Sydney Metro City & Southwest Tree Impact Assessment Report Northern Corridor Works

Chatswood to Sydenham

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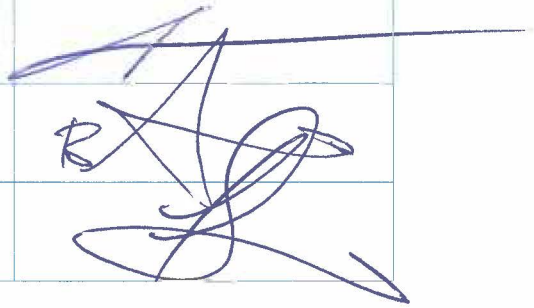
Author, Reviewer and Approver details					
Prepared by:	Andrew Hendy	Date:	11/09/2019	Signature:	
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Distribution
Transport for NSW, Sydney Metro

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Glossary

BC Act	NSW Biodiversity Conservation Act
EPBC Act	Federal Environment Protection and Biodiversity Conservation Act
C&SW	City & Southwest
CSSI	Critical State Significant Infrastructure
DCH	Diameter Chest Height
DBH	Diameter Breast Height
DRB	Diameter Root Base
DRP	Design Review Panel
EIS	Environmental Impact Statement
L/Sc Amen	Landscape Amenity Rating
PEA	Preliminary Environmental Assessment
SM	Sydney Metro
SRZ	Structural Root Zone
SULE	Safe Useful Life Expectancy
TPD	Transport Projects Division
TPZ	Tree Protection Zone
TfNSW	Transport for New South Wales

Executive Summary

This Tree Impact Assessment Report has been developed to inform the construction activities for the Sydney Metro City and South West Northern Rail Corridor works. The report includes a description of the likely impacts on existing trees resulting from the Northern Corridor Work (NCW) contracts and provides ecological assessments of this vegetation.

The Northern Corridor Works Site is within the rail corridor between Chatswood and Artarmon station. Impacts to vegetation are required to enable upgrades to the North Shore Line. Impacts are minimised where possible by assessing and implementing alternatives where suitable.

It is intended that the Tree Impact Assessment is a live document. As works progress and vegetation is identified as potentially being impacted at different sites, this report will be updated and reissued.

These trees are described in various arborist reports which can be found in the Appendices. Any recommendations in this tree impact assessment report will be implemented by the relevant contractor that are applicable to that stage.

Note: All existing trees to be retained within the site area must be protected in accordance with Australian Standard AS 4970 'Tree protection in development sites' to avoid and minimise impacts during site establishment and demolition.

1. Introduction

1.1. Purpose of Report

This Tree Impact Assessment Report has been developed to identify the impacts to existing trees within the rail corridor for the Northern Corridor Work sites as part of Sydney Metro railway works.

This report has been prepared to satisfy the requirements of EIS condition of approval E6. Surveys have been undertaken by independent, experienced and suitably qualified arborists. The table below outlines how E6 is being or will be met.

Table 1: Requirements of Condition E6

Condition E6	Compliance
The CSSI must be designed to retain as many trees as possible and provide replacement trees such that there a net increase in the number of trees.	Noted. Project is being designed as per the EIS and PIR. Any trees that require removing will be replaced such that there is a net increase in the number of trees.
The Proponent must commission an independent, experienced and suitably qualified arborist to prepare a comprehensive Tree Report before removing any trees as detailed in the EIS, as amended by the documents listed in A1. The Tree Report must include:	Noted. The arborist is independent, experienced and suitably qualified. The arborist has informed the preparation of this tree report which fulfils the condition requirement.
(a) a description of the condition of the tree(s) it's amenity and visual value;	A visual assessment to note the condition of the trees has been undertaken and is found in the arborist report included in the Appendices.
(b) consideration of all options to avoid tree removal, including relocation of services, redesign or relocation of ancillary components (such as substations, fencing etc.) and reduction of standard offsets to underground services; and	This is being undertaken as part of the detailed design process.
(c) measures to avoid tree removal, minimise damage to, and ensure the health and stability of those trees to be retained and protected. This includes details of any proposed canopy or root pruning, root protection zone, excavation, site controls on waste disposal, vehicular access, materials storage and protection of public utilities.	Trees that are to be retained are protected as per the recommendations of the Tree Impact Assessment Report. During the design process, every effort is made to retain significant tree/s where possible taking into consideration a number of criterion including safety, security, urban design, access, pedestrian flow etc.
In the event that tree removal cannot be avoided, then replacement trees are to be planted within, or in close proximity to the CSSI or other location in consultation with the Relevant Councils and agreed by the Secretary. The size of the replacement trees will be determined in consultation with the relevant Council.	Noted. This will be undertaken during the development of the station design and precinct plans.
A copy of the Tree Report must be submitted to the Secretary before the removal, damage and/or pruning of any trees, including those affected by the site establishment works.	Noted. This Tree Impact Assessment Report is being submitted for the proposed works and prior to any pruning/damage or removal is undertaken.
All recommendations of the Tree Report must be implemented by the Proponent, unless otherwise agreed by the Secretary.	Noted. Tree protection measures will be implemented as per the Tree Impact Assessment Report recommendations.
The Tree Report may be prepared for the entire CSSI or separate reports may be prepared for individual areas where tree removal and/or pruning is proposed.	The Tree Impact Assessment Report will be prepared as separate reports for sites dependent on the proposed work schedule.

1.2. Tree Amenity and Visual Value

The landscape amenity rating scale has been applied by independent arborists. The landscape amenity value provided by trees indicates:

- How highly the tree is regarded as part of the local landscape
- How the tree provides and enhances the visual quality of the site
- The importance of the tree's historical and cultural significance
- The provision of habitat and vegetation linkages within development sites, streetscapes, recreation areas or open space

The protection, preservation and enhancement of the landscape amenity, particularly community and residential amenity are a core objective of site design, land use and planning. Ratings are as follows:

1.2.1. No.1 Rating

- Recognised landmark
- Contributes to high visual amenity
- Major contribution to the sites landscape amenity
- Excellent condition, health, structure and form
- Forms part of a listed Critically Endangered Ecological Community
- Significant introduced native species that has successfully adapted to the site conditions and environment.
- Significant introduced evergreen or deciduous species that has successfully adapted to the site conditions and environment
- Indigenous to the locality
- Significant remnant species indigenous to site and locality
- Historic importance
- Cultural importance
- Recorded on significant tree register
- Listed as a threatened species
- Identified habitat tree
- Contributes to the bio-diversity of native vegetation within the locality

1.2.2. No.2 Rating

- Contributes to good visual amenity
- Makes substantial contribution to the sites landscape amenity
- Good/Fair condition, health, structure and form

- Forms part of a listed Critically Endangered Ecological Community
- Indigenous to the locality
- Remnant species indigenous to site and locality
- Introduced native species that has adapted to the site conditions and environment.
- Introduced evergreen or deciduous species that has adapted to the site conditions and environment
- Listed as a threatened species
- Possible habitat tree
- Contributes to the bio-diversity of native vegetation within the locality

1.2.3. No.3 Rating

- Minor contribution to the sites landscape amenity
- Fair/Average condition, health, structure and form
- Average/poor visual amenity
- Indigenous to the locality
- Introduced species
- Forms part of a listed Critically Endangered Ecological Community
- Growth and development suppressed
- Wounds, structural fault extensive storm damage
- Observance of Pests and disease impacting on health and condition.
- Hazardous trees

1.2.4. No.4 Rating

- Little or no contribution to the sites landscape amenity
- Poor/very poor visual amenity
- Growth and development over-mature / suppressed
- Major structural faults that cannot be mitigated
- Recognised invasive or weed species
- Dangerous tree
- Species unsuitable for site conditions and environment
- Species exempt LGA Tree Protection Order/Management Plan

1.3. Exclusions/Limitations

This report has been prepared based on the following exclusions and limitations:

