25 August 2017

Sean Porter
Development Manager
Lend Lease
Via Email: sean.porter@lendlease.com

Cumberland Ecology
PO Box 2474
Carlingford Court 2118
NSW Australia
Telephone (02) 9868 1933
Mobile 0425 333 466
Facsimile (02) 9868 1977
Web: www.cumberlandecology.com.au

**ST MARYS EAST – WEST CONNECTOR ROAD UPGRADE WORKS – SUPPLEMENTARY ECOLOGICAL ASSESSMENT**

Dear Sean,

The purpose of this letter is to present the findings of a supplementary ecological assessment conducted by Cumberland Ecology for works related to the East West Connector Road upgrade works, which is located within a road reserve between the Eastern Precinct (now the suburb of Ropes Crossing), the Ropes Creek Precinct, Dunheved Precinct and the Central Precinct (being developed as the suburb 'Jordan Springs East'), on the St Marys Property (SMP) (referred to as the 'subject site'). The works are being done to accommodate traffic between the Precincts and to adequately address the flooding impacts on the East - West Connector Road (the 'Connector Road').

Cumberland Ecology has conducted a Species Impact Statements (SIS) for the development of the Central Precinct (dated February 2014), and numerous flora and fauna assessments of the Dunheved Precinct, Eastern Precinct, Ropes Crossing Precinct and Western Precinct and an addendum report for assessment of an extension to the Jordan Springs Connector Road, for impacts on threatened species, populations and communities listed under the *NSW Threatened Species Conservation Act 1995* (TSC Act). However a large portion of the road works will occur adjacent to the approved areas for development, and adjoins the Regional Park, and has not been assessed under previous assessments.

Although the proposed works involve upgrade of an existing sealed road located within an easement zoned for Road and Road Widening, they still have the potential to impact on threatened species, populations and communities listed under the TSC Act. Therefore, a supplementary ecological assessment was prepared to assess the residual impacts of the works within the Road and Road Widening Zone.

The supplementary ecological assessment is required for submission to Blacktown City Council and Penrith City Council as part of the DA for the East West Connector

road works and associated infrastructure. Parts of the Road and Road Widening zone that will be developed as part of the current scope of the DA have been included in previous ecological assessments prepared for the Central Precinct, Dunheved Precinct works and East West Connector Road Extension, and are therefore not considered further as part of this assessment.

Our methods, results and conclusions have been explained in detail and are provided in **Appendix A** to this letter. Figures are provided in **Appendix B** and Assessments of Significance are provided in **Appendix C**.

The road upgrade works are recommended for approval, subject to the implementation of the mitigation measures outlined in **Appendix A**.

We would be happy to discuss any aspect of this assessment in further detail. If you have any queries or require further clarification, please do not hesitate to contact myself or Gitanjali Katrak on (02) 9868 1933.

Yours sincerely

Vanessa Orsborn
Project Manager / Ecologist
vanessa.orsborn@cumberlandecology.com.au

*Appendix A*

# Supplementary Ecological Assessment for the East – West Connector Road Upgrade Works

## A.1 Introduction

Incivil Pty Ltd and Ethos Urban, on behalf of Lendlease are preparing a Development Application (DA) for construction of a 3.4 km section of road that will connect the Central Precinct (referred to as the suburb of Jordan Springs East) with the suburb of Ropes Crossing. Two further DAs have been prepared for the demolition of the existing hardstand within the road corridor to allow for investigatory works to be undertaken.

The St Marys Property (SMP) comprises 1,545 ha of land which is situated north of St Marys and north-east of Penrith on the Cumberland Plain in Western Sydney. The SMP is divided into development "Precincts" (Western Precinct, Central Precinct, Dunheved Precincts, Ropes Creek Precinct and Eastern Precinct) under the Regional Environment Plan for St Marys (SREP 30).

The Central Precinct (now the suburb of Jordan Springs East) is located in the centre of the SMP, within the Penrith Local Government Area (LGA) and is connected to the Eastern Precinct (now the suburb of Ropes Crossing) by the East West Connector Road. The Connector Road is located between two Local Government Area (LGA) boundaries; Penrith City Council in the west and Blacktown City Council in the east.

The area that is the focus of this ecological assessment (referred to as the 'subject site') consists of an existing sealed private road, and adjoining land located within the Road and Road Widening Zoned easement, in the portion that has not previously been assessed, located in Blacktown LGA, as shown in **Figure 1** in **Appendix B**.

Cumberland Ecology has been involved in the development process of the St Marys Property (SMP) since 2004 and has prepared a Species Impact Statement (SIS) for the Central Precinct bulk earthworks DA (Cumberland Ecology, 2014a), and numerous flora and fauna assessments of the Dunheved Precinct, Eastern Precinct, Ropes Crossing Precinct and Western Precinct. These assessments have assessed impacts of the developments on threatened species, populations and communities listed under the *NSW Threatened Species Conservation Act 1995* (TSC Act).

Parts of the Road and Road Widening zone that will be developed as part of the current scope of the DA have been included in previous ecological assessments prepared for the Central Precinct, Dunheved Precinct works and East West Connector Road Extension. These include the Central Precinct Bulk Earthworks DA (Cumberland Ecology, 2014a), the Ropes Crossing Connector Road Extension (Cumberland Ecology, 2016) and the Dunheved Haul Rd Extension (Cumberland Ecology, 2014b). These previous assessments assumed complete removal of vegetation within the Road and Road Widening Zone. As these areas of works that do not require further ecological assessment, they have been excluded from the subject site.

The purpose of this report is to provide a supplementary ecological assessment that focuses on the biodiversity values of the area impacted by the East – West Connector Rd upgrade works, particularly threatened species, populations and communities that are listed under the schedules of the TSC Act.

### *A.1.1 Description of the Proposal*

The proposed works will involve construction of approximately 3.4 kilometres of new roadway, 3 bridges, a large culvert crossing and upgrade of existing drainage structures. Demolition of the existing hardstand area in the road corridor is the subject of separate DAs to both Blacktown and Penrith Councils.

The proposed roadway will be contained within the footprint shown in Figure 1 in Appendix C to this letter, and identified on SK595 as part of the SEE. This coincides with the area of land zoned for Road and Road Widening and represents a corridor typically 30 metres wide, with some increase in the width at the location of future intersections. Along with replacing the existing bridge crossings at South Creek and Ropes Creek, the works will involve the construction of a new bridge on the proposed Dunheved Link Road. Widening works are proposed on the western abutment of the South Creek Bridge in order to meet the conveyance requirements of the South Creek floodplain. Along with the proposed bridge and culvert crossings, there are five existing drainage crossings along the roadway that will be maintained. It is likely that these crossing will be replaced as part of the proposed works in order to achieve the hydraulic and structural outcomes required as part of the approval.

The proposed works will require some cut and fill within the proposed road corridor in order to provide a flood immunity for the proposed roadway at least equivalent to the 1 % AEP flood event, as defined by the Jacobs flood modelling. Cut and fill works will be restricted to the road corridor. In general, the section of roadway between Jordan Springs East and Ropes Creek Bridge will require fill to raise the roadway to the required level. Between Ropes Creek Bridge and the Ropes crossing development, nominal cut and fill will be required to achieve a road geometric design consistent with the relevant Australian standards. While it is anticipated that the majority of the 30 metre corridor will be cleared as a result of the proposed works, all reasonable attempts will be made to retain existing vegetation of value within the corridor.

There will be a relatively minor change in the drainage system of the existing roadway as a result of the proposed works, with minor changes to sag points in the road and a minor increase in the impermeable area and a minor increase in the expected volume of run-off. The road will be designed with appropriate drainage measures which will formalise discharge of run-off, with scour protection provided as necessary.

While the finished works will be contained within the 30 metre corridor, it is anticipated that during construction a range of measures may be required to maintain the condition of areas upstream and downstream from the proposed works area. It is anticipated that this may result in the requirement to install temporary erosion and sediment controls measures including but not limited to swales, sediment fences, basins, silt fences and similar beyond the active works area. This may necessitate a small amount of clearing of these areas to guarantee the immediate and longer term outcomes for the area.

## A.2 Relevant Legislation

The SMP was endorsed by the NSW Government for inclusion on the Urban Development Program (UDP) in 1993. As the SMP straddles the boundary between two local government areas (Blacktown and Penrith) the NSW Government decided that a regional environmental plan should be prepared for the site and the Regional Environmental Plan for St Marys (SREP 30) was gazetted in January, 2001. Under SREP 30, the SMP is subdivided into Eastern Precinct, Ropes Creek Precinct, Central Precinct, Western Precinct, Dunheved Precinct and Regional Park, Regional Open Space, Drainage Land and Roads.

The proposed Connector Road upgrade works are located within land zoned as 'Road and Road Widening'.

Approval under Commonwealth environmental law was granted to the development of the SMP under the *Environment Protection (Impact of Proposals) Act 1974* (EPIP Act) prior to the gazettal of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Clarification of all related actions necessary for the carrying out of the approved development was thereafter granted by the Commonwealth under the Environmental Reform (Consequential Provisions) Act 1999 (ERCP Act). As such, following the commencement of the EPBC Act, the Commonwealth confirmed that the EPIP Act approval and ERCP Act certification completed the Commonwealth environmental assessment and held that "***no further approvals***" were required provided development was consistent with the established planning framework provided by the SREP 30.

## A.3 Methods

### *A.3.1 Review of Existing Information*

Cumberland Ecology has been involved in the development process of the SMP since 2004 and has previously conducted detailed ecological assessments between 2011 and 2017 for developments related to the Central Precinct, including the SIS for bulk earthworks, which included assessment of clearing related to the adjoining portion of Regional Open Space, as well as various supplementary assessments, including for the Jordan Springs Connector Road. Earlier assessment for the Dunheved Precinct have also included part of the East West Connector Road (Cumberland Ecology, 2014b) and various staged assessments of Eastern Precinct (Ropes Crossing) and Ropes Creek Precinct prepared by Cumberland Ecology and ERM between 2002 – 2006. The information relating to the vegetation, flora and fauna from these previous assessments, in particular assessments conducted in the vicinity of the Connector Rd and western parts of the Central Precinct were reviewed to gain an appreciation of the potential flora and fauna values within the subject site.

As part of this process, vegetation mapping from for the Cumberland Plain (OEH, 2013c) was also reviewed.

### *A.3.2 Field surveys*

Field surveys were conducted by an ecologist and botanist on 18 October 2016. The surveys involved a meander of the subject site, where it was safe to access, as part of the existing road

was being used as a construction haul road at the time of survey. The general condition of the vegetation was noted at several locations or waypoints and photographs were also taken to record conditions during the survey. In particular, the following were noted during the meander survey:

- Presence of noxious and environmental weeds;
- Location of potential fauna habitat, including hollow bearing trees and logs;
- Locations of threatened flora species known to occur within the subject site; and
- Potential habitat trees for the threatened Cumberland Plain Land Snail.

