanists should be able to identify this TEC year round.	Botanical surveys should focus on areas associated with clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. The community occurs below 50 m, but may occur on localised river flats up to 250 m elevation (DECC 2005).
<i>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast; Sydney Basin and South East Corner Bioregions</i>	Swamp sclerophyll forest on coastal floodplains	EEC	N/A	Survey should ideally correlate with flowering of dominant canopy trees. These vary regionally, however commonly include <i>Eucalyptus robusta</i> (May - July), and <i>Melaleuca quinquenervia</i> (March - July). Experienced botanists should be able to identify this TEC year round.	Surveys should target humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. The community generally occurs below 20 m (though sometimes up to 50 m) elevation, often on small floodplains or where the larger floodplains adjoin lithic substrates or coastal sand plains (DECC 2005).
<i>White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native</i>	Box Gum Woodland	EEC	CEEC	Survey should ideally correlate with flowering of dominant canopy trees and grassy understory species. Canopy species include: <i>Eucalyptus albens</i> (March - June), <i>E. melliodora</i> (September - February) and <i>E. blakelyi</i> (August - December)	Surveys should focus on fertile lower slopes where resources such as water and nutrients are abundant. Existing vegetation mapping available for the region should be sourced as a basis for vegetation surveys, e.g. Keith, CMA, NPWS, State Forests or similar.

Scientific Name	Common Name	Listing Status		Optimum Pre-clearance Survey Timing Requirement	Required Pre-clearance Survey Method
		TSC Act / FM Act	EPBC Act		
<i>Grassland</i>				The understorey in intact sites is characterised <i>Themeda australis</i> , <i>Poa sieberiana</i> , <i>Austrodanthonia</i> spp., <i>Austrostipa</i> spp., <i>Chrysocephalum apiculatum</i> , <i>Goodenia pinnatifida</i> , <i>Hypericum gramineum</i> , <i>Vittadinia muelleri</i> and <i>Wahlenbergia</i> spp.. These species typically flower in spring. Experienced botanists should be able to identify this TEC year round.	
<i>Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland</i>	Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	N/A	CEEC	Surveys should target flowering of dominant grasses. This would typically be in spring and early summer. Species composition within the community can change yearly and seasonally, therefore local reference communities <i>must</i> be used to guide optimum survey periods.	The occurrence of this community is strongly reliant on soil type. Surveys should target areas with fine textured, often cracking clays derived from either basalt or quaternary alluvium (DEWHA 2010). The community would typically be found on flat to low slopes within these areas, as per profile information (DEWHA 2010).

Threatened Fauna

Targeted pre-clearance flow chart (**Chart 1**) for threatened biota indicates the pre-clearance survey steps and trigger points for the remaining threatened fauna surveys.

In addition to **Chart 1**, **Table 7-5** of this appendix outlines the specific requirements for pre-clearance surveys for 58 threatened fauna species that have the potential to occur in areas that have not yet been surveyed (due to access restrictions etc.).

Included in the 58 species listed in **Table 7-5** are 13 threatened fauna species (refer to the shaded rows in **Table 7-5**) that were newly listed/recorded from the area under the TSC Act and/or EPBC Act since surveys were completed in 2009 and 2010. Whilst no surveys were completed for these species, they were considered in the EA. Where suitable habitat exists, the 13 species would be surveyed as part of the pre-clearance surveys along the Project area.

Typically, survey timing in **Table 7-5** is focused around periods of maximum activity for each species. Surveys should be conducted by suitably qualified fauna ecologists and carried out “*to target special habitats such as watercourses and rock outcrops in addition to the stratification process in areas of preferred habitat for these species*” (DEC 2004), i.e. in all relevant vegetation formations as identified in **Appendix D3**. Vegetation communities should be used to guide stratification units to determine sampling effort as listed in Table 5.4 of the Threatened Biodiversity Survey and Assessment, DEC (2004). As a consequence, surveys should target areas identified in NSW and Commonwealth threatened species profiles and other scientific literature to increase the likelihood of determining a species presence within the Project area.

Additional survey methods for reptiles include funnel trapping, based upon recent literature which identifies this method as appropriate for reptile surveys (Denny 2005; Garden et al. 2007; Thompson and Thompson 2007; Sass 2009). In addition to targeted reptile pre-clearance surveys (**Table 7-5**) the Border Thick-tailed Gecko (*Uvidicolus sphyrrurus*), vulnerable TSC Act and EPBC Act, would be targeted across the Project area, due to current DSEWPac concern regarding this species.

The five NSW and Commonwealth listed threatened fish species (*Maccullochella peelii peelii*, *Maccullochella ikei*, *Mogurnda adspersa*, *Tandanus tandanus* and *Ambassis agassizii*) assessed in **Appendix D1** and **D2** would not be the focus of targeted pre-clearance surveys. Instead, all works associated with proposed waterway crossing upgrades and new waterway installations would be designed and constructed in consultation with NSW DPI as well as the following:

- NSW DPI Policy and Guidelines for Fish Friendly Waterway Crossings;
- NSW DPI Guideline - *Why Do Fish Need to Cross the Road?* (2003);
- relevant TransGrid guidelines;
- industry guidelines developed by Landcom (2008) *Managing Urban Stormwater: Soils and Construction Volume 1*, and (DECC, 2008) *Volume 2*, (The Blue Book Volumes 1 and 2);
- landowner considerations; and
- design, geotechnical and topographical constraints.

Table 7-5 Threatened Fauna Pre-clearance Survey Requirements

Scientific Name	Common Name	Listing Status		Optimum Survey Period and Timing	Required/ Preferred Pre-clearance Survey Methodology	Other Species Specific Requirements
		TSC Act	EPBC Act			
<i>Aepyprymnus rufescens</i>	Rufous Bettong	V	N/A	September – November Optimum survey timing is after dusk.	Hair tubes, cage traps, scat collection, spotlighting and detailed habitat mapping.	Surveys should focus on dry coastal forests and target evidence of woven nests built in scrapes beneath dense cover.
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E	Highly variable movements. Has been known to extend into Northern NSW during autumn, contracting to core breeding sites in winter. Surveys in morning are preferable. Breeding season ranges, from May to March, mostly September to November	As outlined in DEWHA (2010a); area searches in suitable habitat, detection by call or sighting. Targeted searches of woodland patches with heavily flowering trees is useful, especially around water points. Call playback surveys immediately before and during the breeding season may also be useful.	Surveys should target Box-Ironbark eucalypt associations.
<i>Cacophis harriettae</i>	White-crowned Snake	V	N/A	October – March Optimum nocturnal survey period is 3-4 hours after sunset. Active searches should be conducted during the day.	Pitfall trapping, funnel trapping, active searches, spotlighting on foot and habitat mapping.	Surveys should focus on habitat in coastal and near coastal areas including sheltering sites under rocks and logs in damp locations.
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	V	N/A	Breeding habitat should be surveyed between March and August. Foraging habitat can be surveyed year round. Optimum survey timing is early morning and afternoon.	Walking transects/area searches and detailed habitat mapping. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Breeding habitat surveys should focus on large hollow bearing eucalypts. Foraging habitat surveys should focus on seeding <i>Casuarina</i> and <i>Allocasuarina</i> species.
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	N/A	September – November Nocturnal for trapping and spotlighting.	Arboreal and ground pitfall trapping, arboreal and ground Elliot trapping, nest box installation, spotlighting, predator scat analysis and hair tubes.	Surveys should target suitable flowering habitat, where pollen and nectar from banksias, eucalypts and understorey plants is available.
<i>Chalinolobus</i>	Large-eared	V	V	October – March	Anabat detection; as outlined in	Surveys should focus on any known roost sites, or

Scientific Name	Common Name	Listing Status		Optimum Survey Period and Timing	Required/ Preferred Pre-clearance Survey Methodology	Other Species Specific Requirements
		TSC Act	EPBC Act			
<i>dwyeri</i>	Pied Bat			Optimum survey timing is dusk till dawn.	DEWHA (2010d).	areas with caves, crevices in cliffs, old mine workings or disused mud nests of the Fairy Martin (<i>Hirundo ariel</i>). Surveys should focus on areas with low to mid-elevation, dry open forest and woodland close to habitat features. The species is often found in well-timbered areas containing gullies. Passive acoustic detection should be followed up with active acoustic detection to determine if the species is roosting or foraging in the Project area. Harp netting could also be used to determine abundance once presence is confirmed through Anabat detection.
<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	V	N/A	October – March Optimum survey timing is dusk till dawn.	Passive and active acoustic detection. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Surveys should target forests with naturally sparse understory layers. Vegetation communities may include dry open eucalypt forests, forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common. Passive acoustic detection should be confirmed by active acoustic detection to determine if the species is roosting or foraging in the Project area.
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V	N/A	Year round. Optimum survey timing is early morning and afternoon.	Walking transects/area searches and detailed habitat mapping. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Surveys should focus on eucalypt woodlands (including Box-Gum Woodland) and dry open forest. Surveys should target woodlands dominated by stringybarks or other rough-barked eucalypts, with an open grassy understorey, or in mallee and River Red Gum (<i>Eucalyptus camaldulensis</i>) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses. Surveys should focus on areas with fallen timber.
<i>Coeranoscincus reticulatus</i>	Three-toed Snake-tooth Skink	V	V	October – March (Dry periods should be avoided) Optimum nocturnal survey period is 3-4 hours after sunset. Active searches should be	As outlined in DEWHA (2010b).	Surveys should focus on areas of closed forest and open layered eucalypt forest, on loamy basaltic soils or silica sand dunes. Within these areas, surveys should target well-mulched, loose, friable rainforest soil in leaf litter, often immediately adjacent to fallen tree trunks. Vegetation communities include

Scientific Name	Common Name	Listing Status		Optimum Survey Period and Timing	Required/ Preferred Pre-clearance Survey Methodology	Other Species Specific Requirements
		TSC Act	EPBC Act			
				conducted during the day.		rainforest and those adjacent to rainforest.
<i>Cyclopsitta diophthalma coxeni</i>	Coxen's Fig-Parrot	CE	E	Year round. Surveys should be carried out when figs and other fruiting rainforest species within the Project area are in fruit. Optimum survey timing is early morning and afternoon.	As outlined in DEWHA (2010a).	Surveys should focus on lowland subtropical rainforests such as those found in the Big Scrub remnants around Lismore below 900m. Within these forests, alluvial areas where figs and other fleshy fruits are prevalent should be targeted. The species can be difficult to detect.
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	N/A	Year round Optimum survey timing is early morning and afternoon.	Walking transects/area searches and detailed habitat mapping.	Surveys should target eucalypt forests and woodlands, especially those containing rough barked species and mature smooth barked gums.
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	April - August	As outlined in DEWHA (2010c). Techniques include hair tubes, motion sensor cameras, and diurnal habitat searches. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	This species utilises a range of habitats, particularly those associated with gullies, rocky escarpments and outcrops.
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E	N/A	Year round Optimum survey timing is early morning and afternoon.	Walking transects/area searches and detailed habitat mapping.	Surveys should target shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as adjacent grasslands, paddocks and open savannah woodlands. Outside the breeding season (March - May), small family groups can be seen. The species is thought to be intolerant of disturbance, preferring easily accessible locations with minimal disturbance for nesting sites.
<i>Erythroriorchis</i>	Red	CE	N/A	Year round, although birds may	Characteristic nest searches, using	The species home range can be up to 200 square