- The tree impact assessments in the appendices are based on the following information:
  - Site survey information that either identifies global co-ordinates of each tree to be assessed, or drafts drawings using digital data (google earth)
  - Arborist tree survey information developed through a visual site inspection and assessment, that identifies key attributes and conditions of the existing trees, including tree protection zones and structural root zones
  - Planned demolition works, site establishment and utilities works as required for tunnel and station excavation and identified by the relevant contractor
- The report considers demolition, site establishment, station construction, utility and tunnelling works
- Tree impact assessments are made based on known impacts into the tree protection zones and structural root zones. The assessment considers known branch removal or pruning with consideration to the likely retention or required removal of the trees
- This assessment is based on the applicable Australian Standards
- This tree impact assessment is informed by an independent arborist and focuses on existing trees located within both publicly accessible areas and within project boundaries
- This tree assessment is specific to works associated with the demolition, tunnelling, central station and northern corridor contractors only. It is understood that a separate tree assessment will be undertaken by others to assess the long-term impacts and mitigation measures (including replacement planting) required due to the permanent works that will be constructed at each site
- The report includes justification of trees to be felled as provided by the contractors
- Work to identify locations for compensation planting, to satisfy the EIS condition of approval E6, will be done by others and are not addressed in this report
- The tree impact assessment has been completed using the information available at the time of writing. The known tree impacts are limited to advice provided by the contractors through verbal and written communications

2. Northern Corridor Works

2.1. Location

The Northern Corridor Works are located between Chatswood station and Artarmon Station within the rail corridor (Figure 1).

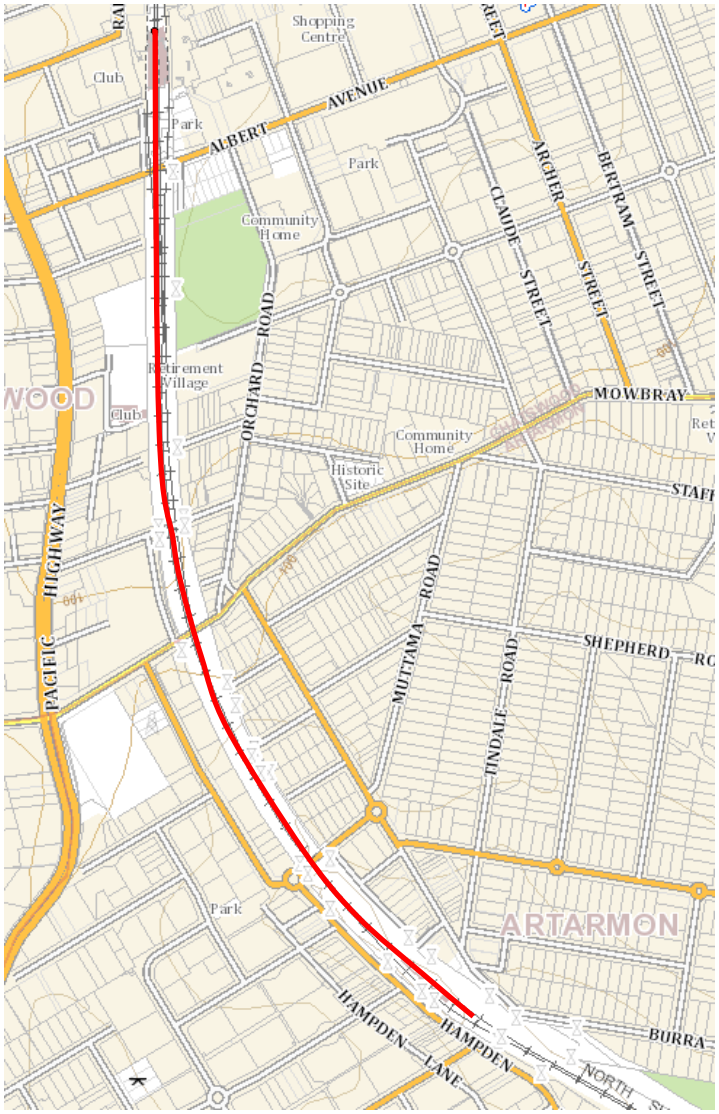

Figure 1: Location plan showing the section of the rail corridor impacted by the Northern Corridor Works

2.2. Existing Environment

Vegetation present within the inside of the rail corridor comprises of a variety of species located on both the western and eastern sides of the rail track.

2.3. Site Works

Northern Corridor Works (NCW) inside the rail corridor include:

- Retaining walls
- Corridor widening
- Slewing of tracks
- Railway works
- New noise barriers
- Bridgeworks and drainage works associated with the widening of the corridor
- Frank Channon walk (FCW) footing construction
- Piling Mats, 'boxout' and drill footings
- Alterations to overhead wiring layout
- Drainage/attenuation tank
- Some of the above works outside the rail corridor will encroach into the rail corridor between Nelson Street and Mowbray Road

2.4. Tree Impact Assessment

Sydney Metro are mindful of potential adverse impacts on neighbouring properties and are continuing to refine detailed design to reduce the removal of vegetation wherever possible, especially at boundaries with neighbouring properties.

Rail works undertaken within the rail corridor will likely be undertaken during rail possession weekends. To suit the construction program this work has been categorised into stages.

Stage 1
It is estimated that approximately 49 trees will be removed from the eastern side between Mowbray Road and Brand Street and 54 trees will be removed from the western side between Mowbray Road and Nelson Street (including one (1) tree on the Chatswood side of Nelson Street Bridge) to enable the scope of works listed above in section 2.3. The detailed design of the proposed scope of works has looked at trying to reduce the impact on exiting trees where possible, understanding though that the rail corridor is already a constrained site with an existing operational rail line and associated infrastructure (such as noise walls, overhead wire supports, perimeter fencing, signalling equipment etc).

Refer to Appendix A1 for the vegetation report associated with these works.

Stage 2

It is estimated that approximately 120 trees will be removed from the western side between Mowbray Road and Brand Street (Figure 2) to widen the rail corridor to allow for the inclusion of two new metro tracks. Trees will be retained where possible.

Refer to Appendix A2 for the Ecological Assessment undertaken to assess the impact of these works.

Figure 2: Vegetation along the western side of the rail corridor between Mowbray Road and Brand Street

Stage 3

Approximately 10 trees will be removed from the eastern side of the rail corridor between Mowbray Road and Nelson Street (Figure 3). These works will be undertaken to enable the construction of a noise wall to help mitigate against noise impacts on nearby sensitive receivers.

The area contains only planted species and does not comprise remnant native vegetation due to the species composition and their location within an artificial embankment constructed along the railway corridor.

Figure 3: Rail Corridor subject site between Mowbray Road and Nelson Street

Impacts to trees will also occur along FCW to support critical works to overhead wire structures and relocation of the retaining wall. The removal of trees will only occur within the red rectangle identified in Figure 4. Not all trees within the rectangle will be removed. Impacts will be limited where possible to those trees directly affected.

Although the trees along FCW are outside the rail corridor this vegetation is located on Sydney Trains property.

Vegetation within the subject site was found to consist of 'urban exotics and natives' Vegetation. The area contains only planted species and does not comprise remnant native vegetation due to the species composition and their location within an artificial embankment constructed along the railway corridor.

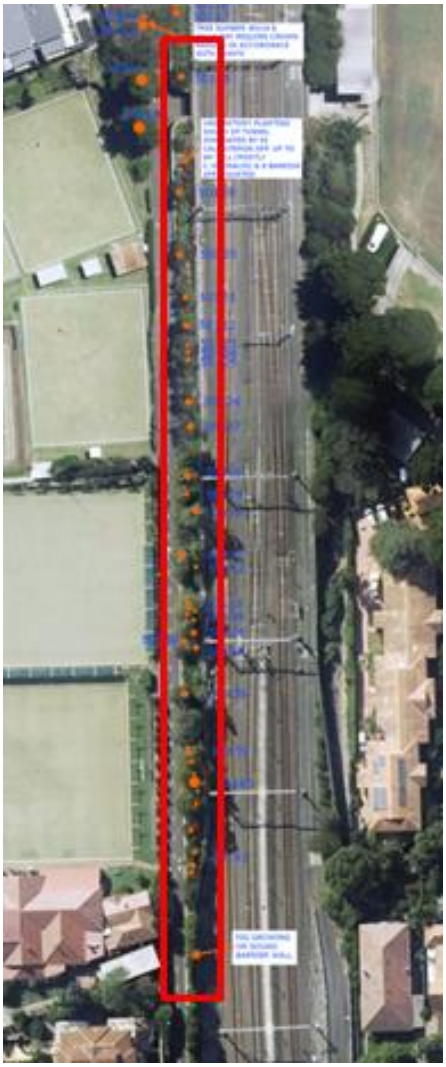

Figure 4 Frank Channon Walk. Tree removal will only occur within the red rectangle and will be limited to trees directly impacted by construction

Refer to Appendix C for further detail.