The general condition of the vegetation was also noted. Searches for threatened flora species known to occur in the vicinity of the road were incorporated into the meander survey.

Locations of threatened species were recorded using a hand-held GPS unit.

## A.4 Results

### *A.4.1 Vegetation*

Vegetation mapping for the Cumberland Plain (OEH, 2013c) and ground truthing by Cumberland Ecology during the survey have mapped the vegetation within the subject site as patches of the Threatened Ecological Communities (TEC's) Cumberland Plain Woodland (CPW), Shale Gravel Transition Forest (SGTF), and River-flat Eucalypt Forest (RFEF) (in the form of Alluvial Woodland) in association with South Creek riparian area and small floodplains.

The list of threatened flora species and flora populations known or likely to occur in the area, identified that several threatened flora species and populations had potential to be present in the study area, including *Pultenaea parviflora*, *Grevillea juniperina ssp juniperina* and *Marsdenia viridiflora ssp viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas. A number of threatened fauna species have been recorded in close proximity to the subject site, in particular threatened woodland birds and microbats, and therefore have potential to be present.

### *A.4.2 Field Survey*

*i. Vegetation*

The vegetation present within the subject site generally consisted of regenerating CPW, SGTF or RFEF adjoining the existing road, where it occurs in adjoining areas of the Regional Park. Within the road reserve native vegetation comprised patches interspersed with exotic vegetation. The most intact sections of native vegetation occurred on elevated locations, especially at the outer margin of the road reserve.

In many locations, the more mature woodland vegetation is overhang from the Regional Park boundary fence. Vegetation within the road corridor, which has been maintained for many years

(previously slashed during management by Defence) and fenced from the Regional Park, occurs as either young regrowth, or shrubby vegetation only.

The CPW patches are generally open and regenerating, and interspersed with areas of low diversity derived native grassland and exotic grassland, as shown in **Photograph 1**. Where present, the canopy is dominated by *Eucalyptus tereticornis* (Forest Red Gum) and *E. moluccana* (Grey Box) and a small tree layer of regenerating canopy species and *Acacia parramattensis* (Parramatta Wattle). A diverse shrub layer is present, dominated by native species; *Daviesia ulicifolia*, *Grevillea juniperina ssp juniperina* and *Acacia parramattensis*. The understorey is dominated by grasses, including the exotic species *Eragrostis curvula* and the natives *Sporobolus crebra and Microlaena stipoides.* The understorey includes a mix of native and exotic herbs, including natives; *Eremophila debilis* and *Calotis lappulacea* and exotics; *Sida rhombifolia* and *Verbena bonariensis*. Weed densities were generally low, although a small number of significant environmental weed species were recorded such as *Ligustrum lucidum* (Large-leaved Privet) and *Olea europaea subsp. cuspidata* (African Olive).

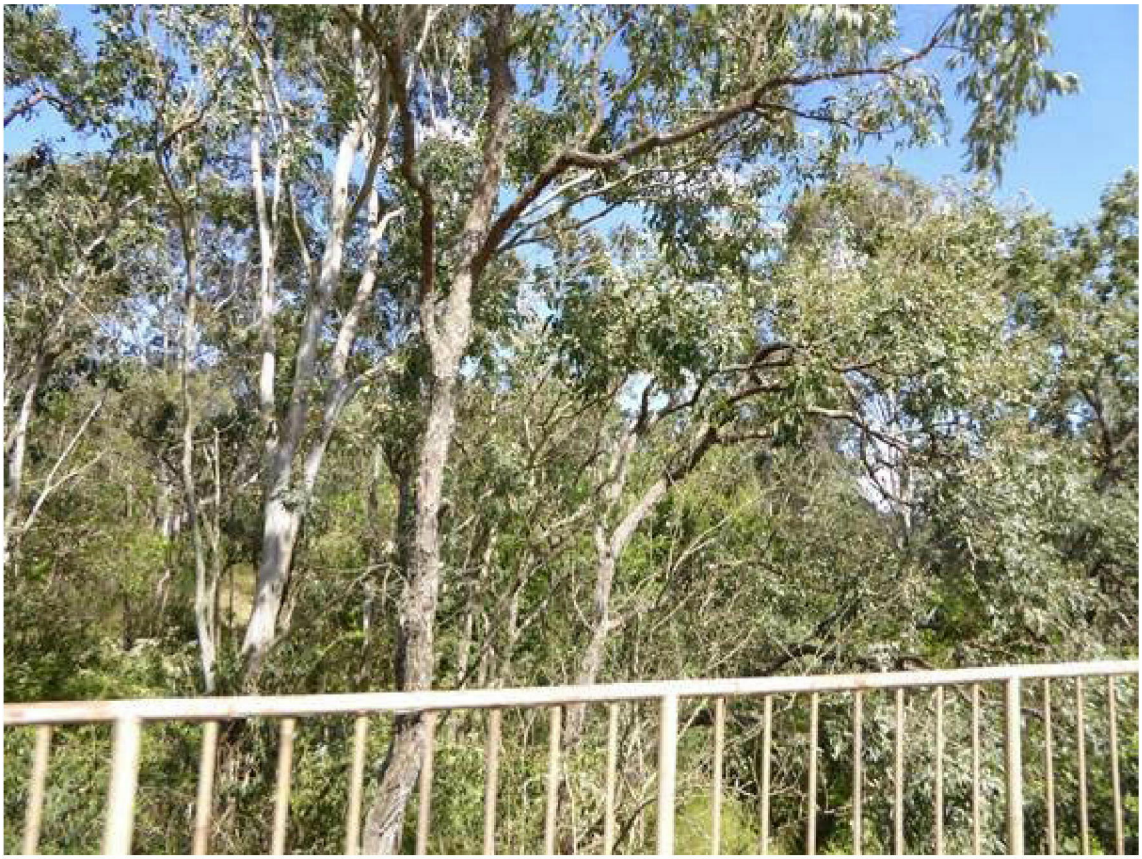
**Photograph 1** **Regenerating CPW on the subject site, adjoining the existing road**

Shale Gravel Transition Forest is present in the eastern extent of the subject site, where gravel influences are present in the soil and grades into Cumberland Plain Woodland where shale influences increase, and Cooks River Castlereagh Ironbark Forest where gravel dominates. The community composition is very similar to CPW in this part of the SMP, as described above in terms of understorey composition, while the canopy is dominated by *Eucalyptus fibrosa (*Broad-

leaved Ironbark) and a sub-canopy of *Melaleuca decora* (Feather Honey-myrtle), as shown in **Photograph 2**.

**Photograph 2** **Shale Gravel Transition Forest with *Pultenaea parviflora* present in the subject site**

River-flat Eucalypt Forest is present in the floodplain and riparian zones that pass beneath the existing road, as shown in **Photograph 3**. Riparian zone vegetation in South Creek was dominated by *Casuarina glauca* (Swamp Oak) with smaller proportions of *Angophora floribunda* (Rough-barked Apple), *Eucalyptus amplifolia* and *Eucalyptus tereticornis*. Dense *Acacia parramattensis* (Parramatta Wattle) regrowth with dense understorey of *Ligustrum sinense* and ground cover of *Tradescantia fluminensis* (Wandering Jew). Localised occurences of significant weeds such as *Rubus fruticosus* (Blackberry) and *Cestrum parqui* (Green Cestrum) were also present.



**Photograph 3 River-flat Eucalypt Forest in South Creek riparian area**

Low Diversity Derived Native Grassland and Exotic Pasture are present throughout much of the subject site, between patches of woodland and shrubland, and on the road verges, as shown in **Photograph 4**.

Much of the natural ground cover is replaced by exotic grasses, established for soil erosion control and is dominated by *Eragrostis curvula* (African Love-grass) and *Chloris gayana* (Rhodes Grass). Native ground cover species vary in concentration from estimated 50-90%. Areas dominated by indigenous species mainly occur east of Ropes Creek where natural soil occurs in road reserve margins.

**Photograph 4 Low Diversity Derived Native Grassland and Exotic Pasture in the road corridor**

*ii. Threatened Species*

Two threatened shrub species; *Grevillea juniperina* ssp *juniperina* (Prickly Spiderflower) and *Pultenaea parviflora*, were recorded in the Shale Gravel Transition Forest within the subject site.

The threatened shrub species; *Grevillea juniperina ssp juniperina*, which is listed as vulnerable under the TSC Act, was recorded on the subject site in clusters of between 10-20 plants, totalling an estimate of approximately 100 mature individuals across the subject site. This species is known to colonise disturbed areas, and it is common for large number of mature plants to occur in association with the tracks and cleared areas in the Regional Park and other parts of the SMP.

The threatened shrub species; *Pultenaea parviflora* (Bush Pea), which is listed as endangered under the TSC Act, was recorded in the Shale Gravel Transition Forest in the eastern extent of the subject site in clusters of 5-10 plants, totalling approximately 60 mature individuals.

Potential habitat for threatened fauna species was identified on the subject site, provided by the young and regenerating woodland vegetation. A few large mature trees are scattered throughout the subject site, some trees with decorticating bark, were present, although no trees with hollows were recorded on the subject site. Habitat for native fauna species on the subject site was therefore limited to foraging resources for nectivorous species. The mature woodland present in adjoining areas of the Regional Park would provide more intact habitat, where it is not fragmented

with existing tracks, and located further from disturbance of the ongoing development in relation to the Connector Road and Precincts.

Due to the lack of roosting and nesting habitat, it was considered that the subject site represents only foraging habitat for some threatened woodland birds and microchiropteran bats, known from the area. The bat and bird species with potential to occur in the study area would be more likely to utilise the habitats present in the more intact portions of the Regional Park. However individuals may still pass through the subject site as part of a wider foraging range.

The woodland present in the study area contains some leaf-litter, in association with the few mature trees present, suitable as shelter habitat for the Cumberland Plain Land Snail (*Meridolum corneovirens*). The habitat present is considered to be sub-optimal and moderate quality, due to the fragmentation of adjoining habitat areas by the presence of the existing road. Nonetheless, it is expected that Cumberland Plain Land Snails could be present on the subject site.

## A.5 Impact Assessment

### *A.5.1 Direct Impacts*

Direct impacts to threatened species, populations or ecological communities listed under the TSC Act are expected to be restricted to the existing road corridor, and no direct impacts are expected outside of the area previously disturbed for the existing road.

For the purposes of this assessment, it has been assumed that complete removal will occur within the area zoned for Road and Road Widening, as summarised in **Table 1** although there may be scope to avoid mature trees, where possible, subject to final design and requirements for cut and fill and battering in association with the construction of the new road.

The regenerating woodland present occurs at the edge of an existing road, and includes some exotic species, including some significant environmental weeds.