Scientific Name	Common Name	Listing Status		Optimum Survey Period and Timing	Required/ Preferred Pre-clearance Survey Methodology	Other Species Specific Requirements
		TSC Act	EPBC Act			
<i>radiatus</i>	Goshawk			be more vocal in the breeding season (May to December), hence easier to find. Optimum survey timing is early morning and afternoon.	vantage points such as mountain tops to visually scan for birds, and call playback during the breeding season as outlined in DEWHA (2010a).	kilometres (sq.km) for males and 120 sq.km for females. Surveys should target open woodland and forest, especially areas that contain a mosaic of vegetation types, a large population of birds as a source of food, and permanent water. Surveys should also target riparian habitats along or near watercourses or wetlands, mixed subtropical rainforest, <i>Melaleuca</i> swamp forest and riparian <i>Eucalyptus</i> forest of coastal rivers.
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	N/A	October – March Optimum survey period is dusk till dawn.	Passive and active acoustic detection. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Surveys should target tall open forest, riparian rainforest, and cool temperate forest. Passive acoustic detection should be confirmed by active acoustic detection to determine if the species is roosting or foraging in the Project area.
<i>Geophaps scripta scripta</i>	Squatter Pigeon	E	V	Surveys should be undertaken in the breeding season; late winter to summer, but may be undertaken year round if necessary; birds are considered to be locally nomadic. Birds are relatively easy to approach.	Walking transects/area searches and detailed habitat mapping. Flushing surveys also work, as outlined in DEWHA (2010a).	Surveys should target grassy woodlands and plains, with a focus on any sandy areas close to water.
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	N/A	Survey timing to correlate with flowering eucalypts including White Box (March - June) and Yellow Box (September - February). Optimum survey timing is early morning and afternoon.	Walking transects/area searches and detailed habitat mapping. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Surveys should target flowering eucalypts in dry, open forests and woodlands.
<i>Grantiella picta</i>	Painted Honeyeater	V	N/A	Surveys should correlate with mistletoe flowering periods (<i>Amyema</i> spp.), typically late July-September. Optimum survey timing is early	Walking transects/area searches and detailed habitat mapping.	Surveys should target woodlands with an abundance of mistletoe.

Scientific Name	Common Name	Listing Status		Optimum Survey Period and Timing	Required/ Preferred Pre-clearance Survey Methodology	Other Species Specific Requirements
		TSC Act	EPBC Act			
				morning and afternoon.		
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V	N/A	October – March Optimum nocturnal survey period is 3-4 hours after sunset. Active searches should be conducted during the day.	Pitfall trapping, funnel trapping, active searches and spotlighting on foot and detailed habitat mapping. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Surveys should focus on rocky outcrops and adjacent sclerophyll forests and woodland, particularly sandstone ridge tops. Surveys during the hotter months should focus on diurnal resting sites in tree hollows, preferably large trees with multiple hollows.
<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	V	N/A	October – March Optimum nocturnal survey period is 3-4 hours after sunset. Active searches should be conducted during the day.	Pitfall trapping, funnel trapping, active searches and spotlighting on foot and detailed habitat mapping.	Surveys should focus on rainforest and rocky areas up to 950m altitude. Diurnal sheltering sites include loose bark, tree trunk, vines, hollow trunk limbs, rock crevices or under slabs.
<i>Kerivoula papuensis</i>	Golden-tipped Bat	V	N/A	October – March Optimum survey period is dusk till dawn.	Passive and active acoustic detection and habitat searches.	Surveys should target known roost sites such as abandoned nests of yellow throated scrubwrens and brown gerygones. Passive acoustic detection should be confirmed by active acoustic detection to determine if the species is roosting or foraging in the Project area.
<i>Lathamus discolor</i>	Swift Parrot	E	E	June – September. The species is migratory and only winters in NSW. Optimum survey timing is early morning and afternoon.	As outlined in DEWHA (2010a).	Surveys should target heavily flowering dry sclerophyll eucalypt forests and woodlands, in particular temperate Box-Ironbark woodlands.
<i>Litoria brevipalmata</i>	Green-thighed Frog	V	N/A	November – February Optimum survey timing is diurnal and nocturnal following heavy rainfall.	Day and night habitat searches and nocturnal call play back.	Surveys should target open coastal forest and grassland during the summer breeding season.
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V	N/A	Year round. Optimum survey timing is early morning and afternoon.	Walking transects/area searches and detailed habitat mapping.	Surveys should target open eucalypt woodland, acacia scrub and mallee, supporting structurally diverse habitats. Home ranges vary from 10 ha during the breeding season and 30ha in the non-breeding season.

Scientific Name	Common Name	Listing Status		Optimum Survey Period and Timing	Required/ Preferred Pre-clearance Survey Methodology	Other Species Specific Requirements
		TSC Act	EPBC Act			
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V	N/A	Year round, to correlate with flowering eucalypts. Optimum survey timing is early morning and afternoon.	Walking transects/area searches and detailed habitat mapping.	Surveys should target upper levels of flowering open eucalypt forests and woodlands dominated by Box and Ironbark eucalypts.
<i>Miniopterus australis</i>	Little Bentwing-bat	V	N/A	October - March Optimum survey period is dusk till dawn.	Passive and active acoustic detection. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Passive acoustic detection should be confirmed by active acoustic detection to determine if the species is roosting or foraging in the Project area.
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	N/A	October – March Optimum survey period is dusk till dawn.	Passive and active acoustic detection.	Passive acoustic detection should be confirmed by active acoustic detection to determine if the species is roosting or foraging in the Project area.
<i>Mixophyes balbus</i>	Stuttering Frog	E	V	November - February after heavy rain	As outlined in DEWHA (2010e).	Surveys should target the summer breeding season to maximise the chance of detection.
<i>Mixophyes iteratus</i>	Giant Barred Frog	E	E	October – February Optimum survey timing is diurnal and nocturnal.	As outlined in DEWHA (2010e).	Surveys should target the summer breeding season to maximise the chance of detection.
<i>Mormopterus beccarii</i>	Beccari's Freetail-bat	V	N/A	October – March Optimum survey period is dusk till dawn.	Passive and active acoustic detection. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Surveys should target most forests and woodlands, with a preference for water courses lined with River Red Gums. Passive acoustic detection should be confirmed by active acoustic detection to determine if the species is roosting or foraging in the Project area.
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	N/A	October – March Optimum survey period is dusk till dawn.	Passive and active acoustic detection. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Surveys should target open spaces in dry eucalypt forest and woodland. The species is more commonly detected in the upper slopes rather than riparian zones. Passive acoustic detection should be confirmed by active acoustic detection to determine if the species is roosting or foraging in the Project area.
<i>Myotis macropus</i>	Large-footed	V	N/A	March to September, outside	Passive and active acoustic	Surveys should target waterbodies, as this species will live in most habitat types as long as it is near

Scientific Name	Common Name	Listing Status		Optimum Survey Period and Timing	Required/ Preferred Pre-clearance Survey Methodology	Other Species Specific Requirements
		TSC Act	EPBC Act			
	Myotis			peak breeding season Optimum survey period is dusk till dawn.	detection. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	water (Churchill 2008). As the species is rarely found more than 100km inland except along major rivers, the major rivers in these areas should also be targeted (NSW DEC 2005). Passive acoustic detection should be confirmed by active acoustic detection to determine if the species is roosting or foraging in the Project area.
<i>Neophema pulchella</i>	Turquoise Parrot	V	N/A	Year round Optimum survey timing is early morning and afternoon.	Walking transects/area searches and detailed habitat mapping. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Surveys should target open, grassy woodlands with dead trees near permanent water. Nests can be found in vertical or near vertical hollows in living or dead trees.
<i>Ninox connivens</i>	Barking Owl	V	N/A	Year round. Nocturnal and diurnal. Call playback should not be undertaken in nesting season (mid-winter to spring).	Walking transects/area searches and call playback. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Surveys should target vegetation dominated by eucalypts, often red gum species. Roosting sites are often found in or under dense foliage in large trees including rainforest species of streamside gallery forests, River She-oak <i>Casuarina cunninghamiana</i> , other <i>Casuarina</i> and <i>Allocasuarina</i> species, eucalypts, <i>Angophora</i> or <i>Acacia</i> species. Roost sites are often near watercourses or wetlands. Surveys should also target woodlands, forests, partially cleared areas and near or in rural towns. .
<i>Ninox strenua</i>	Powerful Owl	V	N/A	Year round. Nocturnal and diurnal.	Walking transects/area searches and call playback. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Surveys should target open forests and woodlands with suitable breeding habitat. Powerful Owls nest in large hollows in old growth trees.
<i>Nyctimene robinsoni</i>	Eastern Tube-nosed Bat	V	N/A	October – March Optimum survey period is dusk till dawn.	Passive and active acoustic detection.	Surveys should target rainforest and wet sclerophyll forests. Passive acoustic detection should be confirmed by active acoustic detection to determine if the species is roosting or foraging in the Project area.
<i>Nyctophilus bifax</i>	Eastern	V	N/A	October – March	Passive and active acoustic	Surveys should target wetter areas in dry and wet

Scientific Name	Common Name	Listing Status		Optimum Survey Period and Timing	Required/ Preferred Pre-clearance Survey Methodology	Other Species Specific Requirements
		TSC Act	EPBC Act			
	Long-eared Bat			Optimum survey period is dusk till dawn.	detection. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	sclerophyll forests and woodlands. Passive acoustic detection should be confirmed by active acoustic detection to determine if the species is roosting or foraging in the Project area.
<i>Nyctophilus corbeni</i>	South-eastern Long-eared Bat (formerly Greater Long-eared Bat)	V	V	Warm nights between October – April Optimum survey period is dusk till dawn.	Passive and active acoustic detection should be used to establish presence of <i>Nyctophilus</i> species, then mist nets and/or harp nets should be used to capture species to allow identification to species level, as per DEWHA (2010d)	Surveys should target areas with a distinct canopy and a dense cluttered understory. Vegetation may include river red gum forest, semi-arid woodlands and savannahs; box/ironbark/open forests and Buloke woodland, particularly in larger remnants with a well-developed understorey Passive acoustic detection should be confirmed by active acoustic detection to determine if the species is roosting or foraging in the Project area.
<i>Pachycephala olivacea</i>	Olive Whistler	V	N/A	Year round. Optimum survey timing is early morning and afternoon.	Walking transects/area searches and detailed habitat mapping.	Surveys should target rainforest vegetation between 500 and 1500 m.
<i>Petaurus australis</i>	Yellow-bellied Glider	V	N/A	September – March. Nocturnal.	Search for scratchings and feeding scars, arboreal Elliot traps and arboreal hair tubes, spotlighting and call playback and stag watching and detailed habitat mapping. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Surveys should focus on tall eucalypt forests with high rainfall on nutrient rich soils. The species has a large home range (25-80 hectares) and disperses seasonally based on availability of food resources. The species roosts and nest in hollows.
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	N/A	September - March	Arboreal hair tubes, arboreal Elliot traps, spotlighting, stag watching and detailed habitat mapping. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Surveys should focus dry sclerophyll forest and woodland, particularly Box - Ironbark associations and River Red Gum forests. The species roosts and nest in hollows.
<i>Petroica boodang</i>	Scarlet	V	N/A	Year round.	Walking transects/area searches and	Surveys should target dry eucalypt forests and