Stage 4

Works on the eastern side of the rail corridor between Brand Street and Drake Street, Artarmon require approximately 30 trees to be removed (native and introduced species).

The vegetation removal will be undertaken to enable piling works for the North Shore Line signalling upgrade.

All vegetation to be removed exists along narrow linear patches that are heavily degraded with the vegetation assessment identifying that the trees impacted would otherwise be unlikely to survive in the long term. Vegetation removal will occur within the red rectangle identified in Figure 5 below.

Figure 5 Impacted area between Brand Street and Drake Street

Refer to Appendix D for the Ecological Assessment of these works.

Stage 5

Works required with the signal power upgrade of the North Shore Line require limited disturbance to native vegetation in order to access and construct laydown areas. An estimated 7m^2 of 'urban exotics and natives' and 9m^2 of Coastal Sandstone Foreshores Forest are to be trimmed for the Project. These communities are not listed under the NSW Biodiversity Conservation Act (BC Act) or the Federal Environment Protection and Biodiversity Conservation Act (EPBC Act). No canopy trees will be removed for the Project and less than 10% of the total canopy cover within the site will be removed by the trimming of limbs.

Impact to vegetation is required to access and construct laydown areas. Vegetation removal will occur in the red rectangle in the figures below.

Figure 6: Areas 1 and 2

Figure 7: Area 3

Refer to Appendix E for the Ecological Assessment of these works.

Stage 6

In order to provide safe access to construct the hardstand laydown areas for possession and non-possession works, trimming of approximately 35.75m^2 of canopy and shrubs within the 'urban exotics and natives' community the occurs within Areas 1 and 2 of the site.

Figure 8 Valetta Lane

Figure 9 Mowbray Road to Brand Street

No threatened flora species were observed during the site assessment and none are considered likely to occur in this area due to its degraded nature as a result of previous clearing.

No alternatives are feasible as vegetation trimming is required to facilitate vehicular access/movements for material storage within laydown areas. The laydown areas have been identified as the most suitable sites given that the majority of the sites have been cleared previously and due to their proximity to worksites within the rail corridor for material storage required to facilitate construction works.

Refer to Appendix F for a description of the vegetation potentially impacted by these works.

Stage 7

Tree trimming is required to be undertaken between Drake Street and Nelson Street (Figure 10) and adjacent to the Chatswood oval (Figure 11) for the installation of fencing to service the Northern Corridor Works and to ensure safe site access.

Figure 10 Drake Street to Nelson Street

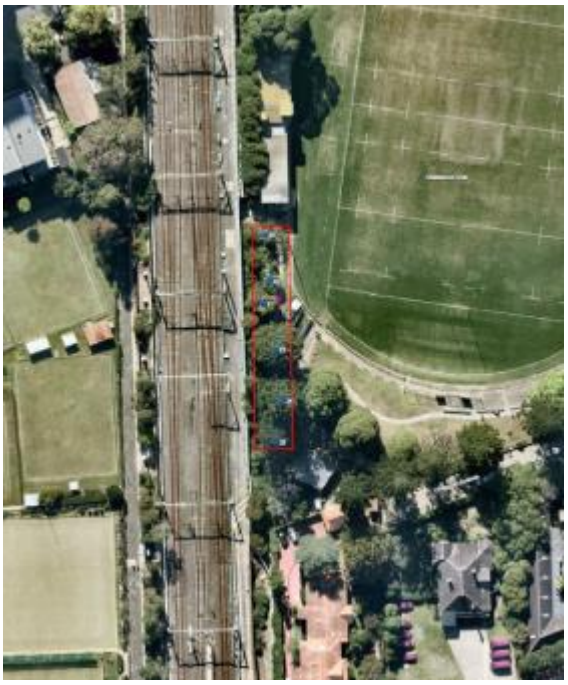

Figure 11 Chatswood Oval

No threatened flora species were observed during the site assessment and none are considered likely to occur in this area due to its degraded nature as a result of previous clearing

This community is not listed under the *BC Act* or *EPBC Act*. Due to the condition of the understorey, the site is considered unlikely to provide suitable habitat for any threatened flora species know to occurring the locality.

Fauna habitat features recorded during the survey included one drey suitable for the Common Ring-tail Possum (*Pseudocherius pereginus*) within dense areas of Morning Glory (*Impomoea indica*). The proposed works will remove the possum drey and potentially impact on any residing individuals.

The vegetation within the site primarily offers foraging habitat for a range of native birds, bats and arboreal mammals in the form of flowering plants. However, the site is highly degraded due to its location close to the rail corridor and surrounding urban areas, and therefore fauna are most likely only to use it on occasion.

Refer to Appendix G for the vegetation reports, including a general description of the potential for fauna within the rail corridor.

Stage 8

To enable works associated with the main North Shore line track realignment and Hopetoun Ave ramp demolition works as part of NCW Portion 7 scope of works, removal of approximately 52.95m^2 of canopy and shrubs within the 'urban exotics and natives' community that occurs within the Site between the Hopetoun Avenue access ramp and Chatswood Oval (Figure 12) will be necessary.

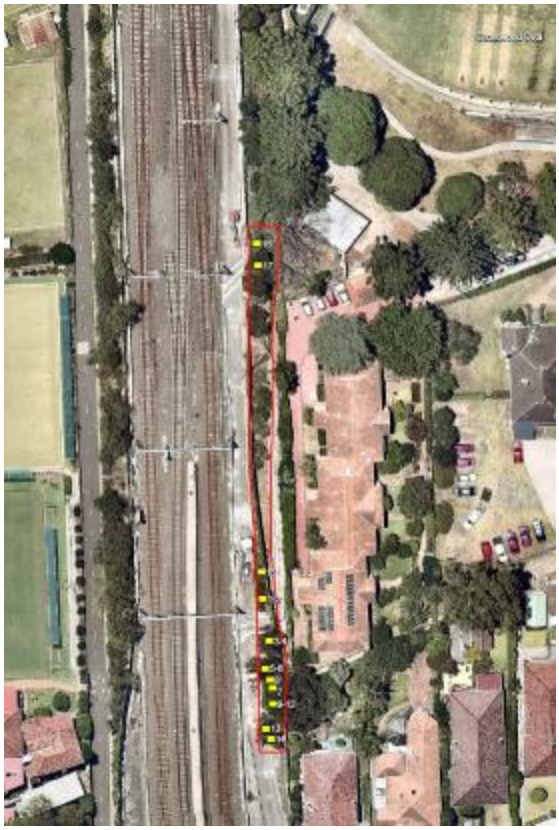

Figure 12 Hopetoun Avenue ramp north towards Chatswood Oval

No threatened flora species were recorded and none are considered likely to occur within the site due to its degraded nature as a result of previous clearing works. The vegetation communities previously mapped by the Office of Environment and Heritage (OEH) as part of the Native Vegetation of the Sydney Metropolitan Area project (OEH 2013) in areas near the Site include a mix of 'urban exotics and natives' species.

This community is not listed under the BC Act or EPBC Act. Field surveys confirmed that 'urban exotics and natives' occur within the site.

No important fauna habitat in the form of hollow-bearing trees, logs or bush-rock was identified from the site.

The proposed works will remove a small amount of foraging habitat for native fauna, but the habitat to be removed is unlikely to be important for the long-term survival of any fauna species as this type of habitat is widespread in the locality and large areas of similar vegetation will remain. The species that may potentially utilise this habitat are expected to be all highly mobile species (e.g. possums, birds and bats) and the habitat to be removed would likely only be utilised on occasion as part of a broader foraging range.