**Table 1 Vegetation Removed on the Subject Site for the East West Connector Road**

| Vegetation Community | Area (ha) |
|---|---|
| Shale/Gravel Transition Forest | 0.34 |
| Alluvial Woodland | 1.26 |
| Shale Plains Woodland | 1.65 |
| Low Diversity Derived Native Grassland (CPW) | 0.48 |
| **Total** | **3.74** |

It is anticipated that approximately 100 *Grevillea juniperina ssp juniperina* plants and 60 *Pultenaea parviflora* plants will be removed as part of the proposed works. It is unlikely that these plants can

be avoided, as they are growing right at the edge of the existing hardstand roadway. However, the threatened plants represent a small percentage of the total number present across the whole Regional Park, estimated to be at minimum 249,000 G. juniperina plants, while *P. parviflora* is estimated to be at minimum 58,860 individuals.

At the completion of the road works, the vegetation disturbed, adjacent to the upgraded road and on the batters, will be revegetated. Furthermore, it is likely that *G. juniperina ssp juniperina* and *P. parviflora* will recolonise the area, as the seed bank will be retained in the top soil to be reapplied at completion of works.

The vegetation within the subject site provides sub-optimal habitat for the threatened fauna species known from the SMP. The woodland areas in the subject site largely lack breeding resources and roosting habitat because of the age and low numbers of mature trees present, However, there is potential for limited foraging habitat for threatened woodland birds, including Varied Sittella (*Daphoenositta chrysoptera)*, Speckled Warbler (*Pyrrholaemus sagittata)* and Diamond Firetail (*Stagonopleura guttata)*, all of which have been recorded in the Regional Park. There is also potential for threatened microchiropteran bats known from the SMP, including Southern Myotis (*Myotis macropus*), Eastern Bentwing-bat (*Miniopterus orianae oceanensis* (formerly *M. schreibersii oceanensis*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), East-coast Freetail-bat (*Mormopterus norfolkensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*), Little Bentwing-bat (*Miniopterus australis*), Southern Myotis (*Myotis macropus*) and Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) to pass through the subject site as part of a larger foraging range. Due to the small size of the subject site, the location of the subject site along a roadside corridor, and the age of the woodland remnants within the subject site, it is unlikely that threatened fauna species known to occur in the SMP would regularly frequent these areas to forage or roost, particularly as better habitat is present in the adjacent Regional Park.

Better quality examples of CWP, SGTF and RFEF, which provide habitat for a range of threatened flora and fauna, are present within the Regional Park and will be protected and enhanced through a range of mitigation measures identified and retained in perpetuity in public ownership. The vegetation within the Regional Park is more mature, more intact and has better opportunities for recovery. As such, the proposed development is unlikely to have a significant impact on TECs such that the large and viable representatives in the Regional Park would be placed at risk of extinction.

Nonetheless, as a precautionary measure, formal Assessments of Significance (7 Part Test) has been prepared for CPW, SGTF, RFEF, *G. juniperina ssp juniperina, P. parviflora* and Cumberland Plain Land Snail, as included in **Appendix C** to this letter.

### *A.5.2 Indirect Impacts*

There is the potential for the proposed road upgrade works to indirectly impact on localised occurrences of native flora and fauna, including threatened species, populations and ecological communities within the adjoining Regional Park, through the following processes:

- Changes to the drainage regime experienced in the adjoining areas of the South Creek catchment from the changes to the drainage in association with the Connector Rd;

- Increased sedimentation and erosion during construction works;
- Increased spread of weeds; and
- Disturbance from noise and vibration during construction works.

Such indirect impacts have been considered in detail in the SIS for the Central Precinct (Cumberland Ecology, 2014a) and are discussed below.

*i. Changes to the drainage regime*

The proposed road construction will result in minor changes to the drainage regime experienced in the adjoining areas of the Regional Park. The location of the existing road and proximate culverts beneath the South Creek cause 'backed-up' flows during flood events in the South Creek catchment. The proposed road upgrade works and the replacement of the culverts, will improve flows beneath the Connector Road and in the South Creek catchment, and hence will alter the current drainage regime. Flood modelling by Cardno indicates that there will be some minor modifications to the localised drainage regime experienced in the Regional Park, although increases in flood waters experienced in South Creek will be negligible. Furthermore, the alterations in drainage will assist in improved access and park management in the longer term, and will reduce the risk of scouring and erosion in the flow-path.

Nonetheless, the alterations to the current drainage regime has the potential to indirectly impact on adjoining areas of TECs, including CPW and also RFEF. However, the potential impacts are considered to be minor and the changes in drainage are therefore not expected to have a significant impact on the proximate patches of these TECs in the Regional Park, or associated threatened species.

*ii. Impacts on Habitat Connectivity*

The development of the Connector Road has the potential to indirectly impact on the local movement corridors for native and threatened fauna species. However, the works involve the expansion of the existing road, and therefore connectivity of habitat is already disrupted to some extent, and habitat connectivity will be partly maintained beneath bridges in the riparian zone for South Creek. Furthermore, the majority of fauna species that are likely to traverse the habitat areas on either side of the existing road are highly mobile, such as birds, bats and some small to medium sized mammals, including arboreal species such as possums and gliders, and ground-dwelling fauna such as rats, rabbits and snakes. Large fauna, such as kangaroos and emus, are excluded from the road corridor by the chain-mesh fence which is designed to contain macrofauna in the Regional Park. The existing road presents a barrier to movement for the Cumberland Plain Land Snail, and the proposed Connector Road will continue to present a barrier for this species.

*iii. Impacts from Road-strike*

The existing road experiences very little traffic, as it is within an undeveloped area, and hence there is the potential for large increase in traffic to increase the incidence of road kill on the Connector Road. The most likely species to suffer road-strike are species such as the Common Brush-tail Possum, and common reptiles, due to them being a highly mobile with large numbers

present in the Regional Park and locality. Other ground-dwelling mammals, such as kangaroos and emus are not expected to experience road-strike, due to the long-term maintenance of the Regional Park perimeter fence, which is designed to contain macrofauna. The large majority of species that will travel between the areas of habitat on either side of the proposed connector road are flying species, and hence they will not be likely to be affected by road-strike.

*iv. Sedimentation, erosion and weed spread*

The proposed development poses a potential risk to the biodiversity values of the Regional Park if impacts are not managed appropriately within the subject site. Sedimentation and erosion during regrading can move soil, pollutants and other materials (such as weed propagules) into the surrounding vegetation of the Regional Park, particularly so during rainfall events. Weed establishment can potentially be prolific after soil disturbance events. If weeds are not managed during and post construction, they can potentially spread further into the Regional Park. A number of management plans and disturbance protocols will be required to ensure that the proposed development will not adversely impact the biodiversity values of the Regional Park during construction and additional measures should be implemented during the operations phase.

*v. Noise, Vibration, Air Quality and Light*

Noise and vibration can affect animal physiology and behaviour, and if it becomes an ongoing stress, it can be injurious to an animal's energy budget, reproductive success and long-term survival. There are other potential impacts due to noise that include habitat loss through avoidance, reduced reproductive success and a retreat away from favourable habitats (AMEC, 2005).

Noise also affects the way that animal-created sounds are heard and interpreted by other animals. This can include mating calls, territorial calls and alarm calls. Interference with these calls by noise created by the mine, has the potential to disrupt the species relying on these calls with deleterious results including reduced reproductive success and mortality (AMEC, 2005).

The proposed works have the potential to generate noise and vibration during road construction works. Notwithstanding this, background noise and vibration levels already exist as a result of the ongoing construction works for the various approved development works in the Central Precinct and Dunheved Precinct, and are being managed in accordance with relevant regulations.

It is unlikely that the proposal will exacerbate these impacts significantly above current background levels experienced in the nearby Central Precinct development area, and the proposed works will continue to comply with regulatory standards. Furthermore, the proposed works will be very short-term, and noise and vibration impacts will not be sustained. Therefore potential indirect impacts on threatened species, populations and ecological communities present in the Regional Park are not likely to be significant.

The major source of air pollution from works associated with the proposed works will be dust created by the construction works, particularly if climatic conditions are dry. Dust emissions from vehicles during ingress and egress are also likely during construction works. However, the works will be short-term, and it is not anticipated that the proposed development will create any air

quality problems. Dust has the potential to smother plants and inhibit growth, if excessive building up occurs on vegetation adjoining the construction zones. However, the impact of dust on air quality and plant health can be minimised if appropriate management actions are undertaken.

The Connector Road has the potential to increase the level of artificial night light in the natural environment, through the installation of street lighting. Increased night light levels may adversely impact wildlife by direct glare, chronic or periodic increased illumination and temporary unexpected fluctuations in light levels (Saleh, 2007; Longcore and Rich, 2010). However, the impacts of artificial lighting can be mitigated through the installation of fauna sensitive lighting, and the impacts from night light pollution are likely to remain close to the immediate boundary of the Connector Road and Regional Park. Additionally, some fauna species are drawn to or dazzled by lights, which can lure them to the roads edge and increase the chance of road-strike. However, this is most commonly associated with kangaroos, and they will remain excluded from the road by the macrofauna-proof fence that borders the Regional Park.

## A.6 Proposed Mitigation Measures

### *A.6.1 Disturbance Protocols and Limits of Disturbance*

The Regional Park, including areas in the immediate vicinity of the subject site, is known to support a number of threatened flora and fauna. Operators will need to be aware of this to ensure that works are strictly limited to the works zone, within the road corridor, and does not have secondary impacts on the surrounding vegetation.

As a minimum, the following will be observed and signed off by the site manager or another appropriate person before ground disturbance commences:

- Marking of any final clearing limits to further reduce clearing extents and to retain potential habitat and other ecological features at the edges of the clearing limits wherever practicable;
- Avoidance of mature trees for clearing, where possible. If mature trees are to be removed, pre-clearance surveys should be conducted by an ecologist to determine presence of native fauna, particularly threatened species, and, if required, to relocate fauna prior to clearance;
- Temporary fencing installed to mark the limits of clearing and “no-go” areas surrounding the footprint to ensure that vehicles and other associated direct disturbances are limited to the approved development areas;
- No construction compounds and stockpile sites should be present in the Regional Park. Existing construction compounds and stockpile sites should be utilised, if possible, and avoid the boundary of the Regional Park;
- Management of stockpiling and other materials to ensure that they are retained solely within designated compound areas and are not placed elsewhere;

- Construction staff informed with regards to the status of the TECs during site induction and/or tool box talks;
- Landscaping will be conducted in accordance with the Management Plans for the adjoining Precincts, and avoid the use of invasive species. Local provenance tubestock should be used where a species are incorporated into landscaping that occurs naturally on the SMP, where possible;
- Tree species selected for planting should be representative of the Cumberland Plain;
- Utilisation of species native to the Cumberland Plain for seeding for any requisite soil stabilisation works; and
- Weed monitoring, in accordance with the Weed Management Plan for the Central Precinct, Dunheved Precinct and Eastern Precinct, will be undertaken after construction is completed and if necessary, undertake weed management to ensure that weeds do not spread to the surrounding woodland.