Scientific Name	Common Name	Listing Status		Optimum Survey Period and Timing	Required/ Preferred Pre-clearance Survey Methodology	Other Species Specific Requirements
		TSC Act	EPBC Act			
	Robin			Optimum survey timing is early morning and afternoon.	detailed habitat mapping.	woodlands with abundant logs and fallen timber.
<i>Petroica phoenicea</i>	Flame Robin	V	N/A	Year round. Optimum survey timing is early morning and afternoon.	Walking transects/area searches and detailed habitat mapping.	Surveys should target forests and woodlands up to 1800m.
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V	N/A	September - March	Arboreal hair tubes, arboreal Elliott traps (large), spotlighting and detailed habitat mapping. Mapping of all hollow-bearing trees including location, size and location of hollows on each tree and species of tree.	Surveys should focus open, dry sclerophyll forest with a sparse ground cover of herbs, grasses and scleromorphic shrubs or leaf litter. The species roosts and nest in hollows.
<i>Phascolarctos cinereus</i>	Koala	V	N/A	Year round	Scat and scratching searches, call playback, spotlighting and habitat mapping.	Surveys should focus known feed trees including, <i>Eucalyptus tereticornis</i> , <i>E. punctata</i> , <i>E. camaldulensis</i> , <i>E. albens</i> , <i>E. populnea</i> and <i>E. robusta</i> .
<i>Philoria loveridgei</i>	Loveridge's Frog	E	N/A	October – February Optimum survey timing is diurnal and nocturnal.	Day and night habitat searches and nocturnal call play back.	Surveys should target habitat at or above 1000 m during the summer breeding season.
<i>Philoria pughi</i>	N/A	E	N/A	October – February Optimum survey timing is diurnal and nocturnal.	Day and night habitat searches and nocturnal call play back.	Surveys should target boggy ground at the headwaters of creeks during the summer breeding season.
<i>Philoria richmondensis</i>	N/A	E	N/A	October – February Optimum survey timing is diurnal and nocturnal.	Day and night habitat searches and nocturnal call play back.	Surveys should target boggy ground at the headwaters of creeks during the summer breeding season.
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V	N/A	Year round. Optimum survey timing is early morning and afternoon.	Walking transects/area searches and detailed habitat mapping.	Surveys should target open Box-Gum woodlands on the slopes and Box-Cypress pine and open Box Woodlands on alluvial soils.
<i>Pteropus</i>	Grey-headed	V	V	Presence would be dependent	As outlined in DEWHA (2010d);	Surveys should focus on known camps and foraging

Scientific Name	Common Name	Listing Status		Optimum Survey Period and Timing	Required/ Preferred Pre-clearance Survey Methodology	Other Species Specific Requirements
		TSC Act	EPBC Act			
<i>poliocephalus</i>	Flying-fox			on food resources. Regional experts should be contacted prior to surveys to determine local movements.	review literature and contact local experts to determine known camp locations, perform daytime field surveys for camps, survey vegetation communities and food plants and conduct night time surveys.	trees within a 50km of camps.
<i>Pyrholaemus saggitatus</i>	Speckled Warbler	V	N/A	Year round. Optimum survey timing is early morning and afternoon.	Walking transects/area searches and detailed habitat mapping.	Surveys should target eucalypt dominated communities that have a grassy understory, often on rocky ridges or in gullies.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	N/A	October – March Optimum survey period is dusk till dawn.	Passive and active acoustic detection. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Passive acoustic detection should be confirmed by active acoustic detection to determine if the species is roosting or foraging in the Project area.
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	N/A	October – March Optimum survey period is dusk till dawn.	Passive and active acoustic detection. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Surveys should target a range of habitat types, including woodland, moist and dry eucalypt forest and rainforest, and tall wet forest Passive acoustic detection should be confirmed by active acoustic detection to determine if the species is roosting or foraging in the Project area.
<i>Stagonopleura guttata</i>	Diamond Firetail	V	N/A	Year round. Optimum survey timing is early morning and afternoon.	Walking transects/area searches and detailed habitat mapping.	Surveys should target grassy eucalypt woodlands.
<i>Tyto novaehollandiae</i>	Masked Owl	V	N/A	Year round. Nocturnal and diurnal.	Walking transects/area searches and call playback. Mapping of all hollow-bearing trees including: location, size and location of hollows on each tree and species of tree.	Surveys should target forests and woodlands with suitable hollows for nesting and roosting.
<i>Tyto tenebricosa</i>	Sooty Owl	V	N/A	Year round. Nocturnal and diurnal.	Walking transects/area searches and call playback. Mapping of all hollow-bearing trees including: location, size and location	Surveys should target rainforest and wet sclerophyll forests with suitable tree hollows for nesting and roosting.

Scientific Name	Common Name	Listing Status		Optimum Survey Period and Timing	Required/ Preferred Pre-clearance Survey Methodology	Other Species Specific Requirements
		TSC Act	EPBC Act			
					of hollows on each tree and species of tree.	
<i>Uvidicolus sphyrurus</i>	Border Thick-tailed Gecko	V	V	November – February Nocturnal (peak activity period is 3-4 hours after sunset) and Diurnal	Funnel trapping, active searches (using a torch to check under rocks during the day, not rock turning) and spotlighting on foot. As outlined in DEWHA (2010b).	Surveys should focus on dry sclerophyll open forest and woodland associated with outcrops of granite, basalt, sandstone and metamorphic rocks, ranging from 500 to 1100 m elevation (DEC, 2005).
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	N/A	October – March Optimum survey period is dusk till dawn.	Passive and active acoustic detection.	Surveys should target habitat with close proximity to natural roosting habitat. Roosting habitat is sandstone overhangs, boulder piles and mines. Surveys should target dry open forest and woodland, near cliffs or rocky overhangs as well as cliff-lines in wet eucalypt forest and rainforest. Passive acoustic detection should be confirmed by active acoustic detection to determine if the species is roosting or foraging in the Project area.

Threatened Populations

Targeted pre-clearance flow chart (**Chart 1**) for threatened biota indicates the pre-clearance survey steps and trigger points for remaining threatened population surveys.

In addition to **Chart 1**, **Table 7-6** outlines the specific requirements for pre-clearance survey required for the threatened population listed under State and Commonwealth legislation as having the potential to occur within the Project area. This population was identified through more recent CMA searches as threatened in the Project area, and was considered within the EA, but not surveyed for in 2009 and 2010.

Survey timing outlined in **Table 7-6** is to be focused around periods of maximum activity for the amphibian and undertaken by suitably qualified ecologists. Surveys would target areas identified by DEC (2005) as per the threatened species profile for this population and other scientific literature to increase the likelihood of determining a species presence within the Project area, i.e. in all relevant vegetation formations as identified in **Appendix D3**.

Table 7-6 Threatened Population Pre-clearance Survey Requirements

Scientific Name	Common Name	Listing Status		Pre-clearance Survey Timing Requirement	Optimum structures required for identification	Required Survey Method
		TSC Act	EPBC Act			
<i>Adelotus brevis</i>	Tusked Frog population in the Nandewar and New England Tableland Bioregions	E	N/A	November – February Optimum survey timing is diurnal and nocturnal following heavy rainfall.	Day and night habitat searches and nocturnal call play back.	Surveys should target rainforests, wet forests and flooded grassland and pasture. The species is usually found near creeks, ditches and ponds. Vegetation communities should be used as stratification units to guide sampling effort as listed in Table 5.3 of <i>Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft</i> (DEC 2004). Section 5.3.4.i of DEC (2004) outlines appropriate survey techniques for amphibians.

7.2.2 Management Strategies

A Construction Environmental Management Plan (CEMP) as well as operational mitigation measures would be prepared for the construction and operational phases of the Project and would include measures for the minimisation or avoidance of the impacts on native flora and fauna as well as aquatic ecology. The management plans would include sub-plans for flora and fauna management of which the components are outlined below. The CEMP and operational mitigation measures would **be adaptive by nature and would** include ongoing monitoring requirements, performance indicators, timing and responsibilities.

Flora Management Plan

A flora management plan would be developed and included in the CEMP. Operational mitigation measures would be developed and implemented to mitigate, manage and/or offset impacts on flora as a result of habitat clearing associated with the Project. Mitigation measures would be implemented to avoid removal of threatened plants during clearing, to ensure the protection of local populations, to promote long-term connectivity of populations within the landscape and to control weed invasion where necessary. The following strategies and mitigation measures would be incorporated as part of the Flora Management Plan:

- management of clearing impacts on native vegetation;
- management of edge effects and connectivity;
- management of exotic flora;
- threatened flora specific monitoring programs;
- identification of offset plans and specific measures where unavoidable impacts, to any detected threatened flora; and
- sediment and erosion control.

Management of Vegetation Clearing

A number of mitigation measures have been proposed to minimise the impacts of clearing on native vegetation within and adjacent to the alignment and along access tracks. Measures have focused on minimising the impacts on existing vegetation communities, TECs and habitat for threatened flora, and are listed below:

- A suitably qualified ecologist (botanist or fauna specialist, as relevant) would undertake targeted pre-clearance surveys in areas of suitable habitat for all threatened biota (as per **Appendix D3** and **Section 7.2.1** of this Appendix) that have the potential to occur and that have also been assessed (**Appendix D1** and **D2**) as having the likelihood of being significantly, adversely or potentially impacted. Ecologists would also target threatened flora (**Table 7-3**) as well as additional, more recently listed/recorded, threatened fauna, populations and ecological communities, considered within the EA, but not surveyed for in the 2009/2010 surveys. Where practical, areas comprising threatened flora or TECs or suitable habitat for identified threatened biota would be avoided when locating suspension structures and access tracks.
- Threatened biota identified along the alignment and access tracks are to be avoided, protected, offset, or adaptively managed/monitored according to OEH, NSW DPI and/or DSEWPac advice, depending on biota level of protection.
- Following pre-clearance surveys vegetation would be cleared using the two-stage approach in areas identified as containing hollow bearing and habitat trees (**Diameter at breast height** (D.B.H) >400mm). Initially all non-habitat trees would be removed. All habitat trees would then be knocked (gently tapped with plant equipment). At least 48 hours after non habitat resource trees have been removed, hollow bearing and habitat trees can be carefully removed in the presence of a suitably qualified ecologist, fauna rescue personnel or certified wildlife handler. It is also suggested that the suitably qualified individual guides the plant equipment operators on 'how' and to 'what' side to fell habitat trees and appropriate relocation, so that habitat resources can be quickly and easily checked for fauna once the tree has been felled.
- Clearing of vegetation would follow best practice methods for fauna rescue developed by DEC (2004), including relocation of rescued fauna and the involvement of wildlife specialists in the process.
- A suitably qualified ecologist would undertake surveys to locate habitat resources (hollow bearing trees, stags, coarse woody debris and rocky outcrops) across the entire Project area to determine the habitat resources that may require protection or offset.