No alternatives are feasible as the vegetation is positioned within the re-aligned up track direction at Hopetoun Avenue in an already constrained rail corridor.

Refer to Appendix H for a description of the vegetation potentially impacted by these works.

Stage 9

To enable works associated with the installation of material storage containers for possession and non-possession related works associated with the Project, removal of approximately 26m^2 of 'urban exotics and natives' vegetation (removal of three trees and the trimming of two trees lateral branches), within the rail corridor adjacent to the St Leonards substation is required (Figure 13).

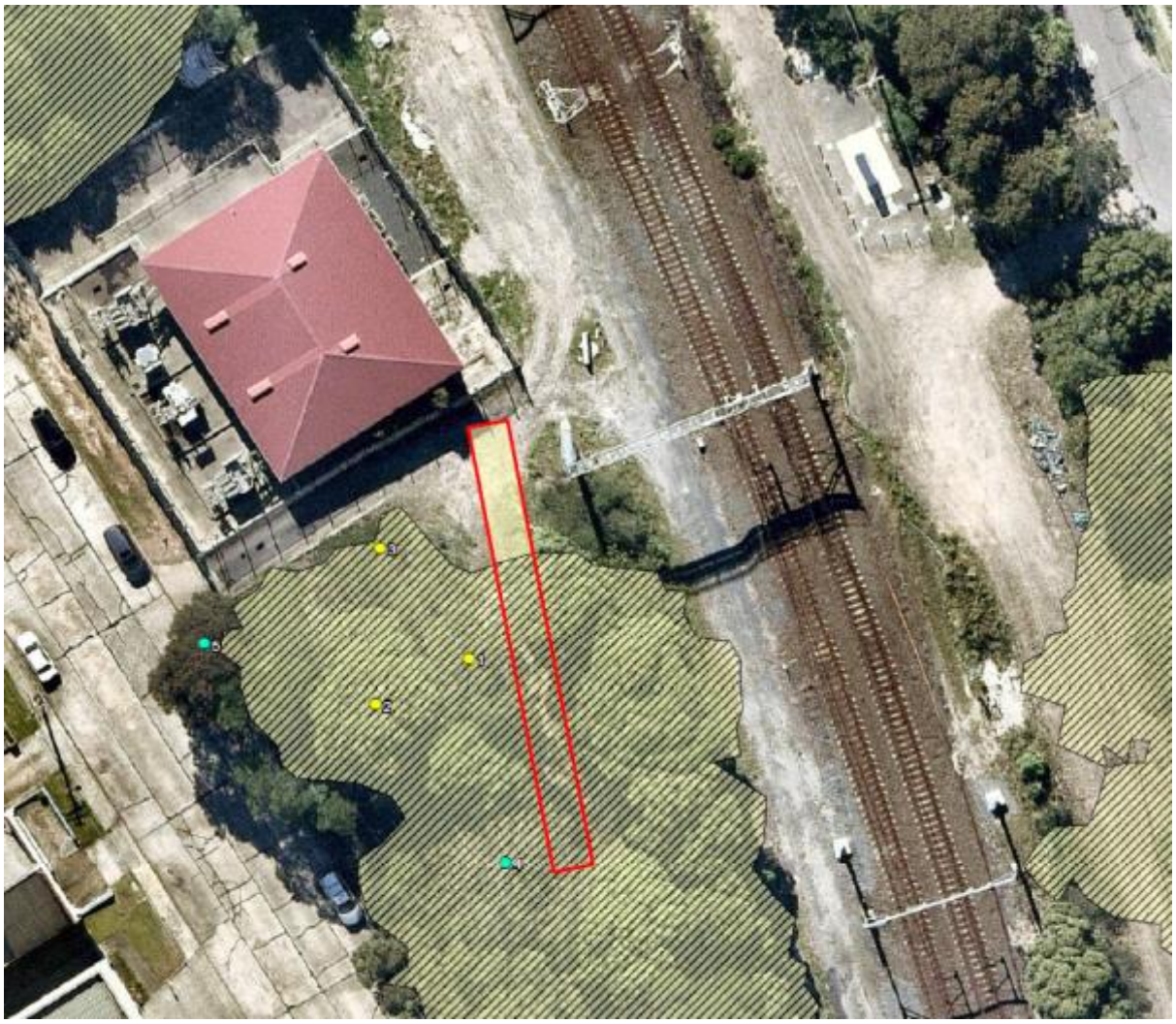

Figure 13 Area off Lambs Road adjacent to St Leonards substation

Vegetation mapping of the site has been undertaken previously by OEH as part of the Native Vegetation of the Sydney Metropolitan Area project (OEH 2013), which identifies the site as containing the vegetation community 'urban exotics and natives'. This community is not listed under the BC Act or EPBC Act. Previous field surveys confirmed that 'urban exotics and natives' occur within the site.

The proposed works are considered likely to have minimal impacts on the biodiversity values of the area. The habitat to be removed is likely to be utilised by urban adapted species for foraging on occasion as part of a much broader foraging range and is unlikely to be important to the long-term survival of any threatened species known to occur in the area. Based on the photos provided, none of the vegetation contains tree hollows or is considered likely to, due to the species and age of trees being impacted.

No alternatives are feasible as vegetation trimming is required to facilitate vehicular access/movements and positioning of storage containers. The area has been identified as the most suitable site, given that the site has been cleared previously and due to the proximity to worksites within the constrained rail corridor for material storage (e.g. cables and cable drums, sleepers, track, ballast and capping materials) required to facilitate project works.

Refer to Appendix I for a description of the vegetation potentially impacted by these works.

Stage 10

To enable works associated with the construction and upgrade of the rail corridor access point and gate which includes a new footpath and vehicular crossing. The installation of new wider rail corridor access gates which includes improvement to the driveway access ramp, incorporating drainage requirements, the removal of three (3) trees is required (Figures 14 and 15).

Figure 14 Tree T1 to be removed is a non-native Evergreen Alder (*Alnus Jorullensis*)

Figure 15 Tree T2 & T3 to be removed are a non-native Jacaranda (*Jacaranda Mimosifolia*) & a dead Bottle Brush (*Callistemon veminalis*).

The trees to be removed have been assessed by an arborist as follows:

- T1 is a mature example of Evergreen Alder (*Alnus jorullensis*) and presents well with good health and vigour. The tree is a non-native species to the area.

- T2 is a semi mature example of Jacaranda (*Jacaranda mimosifolia*). The species is non-native to the area but is still considered to be significant. The tree is in fair condition but has suffered multiple cambium wounds from vehicles entering/leaving the rail corridor.

- T3 is a dead example of a Bottle Brush (*Callistemon veminalis*).

The proposed works are considered likely to have minimal impacts on the biodiversity values of the area. The vegetation due to be removed is isolated and small in size, and is not listed as a threatened ecological community under either the BC Act or EPBC Act. No threatened flora species were recorded and none are considered likely to occur within the site due to its degraded nature as a result of previous clearing works. None of the vegetation was observed to contain tree hollows.

No alternatives are feasible as vegetation removal is required to facilitate the installation of new wider rail corridor access gates, which have been designed as part of the NCW scope of works to allow future unimpeded access to construction and maintenance vehicles/machinery. The current rail corridor access (including the access gate) at Drake St is not sufficient to allow this to occur.

Refer to Appendix J for a description of the vegetation impacted by these works.

Appendix A – Stage 1

Tree & Vegetation report

Sydney Metro
Chatswood site

Prepared by:
Stuart Pittendrigh ***FAILA MAIH M. Arb Aust.***
Registered Landscape Architect
Horticulturist/Consultant Arborist
September 2017

Introduction

This Tree and Vegetation Report was prepared at the request of Transport NSW ***Sydney Metro – City & Southwest*** to visit the subject site and prepare a visual assessment of the existing tree species and other vegetation growing within the rail corridor from Artarmon to Chatswood train stations.

Plans referred to in the preparation of this tree report include:

- Estimated tree count Chatswood Dive Site 246.

Stuart Pittendrigh conducted the site assessment on 27 September 2017

The site

Aims

The aims of this report are to:

- Identify the subject trees and vegetation within the areas highlighted on the aerial image provided.