## A.7 Conclusions

This findings of this supplementary assessment indicate that the road construction works will not result in any significant impacts to threatened species, populations or ecological communities, as a result of vegetation removal or changes to the drainage regime in proximate areas of the Regional Park. Although the proposed works will result in the removal of a relatively small area of regenerating woodland, they will also result in improved access and drainage in the Regional Park. This will have for long term benefits to biodiversity in the long-term due to improved park management.

The East West Connector road works should proceed with caution, and the implementation of appropriate mitigation measures, as outlined in **Section A.7.1**.

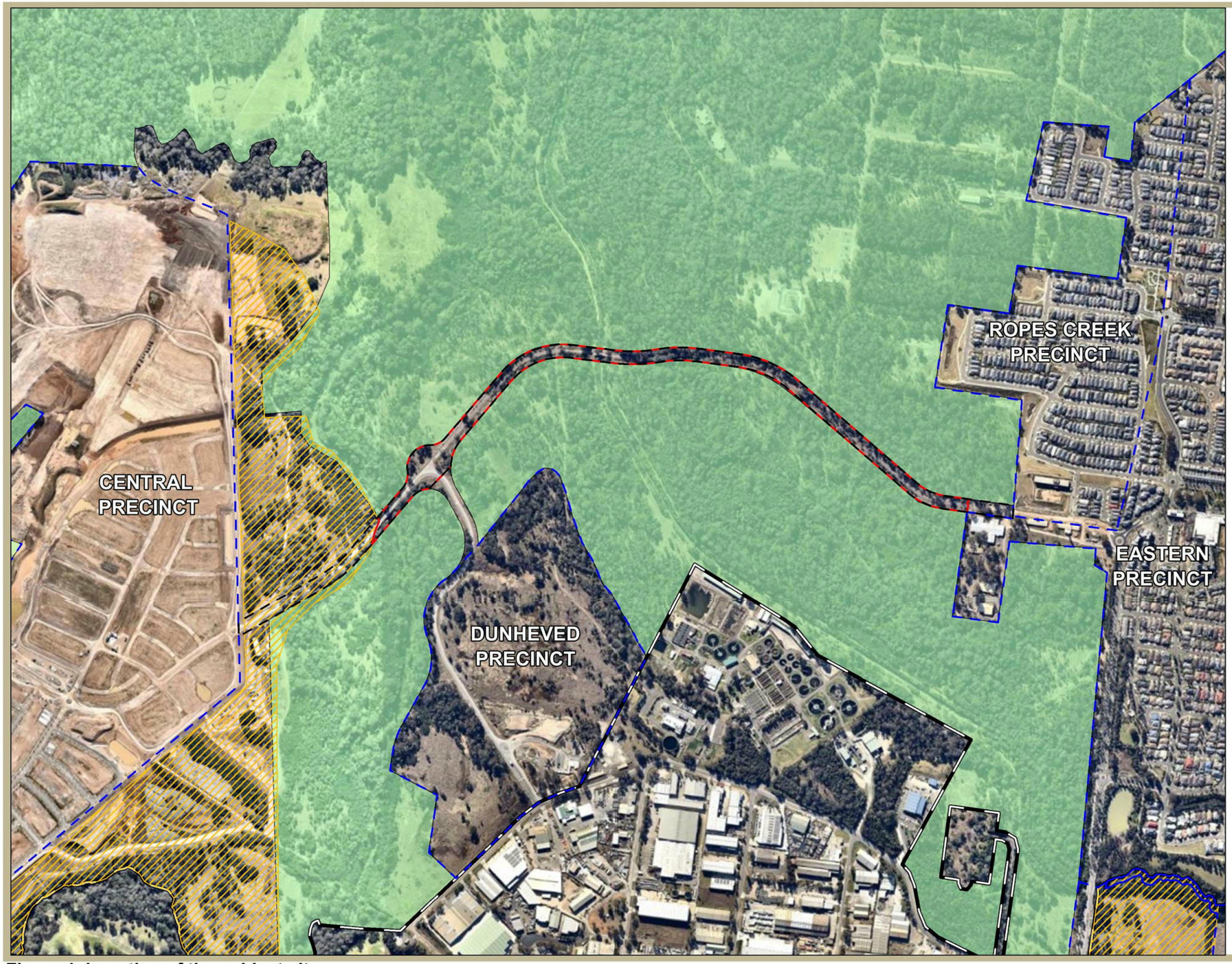
## A.8 References

*Dillwynia tenuifolia Sieber ex DC*.
AMEC (2005). *Mackenzie Gas Project: Effects of Noise on Wildlife*. AMEC Americas Limited.
Cumberland Ecology (2014a). *Development within the Central Precinct, St Marys Property: Species Impact Statement*. Cumberland Ecology, Carlingford Court, NSW.
Cumberland Ecology (2014b). *Ecological Assessment of Dunheved Precinct Haul Road Extension within the St Marys Property*. Letter to Glyn Richard of Lend Lease.
Cumberland Ecology (2016). *Ropes Crossing Connector Road Extension, St Marys Property*. Prepared for Lend Lease.
DECCW (2007). *Cumberland Plain Vegetation Mapping*. Department of Environment, Climate Change and Water.
DECCW (2011). *Approved Cumberland Plain Recovery Plan*. DECCW, Hurstville.
Longcore, T. and Rich, C. (2010). *Light Pollution and Ecosystems*, ActionBioscience.org original article.
NSW Scientific Committee (1997). *Cumberland Plain Land Snail - Endangered Species Listing*. NSW National Parks and Wildlife Service, Hurstville.
NSW Scientific Committee (2002). *Shale gravel transition forest in the Sydney Basin Bioregion - endangered ecological community listing*. NSW National Parks and Wildlife Service, Hurstville.
NSW Scientific Committee (2004). *River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing*. Department of Environment and Conservation (NSW), Hurstville, NSW.
OEH (2012). "Juniper-leaved Grevillea - profile." from http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10367.
OEH (2013a). *Cumberland Plain Land Snail - profile*. Office of Environment and Heritage, Hurstville.
OEH (2013b). *Pultenaea parviflora - profile*. Office of Environment and Heritage, Hurstville.
OEH (2013c). *Remnant Vegetation Mapping of the Cumberland Plain*. O. o. E. a. Heritage, NSW.
Saleh, T. (2007). "Effects of Artificial Lighting on Wildlife." *The Road-RIPorter (Summer Solstice Issue)* **12**(2).

*Appendix B*

# Figures

Coordinate System: MGA Zone 56 (GDA94)




**Legend**

- Subject site
- Road and Road Widening Zone
- St Marys Property Boundary
- Precinct Boundaries
- Regional Park boundary
- Regional Open Space

Grid North

Image Source:
Nearmap (dated 22-07-2017)

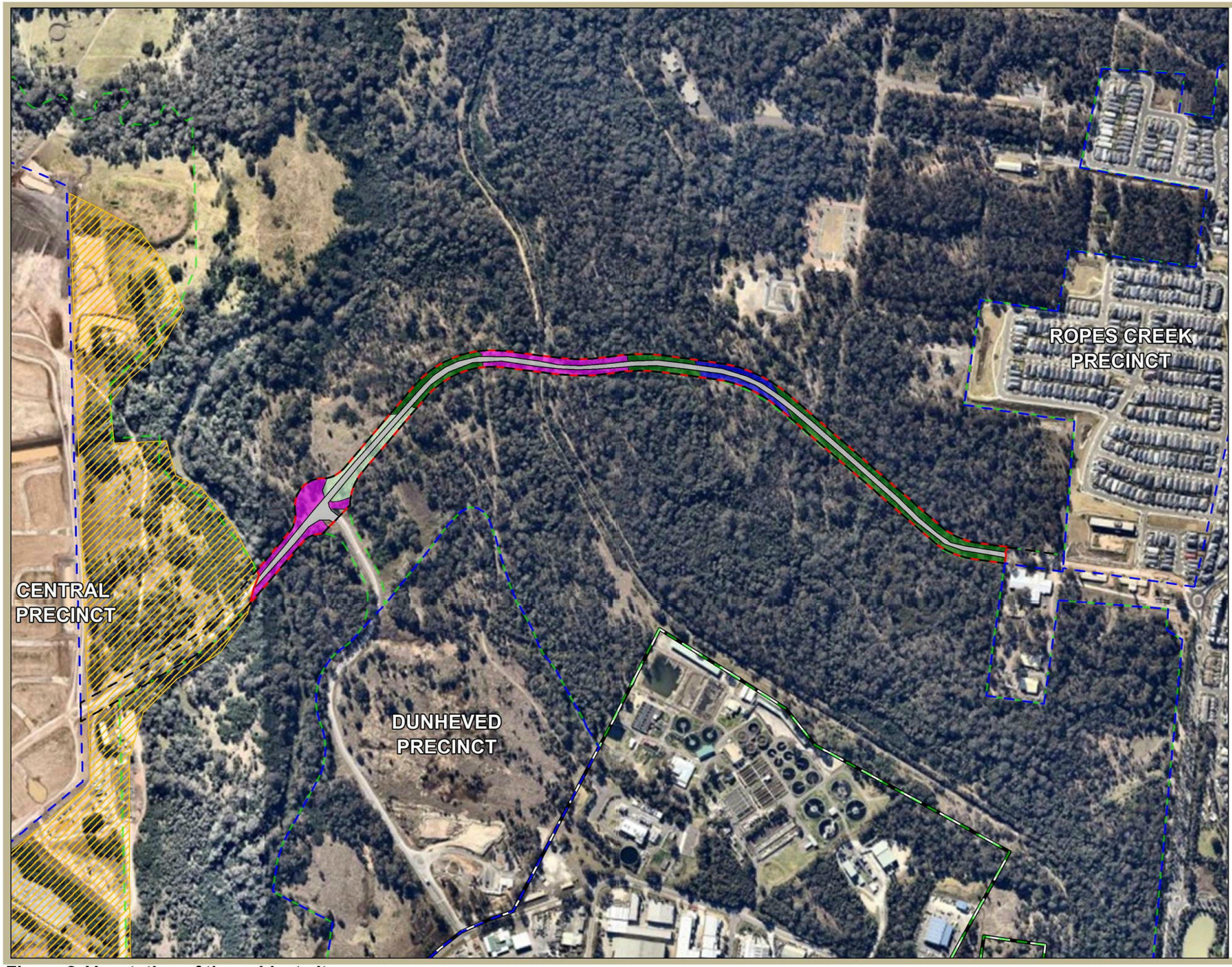
cumberland ecology

I:\...\16194\Figures\Letter 11\20170818\Figure 1. Location_Subject Site

**Figure 1. Location of the subject site**

100 0 100 200 300 400 m

Coordinate System: MGA Zone 56 (GDA94)




**Legend**

- Subject site
- Road and Road Widening Zone
- St Marys Property Boundary
- Precinct Boundaries
- Regional Park boundary
- Regional Open Space
- Existing Road

**Vegetation Community**

- Shale/Gravel Transition Forest
- Alluvial Woodland
- Shale Plains Woodland
- Low Diversity Derived Native Grassland (CPW)

Grid North

Image Source:
Nearmap (dated 22-07-2017)

Data Source:
OEH (2013). Remnant Vegetation of the western Cumberland subregion, 2013 Update. Office of Environment and Heritage, NSW

cumberland ecology

I:\...\16194\Figures\Letter 11\20170818\Figure 2. Vegetation_Subject Site

**Figure 2. Vegetation of the subject site**

100 0 100 200 300 400 m

*Appendix C*

# Assessments of Significance

## C.1 Cumberland Plain Woodland

Cumberland Plain Woodland (CPW) occurs in two forms; Shale Hills Woodland and Shale Plains Woodland. Shale Hills Woodland occurs in the south of the Cumberland Plain in more elevated areas. Shale Plains Woodland (SPW) is more widely distributed, occurring throughout the drier areas of the Cumberland Plain (NSW NPWS, 2001a). Dominant canopy species include Grey Box (*Eucalyptus moluccana*), Forest Red Gum (*E. tereticornis*), Narrow-leaved Ironbark (*E. crebra*), Spotted Gum (*Corymbia maculata*) and Thin-leaved Stringybark (*E. eugenioides*). The shrub layer is dominated by Blackthorn (*Bursaria spinosa*). Grasses dominate the ground layer (Benson and Howell, 1990).