- Clearing boundaries would be clearly marked prior to construction using highly visible flagging tape or equivalent to prevent accidental clearing.
- **Vegetation** mapped as the critically endangered TEC Natural Grasslands on Basalt and Alluvial Plains and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (**Figure 8, Appendix F in Volume 2 of the EA**), listed under EPBC Act, would be avoided as far as possible during construction activities, with access tracks being restricted to specific points, and suspension structure placement to proceed across areas with minimal canopy cover. If ground cover removal is required, all top soils from the area would be stockpiled separately and re-established post construction.
- Any maintenance of the easement in areas mapped as the critically endangered TEC Natural Grasslands on Basalt and Alluvial Plains and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (Box Gum Woodland) (**Figure 8, Appendix F in Volume 2 of the EA**) using slashing or burning techniques would avoid doing so during peak flowering season from spring to summer. Disruptions to water flow in this community would be managed to prevent changes to hydrology.
- Targeted pre-clearance assessments would be undertaken to identify other locations of the TEC Natural Grasslands on Basalt and Alluvial Plains and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (Box Gum Woodland) listed under EPBC Act along Mole River for approximately 1km south-east from the proposed crossing point of the alignment along the river edges (**Figure 7d, Appendix F in Volume 2 of the EA and Section 7.2.1 of this Appendix**).
- Known locations *Dichanthium setosum* (**Figure 9a, Attachment D5**) within the Project area to be targeted and the species identified, counted and mapped as per **Section 7.2.1** timing and methodology (above). Avoidance, protection and/or offset of this species is a primary objective and adaptive management to be guided by OEH and DSEWPaC.
- Any clearing of Darling River EEC (including clearing on the banks of waterways, given that this TEC includes all abiotic and biotic aspects of the riparian area), would be cleared in consultation with NSW DPI to ensure impacts to this TEC are minimised. Waterway crossing construction and upgrades to existing crossings would be undertaken in accordance with relevant NSW DPI, DECC and TransGrid guidelines.
- Threatened biota located as a result of pre-clearance surveys, likely to be adversely affected by the Project, are to be avoided, protected, offset, or adaptively managed/monitored in consultation with DSEWPaC, OEH and DPI (depending on statutory requirements). Focus management controls would be designed by flora and fauna ecologists to be specific for each threatened flora, fauna, ecological community or population. Threatened biota that would be targeted as part of surveys undertaken during pre-clearance surveys, and for which focused management responses may be required, are detailed in **Appendix D3** and in **Section 7.2.1**.

Management of Edge Effects and Connectivity

Mitigation measures to minimise edge effects are typically associated with reducing impacts outside the construction zone, reducing the contrast of the edge and controlling impacts at their source within the alignment. To reduce the impacts associated with increased edge effects and fragmentation, the following mitigation measures have been recommended:

- in densely vegetated areas, temporary fences would be used during construction to minimise disturbance to adjacent vegetation.
- wherever possible, structures and access tracks would be located such that disturbance to water bodies would be minimised.
- where possible construction machinery would be parked in cleared or disturbed areas away from waterways, tree drip lines and other sensitive areas.
- stockpiling of material would avoid areas of native vegetation and be restricted to cleared or disturbed areas.

- construction activities would be managed to ensure waste material is disposed offsite as it is generated, and in a manner compliant with environmental legislation.
- soil erosion and sedimentation controls would be implemented prior to vegetation clearing work commencing, particularly in sections of the alignment around waterways and the community AECDR.

Management of Exotic Flora

Fourteen noxious weeds were recorded within the alignment during the Biodiversity Report surveys. In addition, 110 species of noxious weeds are known to occur within the Lismore, Richmond Valley, Inverell, Kyogle and Tenterfield LGA areas (DPI 2009). A full list of noxious weeds per LGA area is provided in **Appendix L** of **Appendix F** in Volume 2 of the EA.

Weed surveys, focusing on those noxious weeds declared as such under the *Noxious Weeds Act 1993* (NW Act), would be undertaken by a qualified ecologist/botanist prior to construction. The surveys would identify and record the noxious weeds occurring along both the alignment and associated access tracks.

A Weed Management Plan would be developed and implemented in those areas within the alignment and along access tracks. The Weed Management Plan would include:

- measures to reduce the spread of weeds via vehicles and machinery where risk identified;
- targeting areas of potential new weed outbreaks including soil stockpiles, roadsides and any other disturbed areas;
- targeted weed control programs in the areas surrounding the AECDR waterways requiring the upgrade and installation of water crossings;
- measures to mitigate noxious weeds should they be found;
- monitoring and control programs for weeds, including noxious listed weeds on sites and in the surrounding areas, during construction and operation of the line;
- where weed management is undertaken in the vegetation communities mapped as the critically endangered TECs Natural Grasslands on Basalt and Alluvial Plains, and also White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (**Figure 8 of Appendix F in Volume 2 of the EA**), the use of chemicals that kill grasses that form the understory of these TECs **would be avoided; and**
- a requirement that construction areas and access tracks be managed to minimise the invasion of noxious weeds through to, and during, the operational phase of the Project.

Management of Sediment and Erosion Control

Sedimentation and erosion impacts arising from construction activities have the potential to influence water quality and vegetation condition. Mitigation measures to minimise sedimentation and erosion **impacts** within the construction zone have been recommended in order to reduce these impacts.

These recommendations include:

- stockpiling of material would avoid areas of native vegetation and be restricted to cleared or disturbed areas.
- stockpiling of construction materials to be sediment fenced to avoid scouring and runoff into adjoining creek lines and vegetated areas.
- all access track works associated with the currently proposed 37 waterway crossing upgrades and 27 new waterway installations to be designed and constructed in accordance with the NSW DPI *Policy and Guidelines for Fish Friendly Waterway Crossings* and *Why Do Fish Need to Cross the Road?* (2003), and relevant TransGrid specifications.
- sediment and erosion control measures would be implemented prior to vegetation and soil disturbance to manage impacts to sites during construction and operation of the Project. All works

would be carried out in accordance with industry guidelines *Managing Urban Stormwater: Soils and Construction Volume 1* developed by Landcom (2008), and Volume 2, *The Blue Book Volumes 1 and 2* (DECC, 2008). Where necessary practices would include:

- access would be restricted in sensitive areas of the alignment (e.g. TECs and threatened species habitat) during the construction phase through the installation of fencing and signage surrounding such areas.
- endemic seeds and plants to be used for all revegetation and erosion control works.
- mulching or revegetation of cleared areas to be undertaken as soon as possible to permanently stabilise the soil and reduce erosion and run-off.
- construction of diversion banks and channels to intercept and divert water away from disturbed ground.
- appropriate physical stabilisation techniques to be employed, including terracing and the use of geotextiles.
- limiting the removal of ground covering vegetation for construction of the Project.

Fauna Management Plan

A Fauna Management Plan would be developed as part of the CEMP to **minimise impacts to resident native fauna, including threatened species.** The strategies and measures listed below would be **addressed** as part of the Fauna Management Plan:

- details of the two stage clearing process for hollow bearing trees;
- relocation of stags and coarse woody debris;
- translocation and/or rescue of fauna affected by construction works;
- rehabilitation and revegetation to re-establish fauna passageways (see below);
- invasive species management;
 - investigation of possible measures to reduce the likelihood of bird and bat strike such as coloured PVC spiral inserts onto the ground wire of the transmission line at select locations, for example: the known camp or roost sites of threatened bat species, such as around the Mallanganee Grey-headed Flying-fox camp (**Figure 1, Appendix D5**); and
 - near wetland areas (such as **Figure 7I, Appendix F** in Volume 2 of the EA, refer to vegetation community: *Coastal Floodplain Sedgelands Rushlands and Forblands*).
- Targeted pre-clearance assessments to be undertaken during optimal breeding season periods for *Hesperiidae*, *Papilionidae* and *Lycaenidae* butterflies known to occur in far north NSW, to identify potential hill-topping sites (NSW Key Threatening Process) along hilltops and ridges designated for clearing. If sites are found, appropriate management measures to avoid and/or minimise impacts would be implemented. These measures would be included in the fauna management plan.
- If injured microbats are found during vegetation clearing procedures, only a vaccinated ecologist with the **Australian Bat Lyssavirus** inoculation should handle these species.
- The rehabilitation plan developed as part of the Fauna Management Plan would include provisions to reconnect remnant patches of vegetation along creek lines and floodplains. In all areas, locally occurring species would be used.
- Wherever remnant vegetation patches become disconnected in the western study area, revegetation protocols would be established to re-connect, where possible, potential wildlife corridors.
- Any rescued fauna would be transferred to appropriate areas within adjacent habitat or placed in the care of WIRES or other certified wildlife rescue organisations within the local area, if injured.
- It is recommended that regular checks be undertaken for cane toads on construction vehicles, machinery and stockpiled materials. Any individuals found would be humanely euthanized by a trained individual to avoid potential misidentification and euthanising of native frogs.
- It is recommended that wash down protocols be developed and applied to prevent the spread of amphibian chytrid disease *chytridiomycosis*. Protocols would be consistent with OEH guidelines

(DECC, 2008b). Wash down would occur whenever vehicles enter or leave a new drainage area. Wash down protocols would also stop further spread of the alien freshwater fish, Eastern Gambusia (*Gambusia holbrooki*) by removing any individuals or eggs that may be collected in the engines of construction or 4wd drive vehicles crossing waterways.

All waterway and wetland crossings (refer to category 3 access tracks on **Figure 7, Appendix F** in Volume 2 of the EA) would be constructed in accordance with TransGrid specifications which are strongly aligned with NSW Department of Primary Infrastructure & Industries Policy and Guidelines for *Fish Friendly Waterway Crossings* (2004) and *Why Do Fish Need to Cross the Road?*

- Fire regime requirements of threatened fauna species would be considered should asset management burning be proposed.
- Details of threatened biota specific monitoring programs to be undertaken.