Methodology

The tree / vegetation identification in this report is based on observations and findings from the specific site locations listed in this report.

The tree species were identified from ground observation using standard methods of visual assessment criteria. Field glasses were used as necessary in the identification of the vegetation.

Tree - Vegetation sites.

Western vegetated slope looking **north** from the Mowbray Road Bridge towards the Nelson St. Bridge.

- Acacia binerva
- Acacia decurrens
- Acacia elata
- Lophostemon confertus and
- Callistemon spp.

Eastern vegetated slope looking **north** from the Mowbray Road Bridge towards the Nelson St. Bridge.

- Cinnamomum camphora
- Eucalyptus species
- Casuarina spp.
- Pittosporun undulatum
-

Western vegetated slope looking **south** from the Nelson St Bridge St towards the Mowbray Rd. Bridge.

- Acacia spp.
- Ligustrum lucidum
- Callistemon spp.
- Cinnamomum camphora
- Lophostemon confertus

Eastern vegetated slope looking **south** from the Nelson St. Bridge towards the Mowbray Rd. Bridge.

- Cinnamomum camphora
- Eucalyptus species
- Casuarina spp.
- Pittosporun undulatum

Eastern vegetated slope looking **south** from the Mowbray Rd. Bridge and pedestrian access path to the east running parallel to rail corridor from Raleigh St to Artarmon Station.

- Lophostemon confertus
- Pittosporum undulatum
- Jacaranda mimosifolia
- Ceratopetalum gummiferum
- Syncarpia glomulifera
- Cotoneaster spp.
- Bambusa spp.
- Ipomoea indica
- Acer negundo
- Omalanthus populifolius
- Casuarinas pp.
- Acmena smithii.

Western vegetated slope looking **south** from the Mowbray Rd. Bridge towards Artarmon Station.

- Lophostemon confertus
- Pittosporum undulatum
- Acacia spp.
- Ceratopetalum gummiferum
- Ligustrum lucidum
- Cotoneaster spp.
- Callistemon salignus
- Acmena smithii
- Cupressus spp.

Frank Shannon Walk – plantings between sound barrier and rail tracks from Nelson Street to Chatswood Station.

- Eucalyptus saligna (1 only)
- Ficus pumila hedge
- Omalanthus populifolius - self sown
- Acacia longifolia – self sown
- Leptospermum spp.

Frank Shannon Walk – Landscaped area from masonry wall to sound barrier east of the pedestrian path from Nelson Street to Chatswood Station.

- Casuarins spp.
- Corymbia ficifoilia
- Callistemon viminallis
- Omalanthus populifolius
- Acacia longifolia
- Doryanthes excela
- Banksia serrata
- Acacia implexa
- Callistemon pinifolius

Chatswood oval precinct eastern slope .

- Omalanthus populifolius
- Melaleuca stypheloides
- Ligustrum lucidum
- Acacia spp.
- Lomandra
- Doryanthes excela
- Araucaria cunninghamii
- Araucaria bidwillii

- All trees / vegetation viewed were considered to be in good condition displaying structures and form typical of the species. Six species are considered undesirable invasive plants Cinnamomum camphora, Cotoneaster spp, Acer negundo, Ipomoea indica, Ligustrum lucidum and Bambusa spp.

We trust that this list of trees / vegetation addresses your immediate inquiry.

Stuart Pittendrigh *Consultant Arborist M. Arb. Aust. (#2003)*

Appendix B – Stage 2

NORTHERN CORRIDOR WORKS (NCW) – PORTION 7A

Ecological Assessment

For:

Laing O'Rourke Australia

February 2018

Final

PO Box 2474
Carlingford Court 2118

Report No. 16212RP2

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

Approved by:	Dr. David Robertson
Position:	Director
Signed:	David Robertson
Date:	*6 February, 2018*

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Glossary of Terms

DoEE	Commonwealth Department of the Environment and Energy
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GPS	Global Positioning System
LGA	Local Government Area
Locality	The area within a 5 km radius of the centre of the subject site
NCW	Northern Corridor Works
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
the proposed works	Clearing of all vegetation within the subject site for the construction of a noise wall
Subject site	Main North and North Shore Corridor Works (MNNSCW) Portion A, located in Chatswood at the east of the rail corridor located between Nelson Street and Mowbray Road, Chatswood (**Figure 1.1**)
TSC Act	NSW *Threatened Species Conservation Act 1995*

Executive Summary

S1 Introduction

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been commissioned by Laing O'Rourke Australia on behalf of Transport for NSW (TfNSW) to conduct an ecological assessment of upgrade works to be undertaken for the Northern Corridor Works (NCW) – Portion 7a, located in Chatswood (the 'subject site'). The purpose of this report is to describe the current biodiversity values of the subject site and to assess the potential impacts of the proposed works on flora and fauna, particularly threatened species, populations and communities that are listed under the former New South Wales (NSW) *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth Environment *Protection and Biodiversity Conservation Act 1999* (EPBC Act).

S2 Background

The subject site is located within the Willoughby Local Government Area (LGA). It is 0.09 ha in area and comprises of a strip of vegetation located between the railway and residential dwellings.

Transport for NSW (TfNSW) is proposing to undertake upgrade works within the subject site. This will involve the removal of all vegetation within the subject site for the construction of a noise wall.

S3 Methods

Database analysis, vegetation/flora surveys, fauna habitat surveys and incidental fauna observations were undertaken during February 2018. Flora surveys involved recording the presence of species using the random meander survey technique and targeted threatened flora surveys. All vascular plants were recorded or collected and later identified to species level where possible. Fauna surveys included a habitat assessment and any incidental observations of birds and other vertebrates.

S4 Results

Vegetation within the subject site was found to consist of Urban Native/ Exotic Vegetation. The area contains only planted species and does not comprise remnant native vegetation due to the species composition and their location within an artificial slope constructed along the railway corridor.

Surveys by Cumberland Ecology recorded 21 flora species. Of these, approximately 57% are exotic species and 43% are native (including non-endemic species). No threatened flora

species were recorded or are likely to occur within the subject site owing to its highly disturbed nature.

The desktop assessment showed that a number of threatened fauna species have been recorded from the locality and have the potential to occur within the subject site. From the desktop assessment and subsequent site inspections, three threatened fauna species are considered as having potential to occur within the subject site; the Powerful Owl (*Ninox strenua*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*). These potentially occurring fauna species are highly mobile and are expected to move between areas of remaining habitat within the immediate vicinity of the subject site and the wider area. These species are therefore not considered dependent upon the habitats present within the subject site.

S5 Impact Assessment

The proposed upgrade works will clear all vegetation within an area of 0.09 ha. No threatened ecological communities are present on or adjacent to the subject site. No threatened flora species have been recorded from the subject site, and due to the degraded nature of the subject site, it is considered unlikely that any occur. Accordingly, no impacts are predicted to occur to threatened ecological communities or threatened flora species as a result of the proposed development.

No threatened fauna species have been recorded, however some marginal foraging habitat for three threatened fauna species will be removed; the Powerful Owl (*Ninox strenua*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*). However none of these potentially occurring threatened fauna species are likely to be dependent on the habitats present within the subject site for their survival. These species are highly mobile species and are known to access resources from a wide area. Assessments of Significance have determined that the proposed works are unlikely to have a significant impact on these threatened fauna species.

S6 Mitigation Measures

A number of mitigation measures are recommended for the proposed project. The mitigation measures recommended to be implemented include:

- Vegetation protection;
- Erosion, sedimentation and pollution control; and
- Weed control measures.

S7 Conclusion

Despite the impacts of previous disturbance and the location of the subject site within a highly fragmented landscape, the proposed works will require the clearing of vegetation that forms marginal potential habitat for some threatened fauna species.

Patches of Urban Native/ Exotic Vegetation within an area of 0.09 ha will be cleared for the proposed upgrade works. The vegetation and habitat occurring within the subject site is highly modified as the subject site comprises of planted species, as well as exotic weeds.

Based upon the assessment undertaken in this report, no significant impact is expected to occur to threatened species, populations or communities as a result of the proposed upgrade works of the subject site. Therefore, the preparation of a Species Impact Statement (SIS) is not warranted. A referral to the Commonwealth Department of the Environment and Energy, under the EPBC Act is also not required.