The community is well adapted to fire and drought but is now under threat from disturbance triggering weed invasion, increased soil nutrients, rubbish dumping and altered fire regimes (NSW NPWS, 2001a).

In December 2009, the NSW Scientific Committee released a final determination for the listing of Cumberland Plain Woodland as a critically endangered ecological community. The definition of the community in this final determination includes areas of derived native grasslands, referring to areas where trees and shrubs have been cleared but a native understorey typical of Cumberland Plain Woodland still exists.

*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.

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

Not applicable.

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

*(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 proposed development of the subject site will collectively remove an area of approximately 1.65 ha of disturbed and/or modified CPW. This is not likely to have an adverse effect on the extent of the community such that its local occurrence is likely to be placed at risk of extinction because the community is well-represented within the adjacent Regional Park where it has a higher conservation value and is in better condition.

There is a possibility that the composition of CPW may be modified in the adjoining areas of the Regional Park due to an increase in edge effects from the future residential and commercial areas. However, a suite of mitigation measures will be implemented to reduce impacts from the proposed development within the Central Precinct and adjoining Regional Park including fencing and comprehensive drainage and waste management strategies. Any edge-effects that may occur are expected to be localised, and would not be expected to adversely modify composition to place the local occurrence 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, and*

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

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

It is assumed that all CPW within the subject site will be removed or substantially modified for the proposed development. The proposed development of the subject site will collectively remove an area of approximately 1.65 ha. This is compared with the large areas of mature CPW totalling more than 450 ha (DEC (NSW), 2007) conserved in perpetuity in the 900ha Regional Park as an offset to development of the SMP development precincts.

The CPW to be removed or modified as a result of the proposed development is not likely to be of great importance to the long-term survival of the community within the locality. Cumberland Plain Woodland of high conservation significance will be conserved within the Regional Park and managed for conservation. The vegetation within the Regional Park has a higher ecological value than that within the subject site as it has higher resilience, is more structurally intact and has higher species diversity.

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

No critical habitat for this endangered ecological community has currently been identified by the Director-General of the OEH.

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

A Recovery Plan for the Cumberland Plain has been gazetted. The main actions proposed in the Recovery Plan include:

- Building the protected area network;
- Delivering best practice management;

- Promoting awareness, education and engagement; and
- Enhancing information, monitoring and enforcement.

The proposed development is consistent with these actions because the largest and best quality areas of CPW in the SMP will be conserved within the Regional Park, adding to the protected area network with opportunity to deliver best practice management. The patches and sparse patches of CPW in the study area are comparatively small and degraded compared to the representation in the Regional Park and will not greatly add to the viability of the community if retained, once the study area is developed for urban purposes.

There are no threat abatement plans relevant to CPW.

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

The proposed development will result in the threatening process 'Clearing of native vegetation'. However, the vegetation to be cleared consists predominantly of degraded and sparsely regenerating CPW and higher quality examples of the community will be conserved within the Regional Park.

Other key threatening processes that may be increased as a result of the proposed development include:

- Competition and grazing by the Feral European Rabbit;
- Ecological consequence of high frequency fires; and
- Invasion of native plant communities by exotic perennial grasses.

The Feral and Domestic Animal Management Strategy will be implemented in the Central Precinct and the subject site to ensure that the effects of rabbits are not exacerbated by the proposed development and to decrease the impacts from rabbits as they currently exist on the SMP.

The Bushfire Management Plan has been designed to mitigate factors that could lead to high frequency fires. The plan of management for the Regional Park will also ensure that this process is not exacerbated.

The Weed Management Plan prepared for the Central Precinct will be implemented to reduce the impacts of exotic perennial grasses.

The road upgrade works will ultimately improve management of the Park, due to improved access for maintenance and the reduced risk of flooding. Therefore, the clearing of a small area of native vegetation is not considered to exacerbate the impacts of these KTP's on this community.

*Conclusion*

The development of the subject site will remove a relatively small area of regenerating habitat for this community that exists on the edge of an existing road. However, the proposed development

is not likely to have a significant impact on CPW such that the large and viable representatives in the remaining areas of the Regional Park would be placed at risk of extinction. The large and continuous remnants present in the Regional Park will be protected through a range of mitigation measures and retained in perpetuity in public ownership. The proposed development is not likely to have a significant impact on CPW.

## C.2 Shale Gravel Transition Forest

Shale Gravel Transition Forest (SGTF) in the Sydney Basin Bioregion occurs predominately where shallow deposits of tertiary alluvium lie over shale soils but can also be found in areas where there are high concentrations of iron-indurated gravel. It is dominated mostly by *Eucalyptus fibrosa* (Broad-leaved Ironbark), but *Eucalyptus moluccana* (Grey Box), and *Eucalyptus tereticornis* (Forest Red Gum) co-occur.

The community is threatened by land clearing and fragmentation for urban, residential, recreational, and industrial development, weed invasion, and illegal dumping (NSW Scientific Committee, 2002).

SGTF within the subject site consists as a small patch at the eastern end of the alignment and is in a sparse and regenerating form (mainly *E. fibrosa* with some *E. tereticornis*) over an exotic dominated understorey. Larger patches and more intact tracts of SGTF occur on the SMP, with the largest and best quality areas conserved within the Regional Park.

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.

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

Not applicable.

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

   (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 proposed development will remove and area of 0.34 ha of disturbed SGTF. This will not have an adverse effect on the extent of the community such that the local occurrences are likely to be placed at risk of extinction because the community is well-represented within the adjacent Regional Park where it has a higher conservation value and is in better condition.

The composition may be modified in parts of the subject site where representations of the community are retained such as significant trees or patches of understorey. Although patches of vegetation are not likely to be retained with structural complexity or composition resembling the community, this will not adversely modify composition to place the local occurrence at risk of extinction because of the retention of the community in the Regional Park.

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

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

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

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

It is assumed that all SGTF within the subject site will be removed or substantially modified for the proposed development. The proposed development of the subject site will remove approximately 0.34 ha. This is compared with the large areas of mature SGTF totalling more than 50 ha (DEC (NSW), 2007) conserved in perpetuity in the 900ha Regional Park as an offset to development of the SMP development precincts.

The SGTF to be removed or modified as a result of the proposed development is not likely to be of great importance to the long-term survival of the community within the locality. SGTF of high conservation significance will be conserved within the Regional Park and managed for conservation. The vegetation within the Regional Park has a higher ecological value than that within the subject site as it has higher resilience, is more structurally intact.

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

No critical habitat for this endangered ecological community has currently been identified by the Director-General of the OEH.

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

A Recovery Plan for the Cumberland Plain has been gazetted. The main actions proposed in the Recovery Plan include:

- Building the protected area network;
- Delivering best practice management;
- Promoting awareness, education and engagement; and

- Enhancing information, monitoring and enforcement.

The proposed development is consistent with these actions because the largest and best quality areas of SGTF in the SMP will be conserved within the Regional Park, adding to the protected area network with opportunity to deliver best practice management. The sparse patches of SGTF on the subject site are comparatively small and degraded compared to the representation in the Regional Park and will not greatly add to the viability of the community if retained, once the study area is developed for urban purposes.

There are no threat abatement plans relevant to SGTF.

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

The proposed development will result in the threatening process 'Clearing of native vegetation'. However, the vegetation to be cleared consists predominantly of degraded and sparsely regenerating SGTF and higher quality examples of the community will be conserved within the Regional Park.

Other key threatening processes that may be increased as a result of the proposed development include:

- Competition and grazing by the Feral European Rabbit;
- Ecological consequence of high frequency fires; and
- Invasion of native plant communities by exotic perennial grasses.

The Feral and Domestic Animal Management Strategies prepared for the development precincts will be implemented on the subject site to ensure that the effects of rabbits are not exacerbated by the proposed development and to decrease the impacts from rabbits as they currently exist.

The Bushfire Management Plan has been designed to mitigate factors that could lead to high frequency fires. The plan of management for the Regional Park will also ensure that this process is not exacerbated.

The Weed Management Plan prepared for the development precincts will be implemented to reduce the impacts of exotic perennial grasses.

*Conclusion*

The development of the subject site will remove a relatively small area of sub-optimal habitat for this community that exists on the edge of a road. However, the proposed development is not likely to have a significant impact on Shale Gravel Transition Forest such that the large and viable representatives in the Regional Park would be placed at risk of extinction. The large and continuous remnants present in the Regional Park will be protected through a range of mitigation measures and retained in perpetuity in public ownership. The proposed development is not likely to have a significant impact on Shale Gravel Transition Forest.

## C.3 River-flat Eucalypt Forest

River-flat Eucalypt Forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is a form of Alluvial Woodland, as mapped by the Cumberland Plain vegetation mapping project (DECCW, 2007).

River-flat Eucalypt Forest (RFEF) is found on coastal floodplains and has a tall canopy of eucalypts. The most widespread canopy trees include *Eucalyptus tereticornis, E. amplifolia, Angophora floribunda* and *A. subvelutina*. It may have a layer of small trees and a scattering of shrubs. The ground cover consists of abundant forbs, scramblers and grasses. RFEF occurs on alluvial soils on river-flats of the NSW North Coast, Sydney Basin and South East Corner bioregions (NSW Scientific Committee, 2004).

This community occurs on the subject site, in association with the South Creek riparian zone and floodplain.

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.

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

Not applicable.

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

   (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 proposed development of the subject site will remove a small area, totalling approximately 1.26 ha of RFEF. This is not likely to have an adverse effect on the extent of the community such that its local occurrence is likely to be placed at risk of extinction because the community is well-represented within the Regional Park in areas further from the boundaries of the development areas, where it has a higher conservation value and is in better condition.