Management of Nesting Resources

The study area contains nesting habitat for a number of threatened fauna species. This habitat includes tree hollows, stags and hollow logs. Consequently, a number of mitigation measures would need to be addressed to manage nesting resources:

- where possible, identified habitat resources such as hollow bearing trees, stags, coarse woody debris and rocky outcrops, identified through pre-clearance surveys, would be re-located into adjacent suitable habitat outside the alignment or access tracks, prior to clearing.
- nest boxes and/or artificial bat roosts would be installed using an agreed strategy (determined through consultation with DSEWPac and OEH) to replace removed hollows. Different type, style and sizes of nest boxes are required for different species (Franks & Franks, 2003). Further nest box specifications and guidance would be obtained from the following sources:
 - Franks A and S (2006), Nest-boxes for Wildlife: A Practical Guide, Bloomings Books, Melbourne;
 - Smith G C, Lees N, Ross Y (1998), Sustainable Forest Management Technical Report. Habitat Trees and Hollow-dependent Fauna, Department of Natural resources, Queensland;
 - Gibbons P and Lindenmayer D (2002), Tree Hollows and Nature Conservation in Australia, CSIRO, Australia;
 - Gibbons P and Lindenmayer D (1997), Conserving Hollow-dependent Fauna in Timber-production Forests, NSW National Parks and Wildlife Service, Australia; and
 - Franks A and S (2008), Hollow Log Homes, <http://www.hollowloghomes.com.au/nHome.htm>
- Clearing of habitat trees would be undertaken outside of the breeding/nesting months of relevant species wherever possible.
- Habitat features such as hollow bearing trees, stags, coarse woody debris and rock outcrops to be re-located into areas where vegetation is retained to provide fauna corridors. Specific guidelines would be developed for the Project to guide contractors and prevent heaping of debris in adjacent woodland. In areas where embedded or rock outcrops occur, care would be taken to avoid their removal. Where unavoidable, a suitably qualified ecologist or certified wildlife handler would be present for fauna rescue and translocation of reptiles and amphibians.

Management of Connectivity

Vegetation corridors facilitate the safe movement of fauna between patches of habitat and reduce the risk of local extinction of mobile populations (Bolger *et al*, 1997). Transmission line easements can be a source of habitat fragmentation, potentially limiting the movement of fauna (Clarke *et al.*, 2006; Goosen & Marsh, 1997). Management measures to maintain or improve the connectivity of vegetation across the proposed alignment include:

- Where possible retain vegetated bands between continuous vegetation patches within the alignment. Habitat features such as hollow logs would be placed in these bands.

- Native understorey would be left intact wherever possible to allow connectivity and fauna passage.
- Where possible additional planting would be undertaken to promote understorey and mid storey growth in areas where the transmission line creates a sharp contrasting edge. These areas are likely to be where the transmission line clears forested vegetation with a dense mid-storey.
- Significant distances between trees can create barriers to the movement of Squirrel Gliders. The ability of this animal to freely move about the canopy is hindered by gaps in the vegetation greater than the average 'glide distance'. It is considered that gaps greater than 75m can pose a significant barrier to the movement of Squirrel Gliders (Van der Ree *et al.* 2003). Mitigation measures would therefore apply in situations where vegetation clearance would create significant gaps. Pre-clearance assessments in squirrel habitat (mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range (DEC 2005)) would identify areas where significant treeless gaps would be created. Pre-clearance assessments would focus on areas mapped as White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (Box Gum Woodland) (refer to **Figure 8, Appendix F** in Volume 2 of the EA), River Red Gum Riverine Woodland and Tumble Down Red Gum/ Blakely's Red Gum/Pine Shrubby Open Forest (refer to **Figure 7, Appendix F** in Volume 2 of the EA). A detailed glider pole placement plan would be prepared as part of the CEMP to identify suitable locations where poles would provide connectivity while also complying with adequate safety clearance requirements of the transmission line. **Table 7-7** gives an example of possible heights and distances for placing gliding poles, taking into account landing height.

Table 7-7 Glider Pole Heights and Average Glide Distance from Poles

Pole Height (m)	Average glide distance (m)
25	40
20	32
15	22
10	12

Management of Invasive Species

Fragmentation of natural ecosystems can facilitate the spread of feral species such as foxes, cats, dogs, rabbits and pigs. Establishment of the Project and associated access tracks has the potential to increase the movement of feral species within the area. The associated impacts of feral animals on native flora and fauna could potentially include increased predation and grazing. Foxes, rabbits, cats and dogs are all known to use the alignment and study area.

Given the existing level of disturbance within the alignment and study area it is unlikely that the Project would significantly increase the impacts of feral species. No feral animal control is currently recommended. If there is evidence of increased predation or grazing within the alignment, TransGrid would implement an appropriate control program in consultation with relevant experts.

7.3 Biodiversity Offset

7.3.1 Overview

TransGrid recognises that the clearing of vegetation for the development of the Project represents long term removal of vegetation. In light of the DECC (2005) guidelines for Part 3A biodiversity assessments (i.e. to maintain and improve biodiversity values resulting in no net impact on threatened species or native vegetation), as well as the Commonwealth Draft Policy Statement: use of environmental offsets under the *Environment Protection and Biodiversity Conservation Act 1999*

(DEWHA 2007) and the DoP and Supplementary DGR's, an offset strategy would be designed and developed that is appropriate for the proposed development.

The potential impacts of the Project in relation to vegetation clearance have been identified and are provided in **Table 6-7**. This table includes data on each type of community to be impacted, community condition, and the potential scale of impact, namely the amount of vegetation to be cleared, and any corresponding TECs that would be impacted. Based on this, any offset arrangement **currently being negotiated with NSW DP&I, OEH and DSEWPaC** would need to respond to the following potential Project impacts:

- Vegetation losses of between 312 ha and 434 ha of native vegetation.
- TEC losses of up to 91 ha, (or a maximum total of 143 ha including the unsurveyed wooded vegetation) including principal TEC losses in the following communities:
 - Natural Grasslands on Basalt and Alluvial Plains in Northern NSW and Southern Queensland (EPBC Act);
 - White Box, Yellow Box, Blakely's Red Gum Grassy Woodland (EPBC and TSC Act);
 - Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion (TSC Act); and
 - Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast; Sydney Basin and South East Corner Bioregions (TSC Act).
- **Any unavoidable impacts for any threatened biota and habitat resources identified/located during pre-clearance surveys.**
- Other potential impacts on biodiversity values such as threatened flora, fauna and populations as discussed in **Section 6, Biodiversity Report, Appendix F, Volume 2 of the EA.**

While this biodiversity assessment report has quantified potential impacts to a large degree, it has also identified that constraints to impact assessment, including access restrictions to some areas, have limited the degree to which all potential impacts could be quantified. Consequently, there is an area of between 9 and 52 ha of wooded vegetation that remains unmapped, but that would potentially be impacted by the Project.

TransGrid is committed to reaching an agreement **with DP&I, OEH and DSEWPaC** on an initiative that would meet the requirements, principles and guidelines for offsetting established by those bodies. To this end, detailed discussions have commenced with **OEH** in relation to confirming the scale, geographic location, and biodiversity assets that would need to be reflected in an agreed offset outcome.

NSW State Requirements for Offsetting

DECC (2005) and DECCW (2010) guidelines and principles clearly state that where measures to avoid and mitigate impacts on threatened species are not possible, then an offset strategy needs to be considered. The principles according to the DECCW *Principles for the use of biodiversity offsets in NSW* (DECCW 2010) for the use of biodiversity offsets in NSW include:

1. Impacts must be avoided first by using prevention and mitigation measures.
2. All regulatory requirements must be met.
3. Offsets must never reward ongoing poor performance.
4. Offsets would complement other government programs.
5. Offsets must be underpinned by sound ecological principles.
6. Offsets would aim to result in a net improvement in biodiversity over time.
7. Offsets must be enduring 'they must offset the impact of the development for the period that the impact occurs'.

8. Offsets would be agreed prior to the impact occurring.
9. Offsets must be quantifiable 'the impact and benefits must be reliably estimated'.
10. Offsets must be targeted.
11. Offsets must be located appropriately.
12. Offsets must be supplementary.
13. Offsets and their actions must be enforceable through development consent conditions, licence conditions, conservation agreements or a contract.

These offset requirements are used to describe the 'compensatory' offset type where a representative habitat offset is prescribed and maintained by land managers such as OEH or Landcare etc.

Commonwealth Requirements for Offsetting

The Commonwealth has identified eight principles for the use of environmental offsets under the EPBC Act (DEWR, 2007), these are:

1. Environmental offsets would be targeted to the matter protected by the EPBC Act that is being impacted.
2. A flexible approach would be taken to the design and use of environmental offsets to achieve long-term and certain conservation outcomes which are cost effective for proponents.
3. Environmental offsets would deliver a real conservation outcome.
4. Environmental offsets would be developed as a package of actions – which may include both direct and indirect offsets.
5. Environmental offsets would, as a minimum, be commensurate with the magnitude of the impacts of the development and ideally deliver outcomes that are 'like for like'.
6. Environmental offsets would be located within the same general area as the development activity.
7. Environmental offsets would be delivered in a timely manner and be long lasting.
8. Environmental offsets would be enforceable, monitored and audited.

Proposed Biodiversity Offset

The offset package would be developed in accordance with the principles contained in the DECC guidelines (2005) and DECCW guidelines (2010). The offset package would be developed in consultation with the OEH and DSEWPac and preliminary consultations have commenced.

The offset package would need to compensate for the likely vegetation and habitat losses described in **Table 6-7** in terms of the diversity of communities potentially impacted, the scale of that impact, and the condition of the impacted communities. **Section 6** provides detail in relation to the potential impacts of the Project with respect to each of these parameters.

Further consultation would occur with OEH and DSEWPac in regards to the offset strategy.

The Maintain or Improve Test

The DECC (2005) guidelines identify matters that are relevant to the assessment of impacts to threatened species, populations or ecological communities or their habitats, arising from a Project assessed under Part 3A. A key principle in the DECC guidelines states that Projects maintain or improve biodiversity values (i.e. there would be no net impact on threatened species, populations, ecological communities or native vegetation). Where impacts cannot be avoided or mitigated then it is necessary to identify a suitable offset in order to maintain or improve biodiversity values.

The Project's response in relation to avoidance and mitigation of potential impacts has been detailed in **Section 7.1** and **7.2**.

Any agreed biodiversity offset package would be used as a means of ensuring that the Project maintains and improves biodiversity in the locality. The offset would protect and conserve, in perpetuity, threatened species habitats, vegetation types including TECs and landscape features similar or equivalent to those found within the Project.

The offset package would be:

- strategic in nature, adding value to OEH and DSEWPaC conservation priorities for the region;
- focused at a landscape level, to provide valuable outcomes to regional biodiversity connectivity;
- representative of the range of vegetation communities impacted, and the scale of those potential impacts;
- of a scale and configuration, that would
 - be sustainable in terms of the maintenance of flora and fauna populations;
 - minimise edge effects; and
 - adequately offset the area of native vegetation that would potentially be impacted by the Project; and
- managed by OEH, under the umbrella of the NSW NPWS, so as to improve its condition and biodiversity values, where this is possible.

On the basis of the above assessment, the proposed offset package is consistent with the OEH and DSEWPaC guidelines for offsets and would meet the key criterion for like-for-like trade-offs of biodiversity values. Agreement to an offset strategy of the above type would compensate for the loss of native vegetation and threatened species habitats associated with the Project and maintain biodiversity values in the study area.

7.4 Key Thresholds

As required by the *Draft Guidelines for Threatened Species Assessment for Part 3A applications* (DEC 2005), the following assessment of key thresholds must be addressed by this biodiversity assessment. Each key threshold and the location in the report in which each one is addressed is provided in **Table 7-4** below.