Introduction

1.1 Purpose

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been commissioned by Laing O'Rourke Australia on behalf of Transport for NSW (TfNSW) to conduct an ecological assessment of upgrade works to be undertaken as part of the Northern Corridor Works (NCW) – Portion 7a, located on the eastern side of the railway corridor between Nelson Street and Mowbray Road, Chatswood. NCW is part of the Early and Enabling Works for the Sydney Metro City and South West project. The area where the proposed works will occur is the strip of vegetation on the eastern side of the railway line between Nelson Street and Mowbray Road (the 'subject site') (**Figure 1.1**).

The purpose of this report is to describe the current biodiversity values of the subject site and to assess the potential impacts of the proposed upgrades on flora and fauna, particularly threatened species, populations and communities that are listed under the former New South Wales (NSW) *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is noted that the NSW *Biodiversity Conservation Act 2016* (BC Act) has replaced the TSC Act as of 25 August 2017. This report has been prepared as per the requirements of the former TSC Act in accordance with transitional provisions of the BC Act.

The specific objectives of this report are to:

- Describe the vegetation communities on the subject site;
- Describe fauna habitats and fauna usage of the subject site;
- Identify any threatened species, populations or ecological communities (as listed under the TSC Act and/or EPBC Act) existing on the subject site;
- Assess the likelihood of occurrence of threatened species, populations or communities (as listed under the TSC Act and/or EPBC Act) within the subject site;
- Assess the potential impact of the project on threatened communities, flora and fauna, including the completion of Assessments of Significance under Section 5A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act); and

- Where relevant, recommend mitigation measures to reduce the impacts of the proposed works on biodiversity values.

1.2 Background

1.2.1 Site Description

The subject site is located on the eastern side of the railway line between Nelson Street and Mowbray Road in the Willoughby Local Government Area. The subject site forms the Northern Corridor Works (NCW) – Portion 7a and is approximately 0.09 ha in area. NCW is part of the Early and Enabling Works for the Sydney Metro City and South West project. The subject site comprises of a strip of vegetation between the railway line and residential dwellings between Nelson Street and Mowbray Road (**Figure 1.1**).

i. Zoning

The subject site is zoned as SP2 – Infrastructure under the *Willoughby Local Environmental Plan 2012* (**Figure 1.2**).

The objectives of SP2 zoning are:

- *To provide for infrastructure and related uses.*
- *To prevent development that is not compatible with or that may detract from the provision of infrastructure.*
- *To provide for classified roads.*

The following actions are permitted without consent:

- *Nil*

The following actions are permitted with consent

- *Roads; The purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose.*

1.2.2 Description of the Proposed Works

Within the subject site, all vegetation will require clearance for the installation of a noise wall.

Legend

Subject Site

Image Source:

Image © NearMap 2018
(Dated 18-1-2018)

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 50 m

I:\...\16212\Figures\RP2\20180202\Figure 1.1. Location_Subject Site

Figure 1.1. Location of the Subject Site

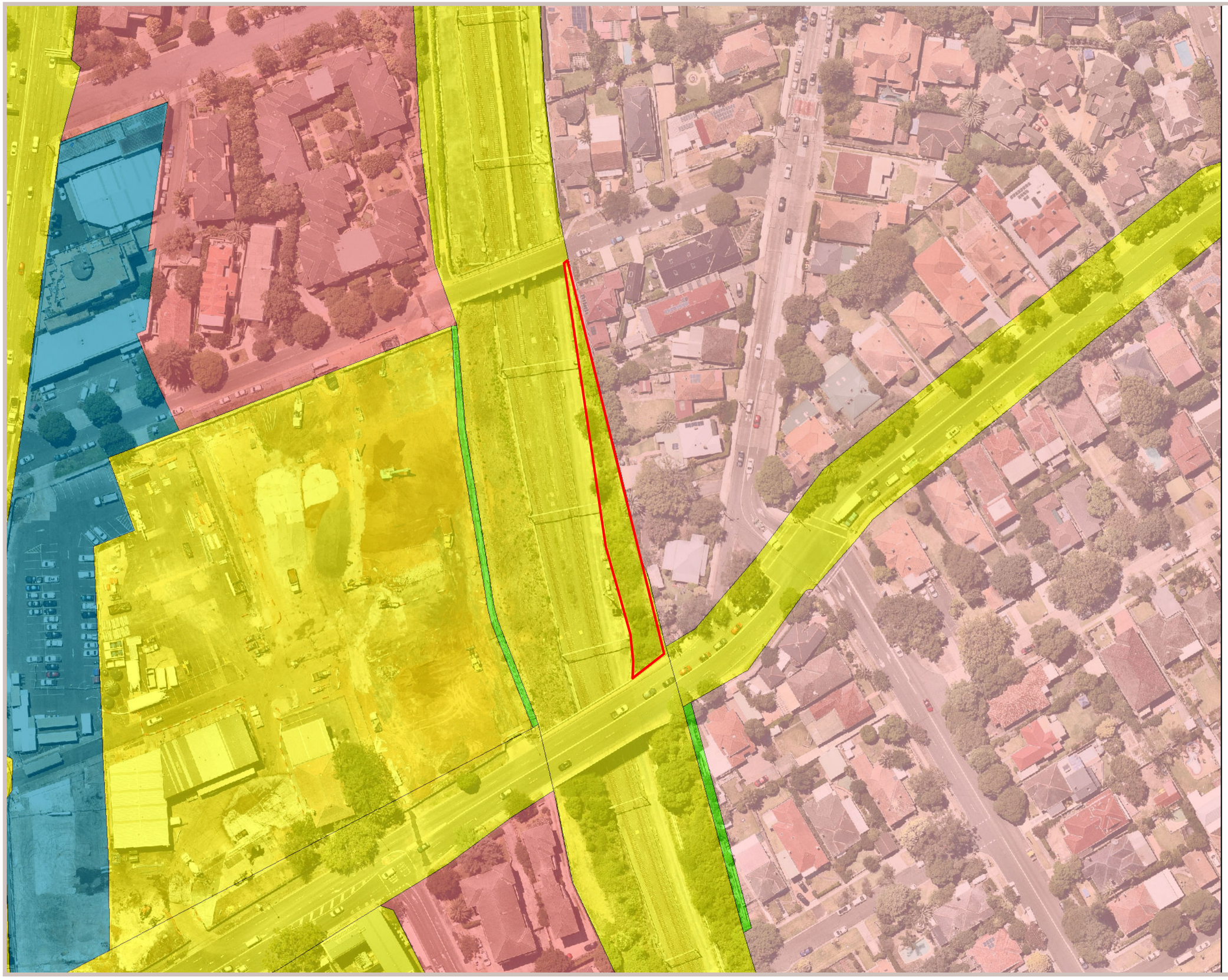

Figure 1.2. Land Zoning of the Subject Site

Chapter 2

Methodology

Methodology

2.1 Database Analysis and Literature Review

Database analysis was conducted for the locality using both the NSW Office of Environment and Heritage (OEH) Atlas of NSW Wildlife (OEH 2017a) and the Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool (DoEE 2017). The locality is defined as the area within a 5 km radius of the subject site. The Atlas of NSW Wildlife Database search was used to generate records of threatened flora and fauna species listed under the TSC Act within the locality of the subject site. The Protected Matters Search Tool generated a list of Matters of National Environmental Significance listed under the EPBC Act potentially occurring within the locality of the subject site. For the purpose of this report, marine animals have been excluded. The lists generated from these databases were reviewed against available knowledge of the subject site, in conjunction with the abundance, distribution and age of records, to ascertain the likelihood of occurrence of threatened species within the subject site.

2.2 Flora Survey

Flora surveys were undertaken within the subject site on 2 February 2018 by an ecologist. Surveys included vegetation mapping, random meander survey within the subject site and targeted threatened flora searches. Further details of each of the survey methods are provided below.

All vascular plants recorded or collected were identified using keys and nomenclature provided in Harden (1990-1993). Where known, taxonomic and nomenclatural changes have been incorporated into the results, as derived from PlantNET (Botanic Gardens Trust 2017).