There is a possibility that the composition of RFEF may be modified in the adjoining areas of the Regional Park due to an increase in edge effects from the road and drainage works. However, a suite of mitigation measures will be implemented to reduce impacts from the proposed development within the Central Precinct, Connector Rd. and adjoining Regional Park including fencing and comprehensive drainage and waste management strategies. Any edge-effects that

may occur are expected to be localised, and would not be expected to adversely modify composition to place the local occurrence 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, and*

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

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

The proposed development of the subject site will remove a small area, totalling approximately 1.26 ha. There is also the potential for indirect impacts from the changes in drainage regimes experienced in the Regional Park to modify the RFEF present. However, this will be localised to the edges of the riparian zone, and is not expected to be significant in area. This is compared with the large areas of mature RFEF conserved in areas of the Regional Park that are further from the boundary of the development areas.

The areas of RFEF remaining in the Regional Park will not become further fragmented or isolated as the works are within an existing road corridor. Although the proposed works will result in the removal of a small area of RFEF, they will also result in improved drainage in the Regional Park. This will have for long term benefits to biodiversity due to improved park management.

The RFEF to be removed or modified as a result of the proposed development is not likely to be of great importance to the long-term survival of the community within the locality. RFEF of high conservation significance will be conserved within the Regional Park and managed for conservation. The vegetation within the Regional Park has a higher ecological value than that within the subject site and works area as it has higher resilience, is more structurally intact and has higher species diversity.

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

No critical habitat for this endangered ecological community has currently been identified by the Director-General of the OEH.

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

A Recovery Plan for the Cumberland Plain has been gazetted. The main actions proposed in the Recovery Plan include:

- Building the protected area network;

- Delivering best practice management;
- Promoting awareness, education and engagement; and
- Enhancing information, monitoring and enforcement.

The proposed development is consistent with these actions because the largest and best quality areas of RFEF in the SMP will be conserved within the Regional Park, adding to the protected area network with opportunity to deliver best practice management. The drainage works will assist with improved park management in the long-term, benefiting this community. There are no threat abatement plans relevant to RFEF.

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

The proposed development will result in the threatening process 'Clearing of native vegetation'. However, the vegetation to be cleared consists predominantly of degraded and sparsely regenerating RFEF and higher quality examples of the community will be conserved within proximate parts of the Regional Park.

Other key threatening processes that may be increased as a result of the proposal include:

- Competition and grazing by the Feral European Rabbit;
- Ecological consequence of high frequency fires; and
- Invasion of native plant communities by exotic perennial grasses.

The Feral and Domestic Animal Management Strategy will be implemented in the Central Precinct and includes the Connector Rd and the subject site to ensure that the effects of rabbits are not exacerbated by the proposed development and to decrease the impacts from rabbits as they currently exist on the SMP.

The Bushfire Management Plan has been designed to mitigate factors that could lead to high frequency fires. The plan of management for the Regional Park will also ensure that this process is not exacerbated.

The Weed Management Plan prepared for the Central Precinct will be implemented to reduce the impacts of exotic perennial grasses.

*Conclusion*

The development of the subject site will remove or modify a relatively small area (1.26 ha) of sub-optimal habitat for this community that exists on the edge of a road. However, the proposed development is not likely to have a significant impact on RFEF such that the large and viable representatives in the Regional Park would be placed at risk of extinction. The large and continuous remnants present in the Regional Park will be protected through a range of mitigation measures and retained in perpetuity in public ownership. The proposed development is not likely to have a significant impact on River-flat Eucalypt Forest.

## C.4 Grevillea juniperina ssp juniperina

*Grevillea juniperina ssp juniperina* is endemic to Western Sydney and centred on an area bounded by Blacktown, Erskine Park, Londonderry and Windsor with outer populations at Kemps Creek and Pitt Town. It is a broadly spreading to erect shrub to 2.5 m high and grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence) which typically contain lateritic gravels (OEH, 2012). Physical disturbance of the soil appears to result in an increase in seedling recruitment.

*Grevillea juniperina* ssp *juniperina* is listed as Vulnerable under the TSC Act. *Grevillea juniperina* ssp *juniperina* is well-represented across the SMP. Large numbers of this shrub occur in the Regional Park, with population in the Regional Park estimated in excess of 250,000 individuals (Cumberland Ecology, 2014b). The species occurs elsewhere across the SMP, especially in disturbed areas such as at the edges of woodland and forest, and along roads and tracks. This species was detected during field survey of the subject site.

a) *In the case of a threatened species, whether the lifecycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

Approximately 100 individuals occur within the subject site and are likely to be removed or impacted. The plants occurring at that location form part of a larger, Regional Park population which is estimated to be in excess of 250,000 individuals. The proposed development will not disrupt the lifecycle of the known local population.

It is not expected that the potential removal of a relatively small number of plants would affect the long term viability of this larger population, which is adequately conserved within the Regional Park. Additionally, management is recommended during and after works which will allow natural regeneration to take place.

b) *In the case of an endangered population, whether the lifecycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised,*

There are no populations of this species listed as endangered under the TSC 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.

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

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

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

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

The known and potential habitat for this species within the subject site is likely to be removed or modified as a result of the proposed development.

No areas of known or potential habitat for this species will become isolated by the proposed development. Connectivity will be maintained in the short term around the subject site, and in the long term through the Regional Park, which will connect plants that occur to the west of the subject site.

The habitat to be removed/ modified as a result of the proposed development is not important to the long-term survival of the species within the locality. Areas of high quality habitat and large numbers of the species occur within the remaining portions of the Regional Park, which is managed for conservation.

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

No critical habitat for this species has currently been identified by the Director-General of the OEH.

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

A specific recovery plan has not been prepared for this species. The Cumberland Plain Recovery Plan does however address this species within it (DECCW, 2011). The Recovery Plan has the main actions proposed:

- Building the protected area network;
- Delivering best practice management;
- Promoting awareness, education and engagement; and
- Enhancing information, monitoring and enforcement.

The proposed development is consistent with these actions because larger and better quality areas of habitat in the SMP will be conserved within the Regional Park, adding to the protected

area network with opportunity to deliver best practice management. The occurrence on the subject site is comparatively small compared to the representation throughout the Regional Park.

No threat abatement plans are relevant to this species.

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

Clearing of native vegetation resulting in the loss of habitat is a listed threatening process under the TSC Act. A small area of habitat for this species may be cleared for the proposed development. However, potential habitat for the species and large numbers of the species will be contained within the wider Regional Park, which will be managed to improve habitat on the SMP. Additionally management is recommended to be implemented during and after construction allowing natural regeneration to take place.

No other key threatening process that may be exacerbated by the proposed action will affect this species.

*Conclusion*

The proposed development will remove a small area of habitat for this species adjacent to an existing track. The large and continuous habitat present in the Regional Park will be protected and retained in perpetuity in public ownership. Therefore, the proposed development is not likely to have a significant impact on *Grevillea juniperina* ssp *juniperina*.

## C.5 Pultenaea parviflora (Bush Pea)

*Pultenaea parviflora* is a small shrub, endemic to the Cumberland Plain. Its core distribution is from Windsor to Penrith and east to Dean Park with outlier populations are recorded from Kemps Creek and Wilberforce. The species may be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays (OEH, 2013b).

*Pultenaea parviflora* is listed as Vulnerable under the TSC Act. *Pultenaea parviflora* is well-represented in the eastern portion of the SMP, primarily in the eastern tip of the Regional Park. Large numbers of this shrub occur in the Regional Park, with population in the Regional Park estimated in excess of 58,860 individuals (Cumberland Ecology, 2014b). The species occurs elsewhere across the SMP, especially in disturbed areas such as at the edges of woodland and forest, and along roads and tracks. This species occurs on the subject site.

*a) In the case of a threatened species, whether the lifecycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

Approximately 60 individuals occur within the subject site and are likely to be removed. The plants occurring at that location form part of a larger, Regional Park population which is estimated to be

in excess of 58,860 individuals. The proposed development will not disrupt the lifecycle of the known local population.

It is not expected that the potential removal of a relatively small number of plants would affect the long term viability of this larger population, which is adequately conserved within the Regional Park. Additionally, management is recommended during and after works which will allow natural regeneration to take place.

b) *In the case of an endangered population, whether the lifecycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised,*

There are no populations of this species listed as endangered under the TSC Act.

c) *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.

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

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

*(v) 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*

*(vi) 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 known and potential habitat for this species within the subject site is likely to be removed or modified as a result of the proposed development.

No areas of known or potential habitat for this species will become isolated by the proposed development. Connectivity will be maintained in the short term around the subject site, and in the long term through the Regional Park, which will connect plants that occur to the west of the subject site. The newly constructed road would not act as a barrier to seed dispersal of this species.

The habitat to be removed/ modified as a result of the proposed development is not important to the long-term survival of the species within the locality. Areas of high quality habitat and large

numbers of the species occur within the remaining portions of the Regional Park, which is managed for conservation.

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

No critical habitat for this species has been identified by the Director-General of the OEH.

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

A specific recovery plan has not been prepared for this species. The Cumberland Plain Recovery Plan does however address this species within it (DECCW, 2011). The Recovery Plan has the main actions proposed:

- Building the protected area network;
- Delivering best practice management;
- Promoting awareness, education and engagement; and
- Enhancing information, monitoring and enforcement.

The proposed development is consistent with these actions because larger and better quality areas of habitat in the SMP will be conserved within the Regional Park, adding to the protected area network with opportunity to deliver best practice management. The occurrence on the subject site is comparatively small compared to the representation throughout the Regional Park.

No threat abatement plans are relevant to this species.

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

Clearing of native vegetation resulting in the loss of habitat is a listed threatening process under the TSC Act. A small area of habitat for this species may be cleared for the proposed development. However, potential habitat for the species and large numbers of the species will be contained within the wider Regional Park, which will be managed to improve habitat on the SMP. Additionally management is recommended to be implemented during and after construction allowing natural regeneration to take place.

No other key threatening process that may be exacerbated by the proposed action will affect this species.

*Conclusion*

The proposed development will remove a small area of habitat for this species adjacent to an existing track. The large and continuous habitat present in the Regional Park will be protected and retained in perpetuity in public ownership. Therefore, the proposed development is not likely to have a significant impact on *Pultenaea parviflora*.

## C.6 Cumberland Plain Land Snail

The Cumberland Plain Land Snail inhabits a very small area on the Cumberland Plain west of Sydney from Richmond and Windsor south to Picton and from Liverpool west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains (OEH, 2013a). It primarily occurs in Cumberland Plain Woodland, which is a grassy open woodland with occasional dense patches of shrubs. It lives under litter or bark, leaves and logs or shelters in loose soil around grass clumps. The Cumberland Plain Land Snail is listed as Endangered under the TSC Act. One live individual and one shell of a Cumberland Plain Land Snail were detected within the subject site during current surveys.

a) *In the case of a threatened species, whether the lifecycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

Little is known about the range of the Cumberland Plain Land Snail and the area required for a viable population, but it is thought that the remaining total population on the Cumberland Plain consists of several disjunct populations (NSW Scientific Committee, 1997). The subject site may support isolated individuals of this species. The Cumberland Plain Land Snail is present within most or all of the larger patches of CPW on the SMP and is represented within the Regional Park which contains more than 400 ha of potential habitat.