Table Error! No text of specified style in document.-2 Key Thresholds Assessments

Key Thresholds	Location
1. Whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts would maintain or improve biodiversity values.	Section 7
2. Whether or not, the proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community.	Section 6, Appendix I and J
3. Whether or not the proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction.	Section 6, Appendix I and J
4. Whether or not the proposal would adversely affect critical habitat.	Section 5.2.11 and Appendix I

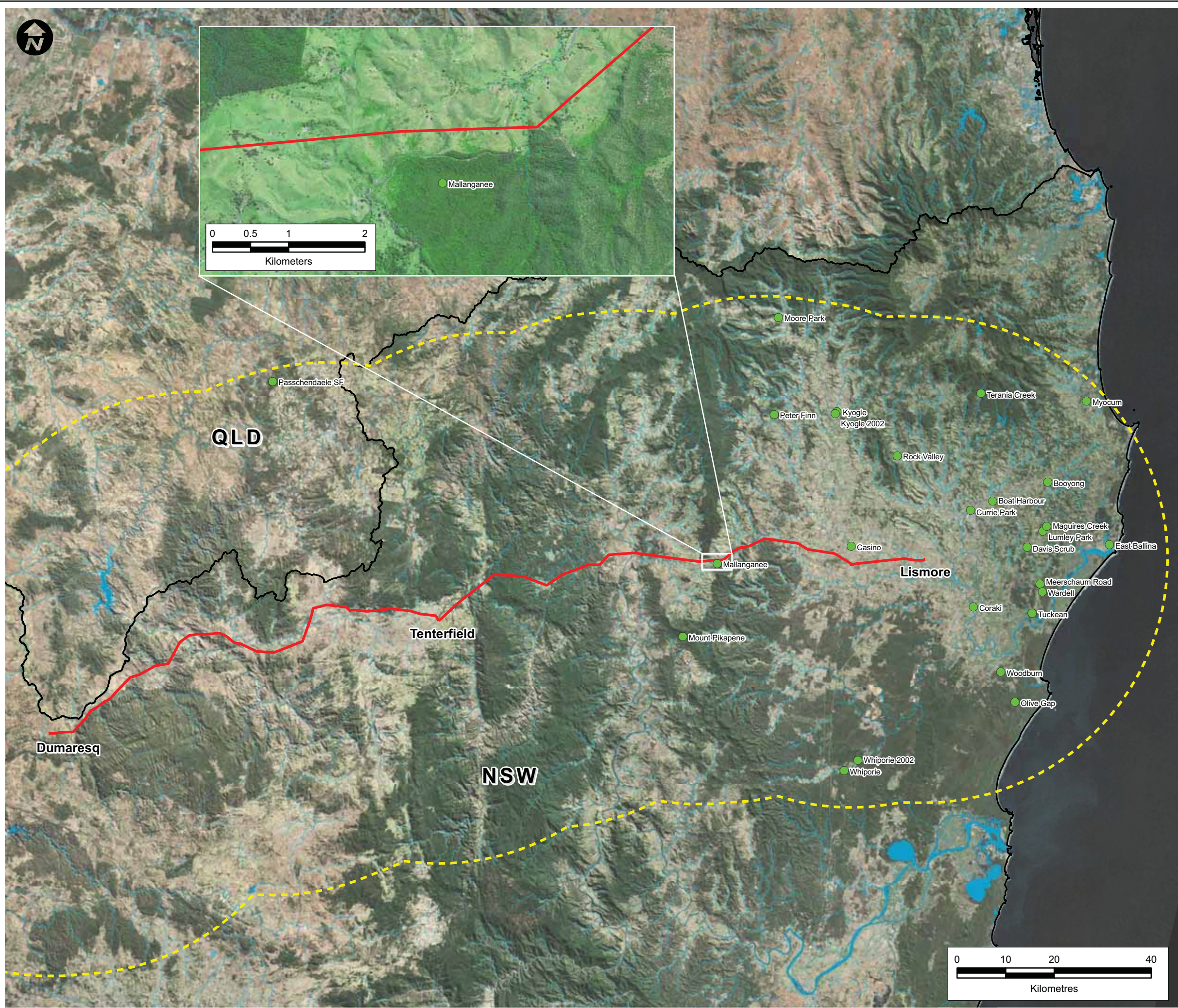
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- DECC 2005, Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion – Profile <http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10944>

- NSW DPI, 2005, Profile: Darling River EEC
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Appendix D5 – Revised Biodiversity Figures

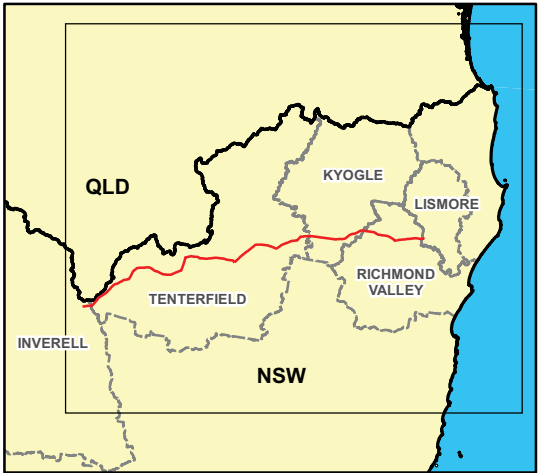
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Datum: GDA94, Projection: UTM, Grid: MGA Zone 56

LEGEND:

- Grey Headed Flying Fox Camps*
- Proposed 330kV Transmission Line^
- - - 50km Buffer around Transmission Line
- Waterways



Symbols and lines used in this figure are indicative and are not intended to reflect actual size of represented features. Symbols and lines have been enhanced to aid visibility.

Source: Bing Maps © 2010 Microsoft Corporation and its data suppliers.
^ TransGrid [2009]
* Marcus Baseler, DSEWPac (supplied 20/12/2011)
Note: **DRAFT VERSION ONLY** (unvalidated data)

Drawn: SB	Approved: JM	Date: 18/01/2012

Job No.: 43177662	File No.: 43177662.154.mxd

Client	TransGrid

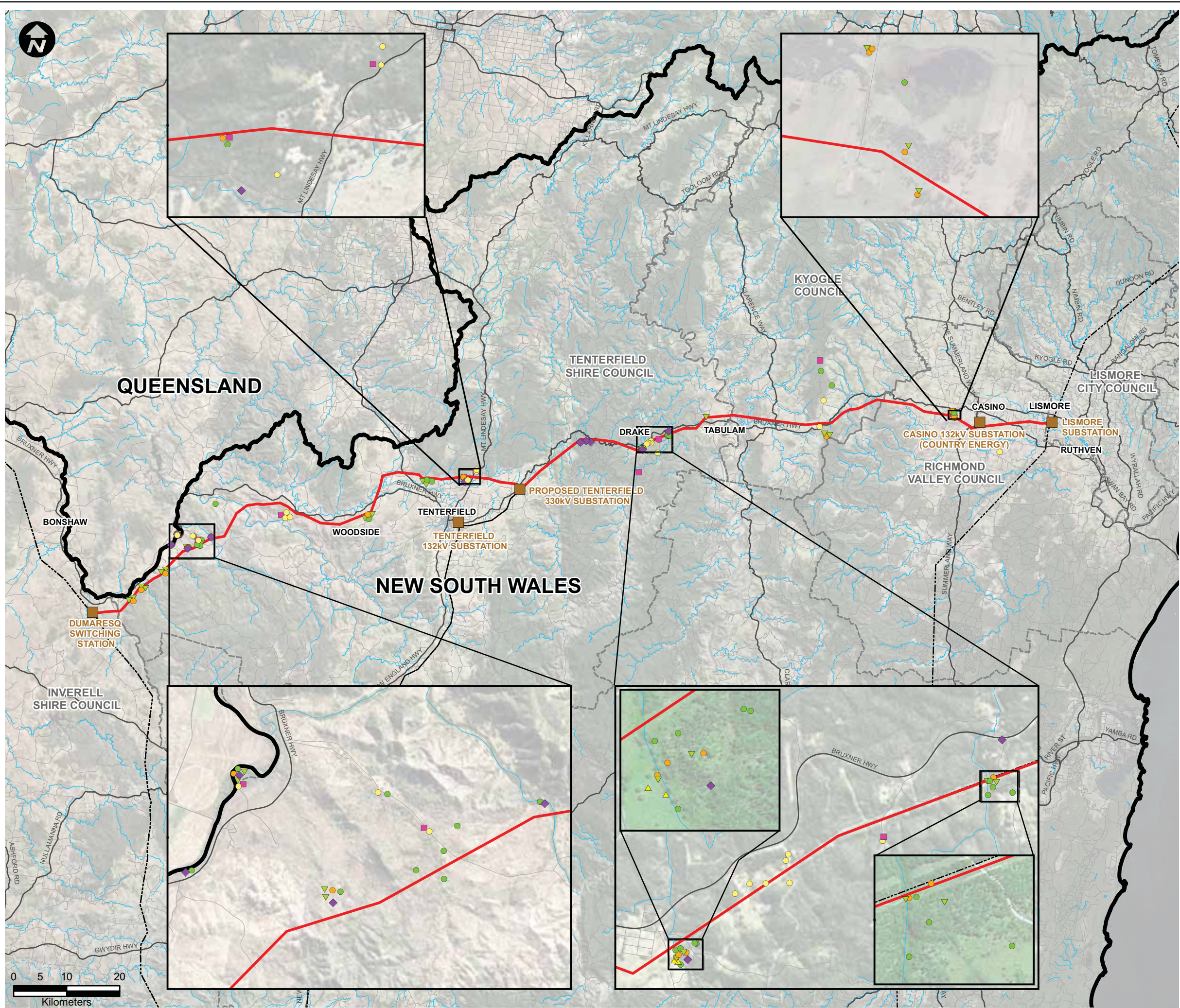
Project	FAR NORTH NSW (DUMARESQ - LISMORE 330kV TRANSMISSION LINE) PROJECT