2.2.1 Vegetation Mapping

Cumberland Ecology conducted vegetation surveys to revise and update the vegetation mapping prepared by OEH (2016). The vegetation within the subject site was ground-truthed to examine and verify the mapping of the condition and extent of the different vegetation communities. Where vegetation community boundaries were found to differ from the OEH mapping, the location of proposed new boundaries was recorded using a hand-held Global Positioning System (GPS) and mark-up of aerial photographs.

The resultant information was synthesised using a Geographic Information System (GIS) to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the subject site.

2.2.2 Random Meander Survey

Random meander surveys were undertaken to detect flora species located within the subject site. These surveys were undertaken within all vegetation communities.

2.2.3 Targeted Threatened Flora Surveys

Targeted threatened flora searches for species known from the locality were undertaken via random meander within areas of suitable habitat.

2.3 Fauna Survey

Fauna surveys were undertaken within the subject site on 2 Februrary 2018. Surveys included a fauna habitat assessment and recording of all fauna species observed. Further details of the survey methods are provided below.

2.3.1 Habitat Assessments

The assessment included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, fallen logs, bush rock and wetland areas such as creeks and soaks. Structural features considered included the nature and extent of the understorey and ground stratum and extent of canopy. The survey also included an assessment of the presence of habitat features suitable for use by threatened fauna species known from the locality.

2.3.2 Incidental Observations

Any fauna species that were observed, heard calling, or otherwise detected on the basis of tracks, scats or other signs, were recorded and listed in the total species list for the subject site.

2.4 Limitations

Vertebrate fauna and vascular flora of the locality are well known based upon a sizeable database of past records and various published reports. The surveys by Cumberland Ecology added to the existing database and helped to provide a clear indication of the likelihood that various species occur, or are likely to occur within the subject site. The data obtained from database assessment and surveys of the subject site furnished an appropriate level of information to support this assessment.

The weather conditions at the time of the flora surveys were generally favourable for plant growth and production of features required for identification of most species. Shrubs, grasses, herbs and creepers were readily identifiable in most instances. It is expected that

not all flora species present would have been recorded during surveys. Most of the subject site was inaccessible due to the location on a steep slope above the railway corridor, so the majority of flora species were recorded from a safe distance. In addition, owing to time constraints not all areas were able to be adequately surveyed. Despite this, it is considered that sufficient information has been collected to assess issues including conservation significance of the flora, condition and viability of bushland and likely impact on native vegetation. An assessment of the likelihood of occurrence of threatened flora species recorded within the locality of the subject site in the database searches was undertaken to supplement the flora survey.

Limited fauna surveys were undertaken for this assessment, which relied on database analysis and fauna habitat assessment. In general, opportunistic observations of fauna provide a "snapshot" of some of the fauna present that were active during time of the survey. The data produced by the surveys is intended to be indicative of the types of species that could occur and is not an absolute census of all vertebrate fauna species occurring within the subject site. Therefore not all fauna utilising the subject site are likely to have been recorded during surveys. An assessment of the likelihood of occurrence of threatened and migratory fauna species listed for the locality in the database searches was undertaken to supplement the fauna surveys. The combination of these techniques is considered appropriate for assessing the habitat values of the site for threatened fauna within the subject site.

Results

3.1 Vegetation Communities

Previous broad-scale mapping for the SMCMA Vegetation Mapping project (OEH 2016) indicates that part of the subject site is mapped as Urban Exotic/ Native vegetation. Surveys by Cumberland Ecology for this assessment identified that this is the only community is present within the subject site.

The distribution of this community is shown in **Figure 3.1**. A description of this vegetation community is provided below.

3.1.1 Urban Exotic/ Native Vegetation

TSC Act Status: Not listed

EPBC Act Status: Not listed

Urban Exotic/ Native Vegetation occurs throughout the entire subject site covering an area of 0.09 ha. It is evident that the area comprises of planted species and not remnant vegetation due to the species composition and location within an artificial slope constructed along the railway corridor (**Photograph 3.1**). Sub-canopy species include exotic *Jacaranda mimosifolia* (Jacaranda) and planted natives such as *Elaeocarpus reticulatus* (Blueberry Ash) and *Casuarina cunninghamiana* (River Oak). Shrubs and groundcover largely comprise of exotics such as *Lantana camara* (Lantana), *Jasminum polyanthum* (White Jasmine), *Ageratina adenophora* (Crofton Weed) as well as non-local native species including *Callistemon citrinus* (Crimson Bottlebrush) and *Kennedia rubicunda* (Dusky Coral Pea). (**Photograph 3.2**). a footpath (**Photograph 3.1**). The groundcover comprises of planted natives including *Lomandra longifolia* (Spiny-headed Mat-rush), and the exotic grass *Cenchrus clandestinus* (Kikuyu Grass). A flora species list is provided in **Appendix A**.

Photograph 3.1 Vegetation within the subject site (as seen from railway level)

Photograph 3.2 Predominantly exotic groundcover (as seen from top of slope)

3.2 Flora Species

3.2.1 General Species

There were 21 flora species recorded throughout the subject site during surveys. Species present within the subject site consists of a mix of exotics (57%) and native species including non-endemic planted species (43%). A flora species list is provided in **Appendix A**.

3.2.2 Threatened Species

No threatened flora species were recorded within the subject site. An analysis of the likelihood of occurrence on the subject site for each threatened flora species recorded within the locality is provided in **Appendix B**. It is unlikely that any threatened flora species naturally occur within the subject site as it is highly disturbed and the vegetation has been planted.

3.2.3 Priority Weeds

The *Noxious Weeds Act 1993* no longer applies and problematic weeds are handled under the NSW *Biosecurity Act 2015*. The subject site is located within the Priority region for Greater Sydney. Two species present within the subject site are listed as a priority weed for the Greater Sydney region: *Genista monspessulana* (Montpellier Broom) and *Lantana camara* (Lantana). Both of these species are also listed as a Weed of National Significance.

Figure 3.1. Vegetation Communities within the Subject Site

3.3 Fauna

3.3.1 Fauna Habitat

The subject site provides highly marginal value habitat for most fauna species. Although there are some exotic flora species within the subject site, these can provide potential foraging resources for nectivorous mammals and birds that may use the subject site from time to time as part of a larger foraging range. No nests or hollows were present within the subject site. No large remnant mature trees are present in the subject site.

3.3.2 General Species

No fauna were sighted within the subject site during the site inspection. However, it is likely that common urban adapted species such as the Noisy Miner (*Manorina melanocephala*) and Rainbow Lorikeet (*Trichoglossus haematodus*) would forage within the subject site on occasion.

3.3.3 Threatened Species

A number of threatened fauna species have been recorded from the locality and have the potential to occur within the subject site. An analysis of the likelihood of occurrence within the subject site for each threatened fauna species recorded or predicted to occur within the locality has been conducted and is presented in **Appendix C**. Three threatened fauna species are considered as having potential to forage within the subject site, the Powerful Owl (*Ninox strenua*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*). A discussion of these fauna species is provided below.

i. Powerful Owl

The Powerful Owl (*Ninox strenua*) is listed as Vulnerable under the TSC Act.

The Powerful Owl is distributed from Mackay to south western Victoria, mainly on the coastal side of the Great Dividing Range. This species occurs in many vegetation types from woodland and open sclerophyll to tall open forest and rainforest. It requires large tracts of native vegetation but can survive in fragmented landscapes. It roosts in dense vegetation and nests in large tree hollows (OEH 2017c).

Potential foraging habitat for this species occurs within the subject site. The species is known to utilise fragmented vegetation as well as larger tracts of forest and woodland. The subject site is considered to only provide marginal foraging habitat for this species. No large tree hollows are present so no breeding habitat is present. The Powerful Owl also would more likely nest within larger tracts of intact native vegetation.

ii. Grey-headed Flying-fox

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as Vulnerable under the TSC Act and the EPBC Act.