As an indication of relative abundance, surveys of comparative CPW in the Regional Park indicate a significantly higher number of snails in mature CPW than regenerating CPW. The habitat on the subject site is mostly regenerating CPW, and there is a lack of suitable habitat trees. Thus, the subject site provides a relatively small area of suboptimal habitat for this species. The conservation of large, intact areas of habitat for the species in the remaining portions of the Regional Park will continue to be available for the long term viability of the species on the SMP.

b) *In the case of an endangered population, whether the lifecycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised,*

There are no populations of this species listed as endangered under the TSC 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.

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

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

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

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

Limited habitat for this species exists within the subject site, due to the regenerating state of the woodland present, and modified understorey due to past maintenance regimes in the road corridor. However, some CPW, which represents potential habitat for this species will be removed as a result of the proposed development, totalling approximately 1.65 ha.

The potential habitat for this species occurs in patches adjacent to larger occurrences in the Regional Park and will not further fragment or isolate any potential habitat beyond what currently exists.

The habitat to be removed and modified as a result of the proposed development is not likely to be important to the long-term survival of the species within the locality. Additionally, areas of better quality habitat occur within the wider Regional Park and will be conserved within the Regional Park and managed for conservation.

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

No critical habitat for this species has been identified by the Director-General of the OEH.

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

A recovery plan has not been prepared for this species. The Cumberland Plain Recovery Plan does however address this species within it (DECCW, 2011). The Recovery Plan has the main actions proposed:

- Building the protected area network;
- Delivering best practice management;
- Promoting awareness, education and engagement; and
- Enhancing information, monitoring and enforcement.

The proposed development is consistent with these actions because larger and better quality areas of habitat in the SMP will be conserved within the Regional Park, adding to the protected

area network with opportunity to deliver best practice management. The occurrence on the subject site is comparatively small compared to the representation throughout the Regional Park.

No threat abatement plans are relevant to this species.

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

Clearing of native vegetation resulting in the loss of habitat is a listed threatening process under the TSC Act. Small, regenerating patches, which represent sub-optimal of potential habitat for the species, will be cleared for the proposal. However, over 400 ha of known habitat for the species will be contained within the Regional Park, which will be managed to improve fauna habitat on the SMP.

No other key threatening process that may be exacerbated by the proposed action will affect this species.

*Conclusion*

The Proposal may remove a small area of sub-optimal habitat adjacent to an existing road. Larger area of higher quality habitat is available the Regional Park and therefore, no viable population of this species would be placed at risk of extinction. The large and continuous remnants present in the Regional Park will be protected through a range of mitigation measures and retained in perpetuity. Therefore, the Proposal is not likely to have a significant impact on the Cumberland Plain Land Snail.

16 February 2018

Sean Porter
Development Manager
Lend Lease
Via Email:
Sean.Porter@lendlease.com
CC:jamie.clouten@cidsa.com.au

Cumberland Ecology
PO Box 2474
Carlingford Court 2118
NSW Australia
Telephone (02) 9868 1933
Mobile 0425 333 466
Facsimile (02) 9868 1977
Web: www.cumberlandecology.com.au

**ADDENDUM TO A SUPPLEMENTARY FLORA AND FAUNA ASSESSMENT FOR THE EAST - WEST CONNECTOR ROAD, ST MARYS PROPERTY**

Dear Sean,

The purpose of this letter is to provide an addendum to an assessment prepared by Cumberland Ecology for the East – West Connector Road upgrade works, within the St Marys Property (letter dated 24 August 2017). The Road upgrade works are required to link the suburbs of Ropes Crossing and Jordan Springs East, and include construction of the new single lane road, and bridges crossing South Creek and Ropes Creek.

An addendum report is considered to be necessary due to the restricted access under each of the bridges proposed for demolition during the previous site inspection (on 18 October 2016).

This addendum assessment, contained in **Appendix A**, should be read in conjunction with 16194 Let11, and the supporting documentation, including the Species Impact Statement prepared for the Central Precinct (now the suburb of Jordan Springs East). An updated Assessment of Significance is provided in **Appendix B**, to address impacts to threatened microchiropteran bats (microbats).

Yours sincerely

Vanessa Orsborn
Project Manager/Ecologist
vanessa.orsborn@cumberlandecology.com.au

*Appendix A*

# Addendum Assessment

## A.1 Introduction

Incivil Pty Ltd and JBA Planning, on behalf of Lend Lease are preparing several Development Applications (DAs) for construction of a 3.4 km section of road that will connect the Central Precinct (referred to as the suburb of Jordan Springs East) with the suburb of Ropes Crossing. This addendum and report will be utilised for multiple development applications for the demolition and reconstruction of the Connector Road and bridges.

Parts of the road and Road Widening Zone that will be developed as part of the current scope of the DAs have been included in previous ecological assessments prepared for the Central Precinct, Dunheved Precinct works and East West Connector Road Extension. These include the Central Precinct Bulk Earthworks DA (Cumberland Ecology 2014), the Ropes Crossing Connector Road Extension (Cumberland Ecology 2016) and the Dunheved Haul Rd Extension (Cumberland Ecology 2014). These previous assessments assumed complete removal of vegetation within the road and Road Widening Zone. As these areas of works do not require further ecological assessment, they have been excluded from the subject site. The supplementary assessment was prepared by Cumberland Ecology for the remainder of the East West Connector Road in a letter dated 27 February 2017 (Cumberland Ecology 2017).

An addendum report to the East West Connector Road Supplementary Assessment (Cumberland Ecology 2017) is considered to be necessary due to the restricted access under each of the bridges proposed for demolition during the previous site inspection (on 18 October 2016), for which a detailed assessment was not conducted.

## A.2 Methods

An inspection of the vegetation beneath and adjoining the South Creek and Ropes Creek bridges, which is proposed for removal, was conducted by an ecologist and botanist on 8 February 2018. The survey included temporary access tracks, for machinery to work on demolition and construction of South Creek Bridge, in the locations of existing access tracks through the Regional Park. Vegetation communities were traversed using a random meander technique. In particular, the following were noted during the meander survey:

- Presence of priority and environmental weeds;
- Location of potential fauna habitat, including hollow bearing trees and logs;
- Locations of threatened flora species known to occur within the subject site; and
- Potential habitat for the threatened Cumberland Plain Land Snail.

The general condition of the vegetation was also noted. Searches for threatened flora species known to occur in the vicinity of the road were incorporated into the meander survey.

A single 20 x 20 m quadrat was surveyed with the native vegetation adjoining South Creek Bridge. In the quadrat, the following information was recorded:

- All vascular flora species present within the plot or directly adjacent to the plot;
- The stratum in which each species occurred;
- The relative frequency of occurrence of each plant species;
- Vegetation structural data (i.e. height and percentage cover of each stratum);
- A waypoint to mark the location of the quadrat, using a handheld GPS; and
- Photographs of the quadrat.

A fauna habitat assessment was conducted concurrently, including a visual inspection of the bridge structure for potential roost habitat, such as crevices for small mammals to shelter in. Due to the height of the bridges, neither was inspected closely with torches, as this would require working at heights with protective fall equipment.

## A.3 Results

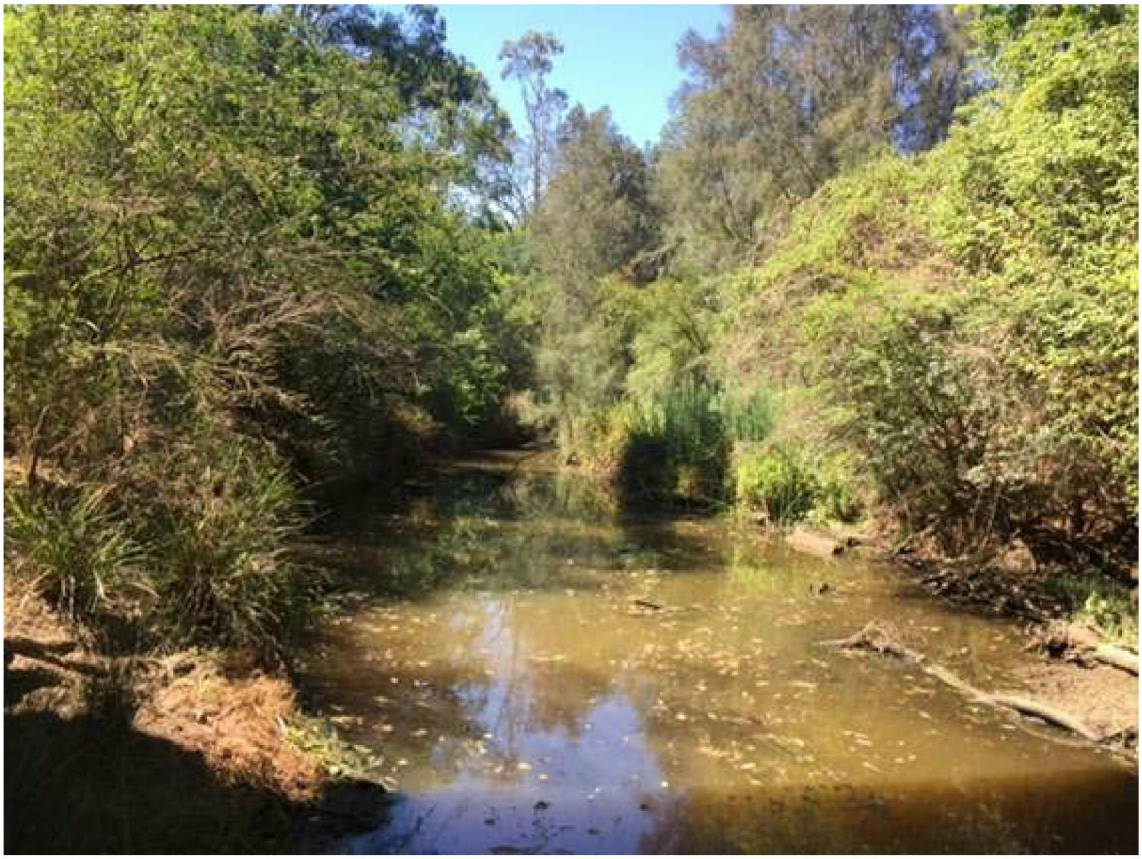
### *A.3.1 Flora*

The vegetation in association with the South Creek bridge is Alluvial Woodland as described in the mapping of the Cumberland Plain (OEH 2013), which is listed as River-flat Eucalypt Forest Endangered Ecological Community under the *NSW Biodiversity Conservation Act 2015* (BC Act). This community is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Riparian zone vegetation in South Creek was dominated by *Casuarina glauca* (Swamp Oak) with smaller proportions of *Angophora floribunda* (Rough-barked Apple), *Eucalyptus amplifolia* and *Eucalyptus tereticornis* (Forest Red Gum). The sub-canopy included a mix of native and exotic species including the native *Acacia parramattensis* (Parramatta Wattle) and juvenile canopy species, and the exotic *Salix babylonica* (Weeping Willow). A dense shrub layer was present, dominated by the exotics*Ligustrum sinense* (Large-leaved Privet), *Senna pendula* var. *glabrata* (Winter Cassia) and *Olea europaea ssp. cuspidata* (African Olive), with some natives represented by regenerating canopy species and *Bursaria spinosa* (Black-thorn). The ground cover was dominated by the exotic grasses *Eragrostis curvula* (African Love Grass) and *Cynodon dactylon* (Couch) and the exotic shrubs *Pavonia hastata* and *Sida rhombifolia* (Paddys Lucerne), with native understorey species uncommon.