Title	GREY HEADED FLYING FOX CAMPS

Figure:	1

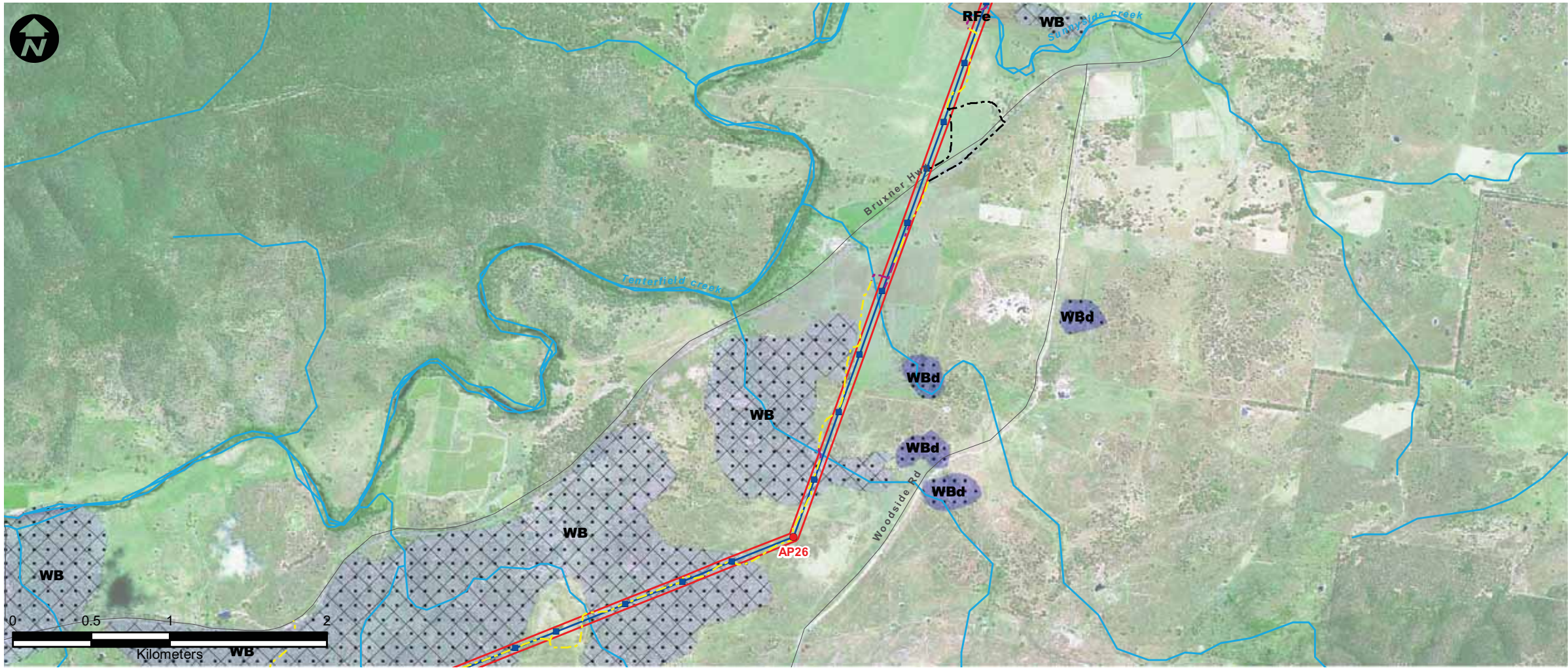
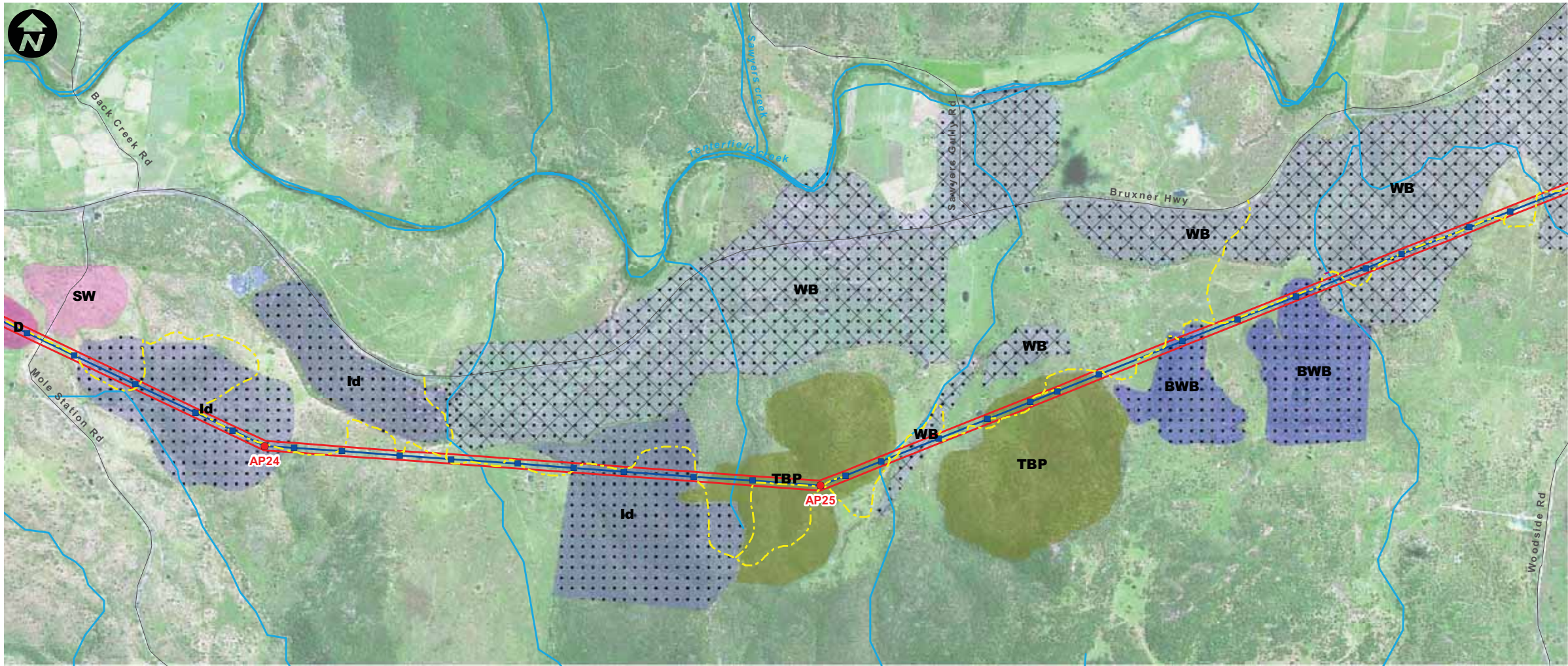


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LEGEND:

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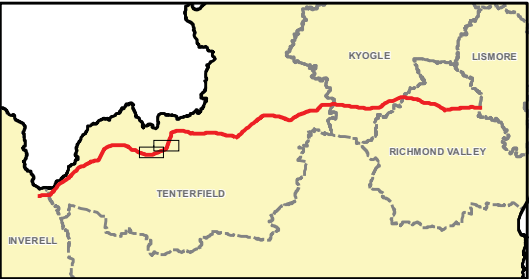
Datum: GDA94, Projection: UTM, Grid: MGA Zone 56

LEGEND:

- Existing 96L 132kV Structures Locations[^]
- Existing Transmission Lines[^]
- Proposed 330kV Angle Position (Indicative)[^]
- Proposed 330kV Structure Locations (Indicative)[^]
- Proposed 330kV Alignment
- Proposed 330kV Easement
- Substation/Switching Station
- Roads and Firetrails
- Waterways
- Access Tracks
 - Category 1
 - Category 2
 - Category 3

Vegetation Formations and Communities

- TSC Act Listed Vegetation Community
- EPBC Act Listed Vegetation Community
- Dry Sclerophyll Forest (shrubby)**
 - Tumbledown Red Gum/Blakely's Red Gum/Pine Shrubby Open Forest, (TBP)
- Forested Wetland**
 - Willow/Poplar/Tree of Heaven Riparian Forest, Exotic, (RFe)
- Grassy Woodland**
 - Inland Grey Box Tall Grassy Woodland, Disturbed, (Id)
 - White Box Grassy Woodland, Disturbed, (WBd)
 - White Box Grassy Woodland, (WB)
- Semi Arid Woodland**
 - Dirty Gum Tall Woodland, (D)
 - Silver-leaved Ironbark/White Cypress Pine Woodland, (SW)
- Aquatic Ecological Community**
 - Aquatic Ecological Community of the Lowland Catchment of the Darling River (FM Act)



Symbols and lines used in this figure are indicative and are not intended to reflect actual size of represented features. Symbols and lines have been enhanced to aid visibility.

Source: Aerial Imagery from TransGrid 2009
[^] TransGrid 2010

Drawn: AO/SB | Approved: JM | Date: 02/05/2012

Job No.: 43177662 | File No.: 43177662.085e.mxd

Client: TransGrid

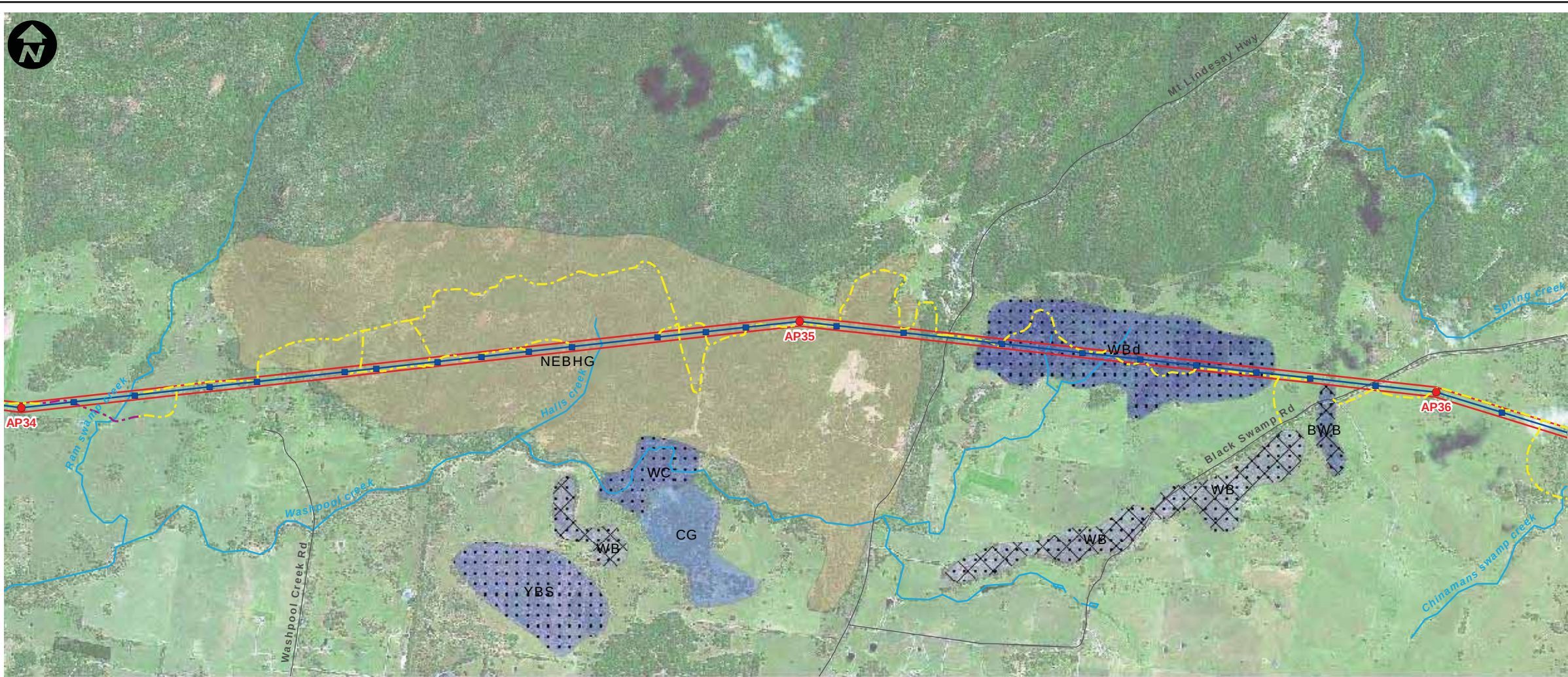
Project: FAR NORTH NSW
(DUMARESQ - LISMORE
330kV TRANSMISSION LINE)
PROJECT