No threatened flora species were recorded within the areas proposed for clearing beneath the bridges.

Alluvial Woodland is shown in **Photograph 1**. The full list of species recorded is including in **Appendix B**.



**Photograph 1 Alluvial Woodland beneath South Creek Bridge**

The access tracks proposed for temporary use are established, and were clear of midstorey and canopy cover, with some overhang in parts of shrub species, as shown in **Photograph 2**. The vegetation consisted of grass species, dominated by the same understorey species recorded in the Alluvial Woodland, but with the addition of some grasses, including the native *Themeda australis* (Kangaroo Grass) and the exotic *Chloris gayana* (Rhodes Grass). No threatened flora species were recorded within or directly adjoining the existing access tracks.

**Photograph 2** **Grassed access track within the Regional Park to be used for access during construction**

### *A.3.2 Fauna*

As identified in the Supplementary Assessment, potential habitat for threatened fauna species was identified on the subject site, provided by the young and regenerating woodland vegetation. South Creek and Ropes Creek provide a water source for fauna and foraging habitat for the 'fishing bat' Southern Myotis (*Myotis macropus*), which is listed as vulnerable under the BC Act. The Alluvial Woodland present in association with the creek crossing would additionally act as a corridor for movement by fauna throughout the riparian zone.

The South Creek Bridge is a solid concrete structure, with no crevices present, which could provide roosting habitat for cave-dependant microchiropteran bats, or any other fauna with potential to utilise bridges as habitat.

Ropes Creek Bridge was observed to have crevices between the concrete formwork and metal support structures, as shown in **Photographs 3** and **4**. Close inspection was not possible, due to the height of the structure, and safety concerns with the steep banks of the creek, however, from the visual inspection conducted, the crevices appeared sufficiently deep to provide habitat for a number of cave-roosting microbats, known from the area. This includes the Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), Little Bentwing-bat (*Miniopterus australis*) and Southern Myotis (*Myotis macropus*) which are listed as vulnerable under the BC Act.

**Photograph 3 View of the underside of Ropes Creek Bridge**

**Photograph 4 Crevices between concrete formwork in Ropes Creek Bridge**

## A.4 Impact Assessment

Direct impacts as a result of the East West Connector Road will involve complete removal of vegetation within the road corridor easement, as outlined in the Supplementary Assessment (Cumberland Ecology 2017). The summary of impact areas is provided in **Table 1**.

**Table 1 Vegetation to be Removed from the Subject Site for the East West Connector Road**

| Vegetation Community | Area (ha) |
|---|---|
| Shale/Gravel Transition Forest | 0.34 |
| Alluvial Woodland | 1.26 |
| Shale Plains Woodland | 1.65 |
| Low Diversity Derived Native Grassland (CPW) | 0.48 |
| **Total** | **3.74** |

Additionally, the demolition of South Creek Bridge and Ropes Creek Bridge has the potential to remove roosting habitat for cave-roosting microbats, including the threatened species; Eastern Bentwing-bat, Little Bentwing-bat and Southern Myotis. An updated Assessment of Significance has been prepared for this species, as included in **Appendix B**. The Assessment concludes that no significant impact is likely to occur as a result of this development.

Temporary disturbance of vegetation located within the existing grassed access tracks located at the boundary of the Regional Park and the road easement, in order for machinery to access South Creek Bridge. The single lane tracks will not be widened, outside of the road easement, and will be remediated after the works are complete.

## A.5 Mitigation Measures

A suite of mitigation measures have been outlined in the Supplementary Assessment (Cumberland Ecology 2017), and the SIS for Central Precinct (Cumberland Ecology 2014). Additional measures proposed include the following:

- Installing temporary fencing at the perimeter of each access track located within the Regional Park;
- Rehabilitate the access tracks, to an equivalent grassed finish (or as agreed with the Office of Environment and Heritage) after the construction phase is complete;
- Conduct surveys for cave-dependant microbats as part of the preclearing process. The survey would aim to carefully examine the creviced identified in Ropes Creek Bridge, and identify bats leaving their roost sites (if present), using bat echolocation recording and analysis; AND
- If microbats are detected, or considered highly likely to occur due to evidence of roosting, such as the presence of guano (faeces), a Bat Management Plan will be developed, in consultation with OEH. This is likely to include methods to exclude the bats from returning to roost, through blocking access when bats are active and foraging. Consideration will be given to the season, as species such as Eastern Bentwing-bat go into torpor, or have an inactive period, during winter.

## A.6 Conclusion

This findings of this addendum assessment indicate that the road construction works, including bridge demolition and construction works, is not likely to result in any significant impacts to threatened species, populations or ecological communities. This is provided that the proposed mitigation measures outlined in **Section A.5**, and also within the supporting documentation, are followed. The potential for roosting habitat for cave-dependant microbats, including the threatened Eastern Bentwing-bat, to occur within Ropes Creek Bridge must be investigated further prior to construction. Development of a Bat Management Plan will be incorporated into the pre-construction phase of works, and this will ensure that bats are excluded from the

structure prior to demolition, using methods approved by OEH as part of similar bridge works projects, such as the M2 Motorway Upgrade (Greg Richards and Associates 2011).

Although the proposed works will result in the removal of a relatively small area of regenerating woodland, they will also result in improved access and drainage in the Regional Park. This will have for long term benefits to biodiversity in the long-term due to improved park management.

The East West Connector road works should proceed with caution, and the implementation of appropriate mitigation measures, as outlined above.

## A.7 References

Cumberland Ecology (2014). Development within the Central Precinct, St Marys Property: Species Impact Statement. Carlingford Court, NSW, Cumberland Ecology.

Cumberland Ecology (2014). Ecological Assessment of Dunheved Precinct Haul Road Extension within the St Marys Property. Letter to Glyn Richard of Lend Lease.

Cumberland Ecology (2016). Ropes Crossing Connector Road Extension, St Marys Property. Prepared for Lend Lease.

Cumberland Ecology (2017). St Marys East - West Connector Road Upgrade Works - Supplementary Ecological Assessment. Letter to Sean Porter, Lend Lease. Epping, NSW.

Greg Richards and Associates (2011). M2 Motorway Upgrade: Short Report on Impact Mitigation for Bats in Culverts - Draft. ACT, Greg Richards and Associates Pty Ltd.

OEH (2013). Remnant Vegetation Mapping of the Cumberland Plain. O. o. E. a. Heritage. NSW.

*Appendix B*

# Assessments of Significance

## B.1 Microchiropteran Bats

The following Assessments of Significance demonstrates apply to the following species of cave-roosting microchiropteran bats (microbats) known to occur in the locality:

- Eastern Bentwing-bat (*Miniopterus orianae oceanensis (formerly M. schreibersii oceanensis*);
- Little Bentwing-bat (*Miniopterus australis*); and
- Southern Myotis (*Myotis macropus*).

The Eastern Bentwing Bat occurs along the east and north-west coasts of Australia. It roosts in caves, derelict mines, stormwater tunnels, buildings and other man-made structures. It forages above the canopy in forested areas. The Eastern Bentwing Bat forms maternity colonies in caves and populations usually centre on such caves (OEH 2012b). The Eastern Bentwing Bat is listed as Vulnerable on Schedule 2 of the TSC Act.

The Little Bentwing-bat occurs along the east coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW. It is generally found in well-timbered areas of moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. It roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings (OEH 2012h). The Little Bentwing-bat is listed as Vulnerable on Schedule 2 of the TSC Act.

The Southern Myotis occurs in coastal areas from north western Australia to south western Victoria (DEC (NSW), 2005i). It roosts close to water in caves, mine shafts, tree hollows, stormwater channels, buildings, under bridges and in dense foliage. It forages over streams and pools by raking its feet across the surface for insects and small fish (OEH 2012j) (DEC (NSW), 2005i). The Southern Myotis is listed as Vulnerable on Schedule 2 of the TSC Act.

a) *In the case of a threatened species, whether the lifecycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

Potential roosting habitat for cave-dwelling species has been identified within crevices beneath Ropes Creek Bridge. However, despite that lack of detailed survey data to confirm their absence, no evidence of habitat use, such as the presence of guano (faeces) was noted during the site inspection. As part of the mitigation measures for the subject site, a detailed pre-clearance survey is proposed, and development of a Bat Management Plan if individuals are found to roost in the bridge structure.

Extensive foraging habitat will be retained for these species throughout the 900ha Regional Park. South Creek and Ropes Creek will continue to provide foraging resources for the fishing bat and insectivorous bat species, and the improved drainage will benefit these species. For these reasons, it is not likely that the proposal will affect the life cycle of these species such that a viable local population is placed at risk of extinction.

b) *In the case of an endangered population, whether the lifecycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised,*

There are no populations of these species listed as endangered under the TSC 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.

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

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

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

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

All of the known and potential habitat for these species on the subject site will be removed or substantially modified as a result of the proposed development.

The potential foraging habitat for these species in the study area occurs in patches isolated from larger occurrences in the Regional Park. Any significant trees or patches of understorey that are retained within the subject site will remain isolated from the Regional Park.

The habitat to be removed, modified or isolated as a result of the proposed development is not important to the long-term survival of these species within the locality. It is unlikely that a large colony of microbats roost in the bridge, due to the lack of evidence of habitat use. Areas of high quality habitat occur within the Regional Park and will be conserved within the Regional Park and managed for conservation.

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

No critical habitat for these species has currently been identified by the Director-General of the OEH.

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

No recovery plans have been prepared for these species. No threat abatement plans are relevant to these 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.*

Clearing of native vegetation is a listed key threatening processes under the TSC Act. Limited mature trees occur on the subject site, which would provide foraging habitat for these species, and will be removed for the proposed development. However 900 ha of vegetation, including mature vegetation, will be conserved within the Regional Park. Future management of the Regional Park will also be designed to protect fauna habitats. The extent of clearing proposed is therefore not considered to be a threat to microchiropteran bat species in the precinct.

No other key threatening process that may be exacerbated by the proposed action will affect these species.

*Conclusion*

The proposed development will not have a significant impact on threatened microchiropteran bats.