Title: NATIVE VEGETATION COMMUNITIES

Figure: 7e

URS

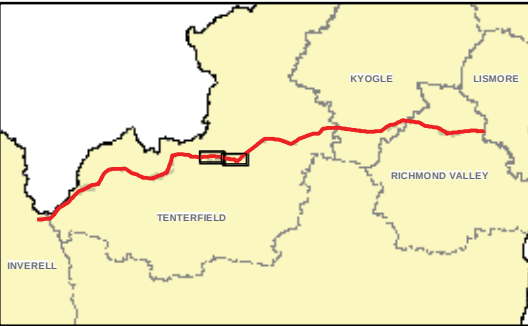
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Datum: GDA94, Projection: UTM, Grid: MGA Zone 56

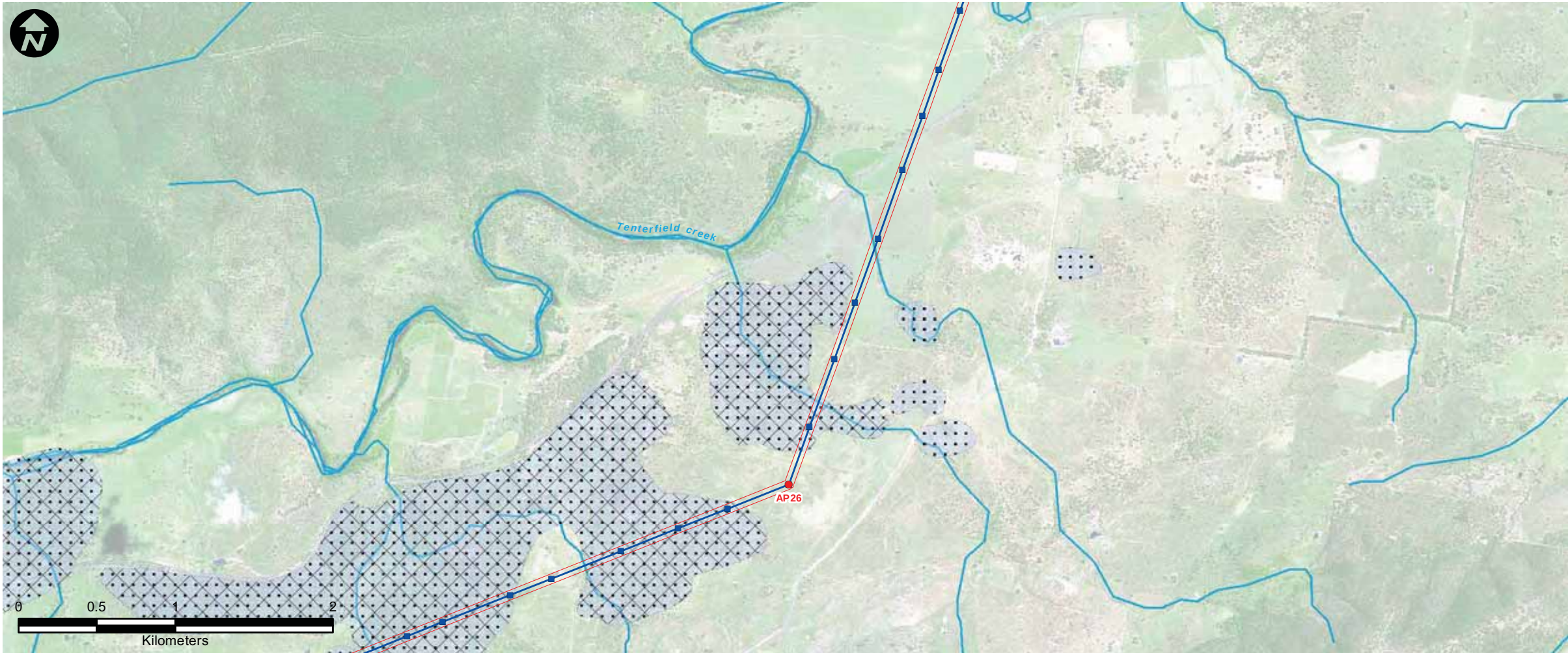
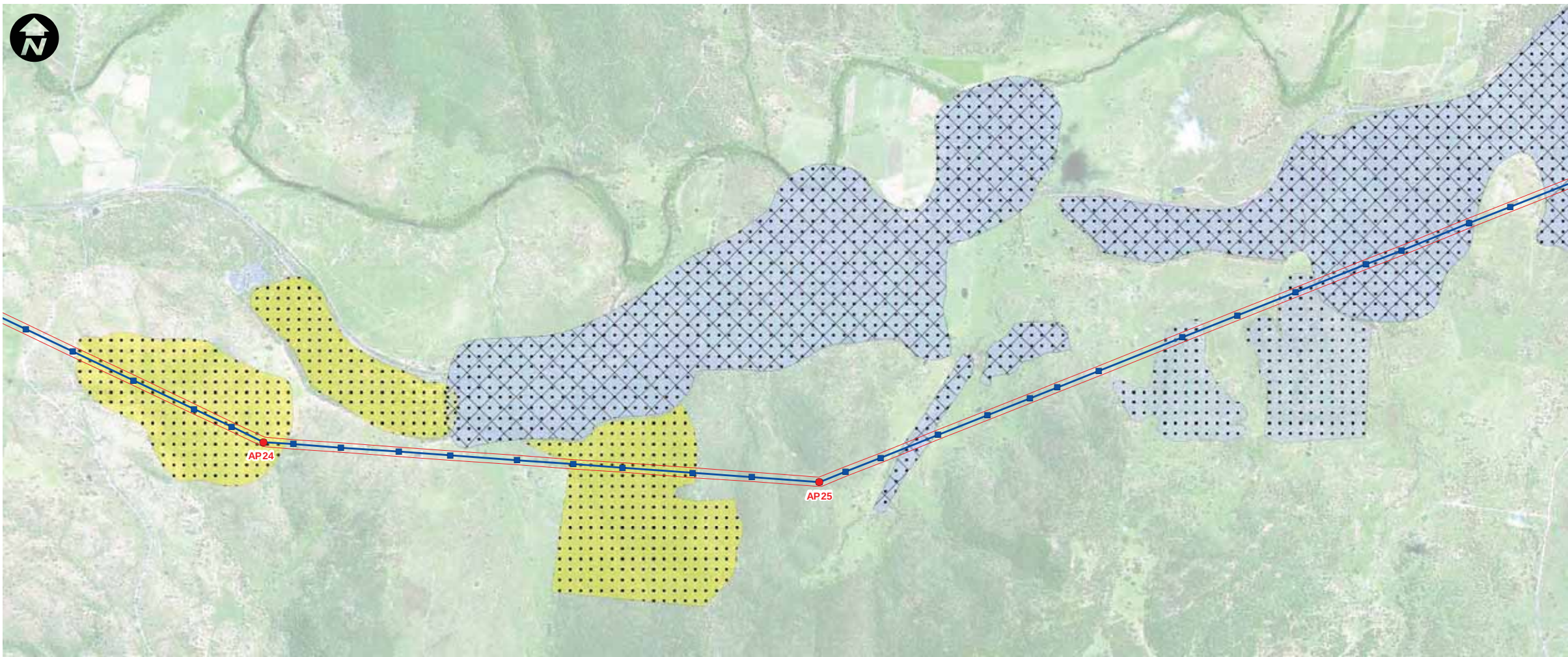
LEGEND:

- Existing 96L 132kV Structures Locations[^]
- Existing Transmission Lines[^]
- Proposed 330kV Angle Position (Indicative)[^]
- Proposed 330kV Structure Locations (Indicative)[^]
- Proposed 330kV Alignment
- Proposed 330kV Easement
- Substation/Switching Station
- Roads and Firetrails
- Waterways
- Access Tracks
 - Category 1
 - Category 2
 - Category 3
- Vegetation Formations and Communities**
 - TSC Act Listed Vegetation Community
 - EPBC Act Listed Vegetation Community
 - Forested Wetland**
 - Forest Red Gum/Broad-leaved Apple Dry Open Forest, (FB)
 - Forest Red Gum/Pink Bloodwood Open Forest, (FP)
 - New England Blackbutt Dry Heathy Open Forest on Granites, (NEBHG)
 - Thin-leaved Stringbark/Broad-leaved Apple Open Forest, (TB)
 - Grassy Woodland**
 - Blakely's Red Gum/Rough Barked Apple Grassy Woodland, (BGB)
 - Blakely's Red Gum/White Box Grassy Woodland, (BWB)
 - Cabbage Gum Grassy Woodland, (CG)
 - White Box/Cabbage Gum Grassy Woodland, Intergrades, (WC)
 - White Box Grassy Woodland, Disturbed, (WBd)
 - White Box Grassy Woodland, (WB)
 - Yellow Box/Blakely's Red Gum/Silver-leaved Ironbark/White Cypress Grassy Woodland, Intergrades, (YBS)
 - Aquatic Ecological Community**
 - Aquatic Ecological Community of the Lowland Catchment of the Darling River (FM Act)



Symbols and lines used in this figure are indicative and are not intended to reflect actual size of represented features. Symbols and lines have been enhanced to aid visibility.
Source: Aerial Imagery from TransGrid 2009
[^] TransGrid 2010

Drawn: AO/SB	Approved: JM	Date: 02/06/2011
Job No.: 43177662	File No.: 43177662.085g.mxd	
Client TransGrid		
Project FAR NORTH NSW (DUMARESQ - LISMORE 330kV TRANSMISSION LINE) PROJECT		
Title NATIVE VEGETATION COMMUNITIES		
Figure: 7g		
		



LEGEND:

- Existing 96L 132kV Structure Locations^
- Existing Transmission Lines^
- Proposed 330kV Angle Positions (Indicative)^
- Proposed 330kV Structure Locations (Indicative)^
- Proposed 330kV Centreline^
- Proposed 330kV Easement^
- Substation/Switching Station
- Roads and Firetrails
- Waterways

Threatened Ecological Communities

- TSC Act Listed Community
- EPBC Act Listed Community
- Inland Grey Box Woodland
- Box Gum Woodland

Aquatic Ecological Community

- Aquatic Ecological Community of the Lowland Catchment of the Darling River (FM Act)

Symbols and lines used in this figure are indicative and are not intended to reflect actual size of represented features. Symbols and lines have been enhanced to aid visibility.

Source: Aerial Imagery from TransGrid 2009,
^ TransGrid 2010

Drawn: AO/SB	Approved: JM	Date: 02/05/2012
Job No.: 43177662	File No.: 43177662.086e.mxd	
Client TransGrid		
Project FAR NORTH NSW (DUMARESQ - LISMORE 330kV TRANSMISSION LINE) PROJECT		
Title THREATENED ECOLOGICAL COMMUNITIES		
Figure: 8e		

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