The Grey-headed Flying-fox is distributed along the east coast from Bundaberg in Queensland to Melbourne, Victoria. It is distributed as far west as the western slopes of the Great Dividing Range in northern NSW. It inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Grey-headed Flying-foxes migrate according to the availability of native fruits, nectar and pollen. They roost in large "camps" which are generally within 20 km of a food source (NSW Scientific Committee 2004). Grey-headed Flying-foxes live in specific roost camps, the locations of which are well-known within the Sydney region. No camps were observed within the subject site. The nearest camp is located approximately 5 km south-west of the subject site at Gladesville (Ku-ring-gai Bat Conservation Society 2017).

Potential foraging habitat for this species occurs within the subject site.

iii. Eastern Bentwing-bat

The Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) is listed as Vulnerable under the TSC Act.

It is distributed throughout the east and north-west coast of Australia. They hunt in forested areas above the canopy, and roost primarily in caves, however derelict mines, storm-water tunnels, buildings and other manmade structures can be utilised (OEH 2017b).

Potential foraging habitat for this species occurs within the subject site. The species could forage within the subject site as part of its wider foraging range. However, no roosting habitat occurs within the vegetation on the subject site.

Impact Assessment

4.1 Impacts to Vegetation Communities and Habitat

4.1.1 Vegetation Removal

The primary impact resulting from the proposed upgrade works is the clearing of vegetation and associated habitat within the subject site. Patches of vegetation within an area of 0.09 ha of Urban Exotic/ Native Vegetation will be removed within the subject site.

Past and current use of the subject site and surrounding areas has entailed clearing and modification of the majority of native vegetation. The vegetation present within the subject site is highly modified and located within an urbanised environment. The area comprises of planted species located within an artificial slope along a footpath. No remnant vegetation or Endangered Ecological Communities are present in the subject site.

4.1.2 Loss of Specific Habitat Features

In addition to the clearance of broad habitats within the subject site, the only specific fauna habitat features to be removed are nectar-producing trees. No nests or hollows were present at the time of the survey.

4.1.3 Impact on Remaining Vegetation and Habitats

The proposed works have the potential to indirectly impact remaining vegetation and habitats. These impacts include:

- Habitat fragmentation - affects biodiversity by reducing the amount of available habitat for some species to occupy due to increased distances between habitat patches;
- Edge effects – affects biodiversity through microclimatic changes in light, temperature, humidity and wind, which can favour a suite of different species and therefore cause significant changes to the ecology of the patch (Lindenmayer and Fischer 2006);
- Alteration to hydrological regimes – affects biodiversity through modification of hydrology necessary for vegetation and habitat survival, such as surface water drainage patterns; and

- Increased sedimentation and erosion – affects biodiversity through the smothering of vegetation, increasing turbidity of waterways and transportation of weed matter and nutrients; and
- Weeds and feral animals – affects biodiversity through increased competition for resources.

4.2 Impacts to Flora Species

No threatened flora species are present in the subject site or are likely to occur.

The project has the potential to result in a number of direct and indirect impacts to flora species in general within the subject site. In addition to the direct removal and modification of vegetation within the subject site, potential indirect impacts to flora species include:

- Weed invasion;
- Run-off, erosion and sedimentation; and
- Modification of microhabitat features resulting from long and short-term edge effects (e.g. changes in light filtration).

A number of mitigation measures are proposed to minimise these impacts. These are discussed further in **Chapter 5**.

4.3 Impacts to Fauna Species

The proposed works have the potential to result in a number of direct and indirect impacts to fauna species within the subject site. In addition to the direct removal and modification of vegetation within the subject site, potential indirect impacts to fauna species include:

- Habitat disturbance during the construction phase of the project (e.g. changes in noise levels);
- Runoff, erosion and sedimentation;
- Increased pollution;
- Hydrological changes resulting in altered fauna habitats; and
- Modification of microhabitat features resulting from long and short-term edge effects (e.g. changes in light filtration).

Three threatened fauna species are considered to have the potential to forage within the subject site; the Powerful Owl (*Ninox strenua*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (see ***Section 3.3.3***). The subject site provides potential foraging opportunities for these threatened fauna but is unlikely to exclusively support a local population of any threatened

fauna species. All three species are known to forage over a wide area, and may access resources from the subject site periodically. These species may forage on or near the subject site from time to time as part of a much larger range.

Assessments of Significance for the Powerful Owl (*Ninox strenua*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) have been conducted and are provided in **Appendix D**. These assessments indicate that the project will not significantly impact these species.

Mitigation Measures

A number of mitigation measures are recommended for the proposed project. These measures should be implemented to minimise impacts to biodiversity values within adjoining habitats.

5.1 Vegetation Protection

To avoid unnecessary removal or damage to any adjoining vegetation outside of the subject site, the clearing area should be clearly demarcated and signed, where appropriate, to ensure no vegetation beyond these boundaries is removed. Clearing works and equipment should be excluded from areas outside the clearing area. Site inductions are to be provided by the civil contractor to ensure all site workers and visitors are aware of any no-access areas.

5.2 Erosion, Sedimentation and Pollution Control

Potential impacts to flora and fauna occurring in the construction phase that can be managed include: run-off, sedimentation, erosion and pollution. To reduce sedimentation on the subject site, erosion control measures should be implemented. This includes minimising the amount of exposed soils on the site at any given time. All soil stockpiles should be adequately covered when not in use to prevent erosion during heavy rainfall. To reduce the potential impacts of sediment/erosion runoff, it is recommended that no works be undertaken during periods of heavy rainfall. Sediment fences should be established in all areas down slope of proposed works.

5.3 Weed Control Measures

Priority weed species occurring within the subject site should be managed in order to prevent further spread. Prior to any vegetation clearance, priority weeds should be demarcated in order for these to be disposed of separately from native material. All groundcover should be disposed of in a manner that will prevent spread as the majority of the vegetation comprises of exotic species.

Conclusion

Past and current use of the subject site has entailed clearing and modification of all the pre-existing vegetation and the vegetation present currently comprises a mix of planted native species and exotics species. Despite the impacts of previous disturbance and location within a highly fragmented landscape, the proposed upgrade works will require the clearing of planted vegetation that forms potential, albeit marginal habitat for some threatened fauna species.

Vegetation will be cleared for the proposed development, within an area of 0.09 ha of Urban Native/Exotic Vegetation. No threatened ecological communities are present on or adjacent to the subject site. No threatened flora species have been recorded or are predicted to occur.

Some threatened fauna species have been recorded from the locality, and three have the potential to forage within the subject site based on the presence of suitable habitat and records in the locality. These are the Powerful Owl (*Ninox strenua*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*). Assessments of significance indicate that no significant impact is predicted to occur to these species as a result of the proposal.

A range of mitigation measures are recommended to be implemented for the project including:

- Vegetation protection;
- Erosion, sedimentation and pollution control; and
- Weed control measures.

No significant impact is predicted to occur to threatened species, populations or communities as a result of the proposed development. Therefore, the preparation of a Species Impact Statement (SIS) is not warranted. A referral to the Commonwealth Department of the Environment and Energy, under the EPBC Act is also not required.

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OEH. 2017c. Powerful Owl - profile. Office of Environment and Heritage, Hurstville.

Appendix A
Flora Species List

Flora Species List

Table A.1 Flora species recorded within the subject site

Family	Exotic	Scientific Name	Common Name
Sub-canopy			
Bignoniaceae	*	*Jacaranda mimosifolia*	Jacaranda
Casuarinaceae		*Casuarina cunninghamiana*	River Oak
Elaeocarpaceae		*Elaeocarpus reticulatus*	Blueberry Ash
Fabaceae (Mimosoideae)		*Acacia decurrens*	Black Wattle
Myrtaceae		*Eucalyptus* sp.	
Pittosporaceae		*Pittosporum undulatum*	Native Daphne
Shrub			
Fabaceae (Faboideae)	*	*Genista monspessulana*	Montpellier Broom
Elaeocarpaceae		*Elaeocarpus reticulatus*	Blueberry Ash
Myrtaceae		*Callistemon citrinus*	Crimson Bottlebrush
Pittosporaceae		*Pittosporum undulatum*	Native Daphne
Verbenaceae	*	*Lantana camara*	Lantana
Groundcover			
Asteraceae	*	*Ageratina adenophora*	Crofton Weed
Asteraceae	*	*Ambrosia artemisiifolia*	Annual Ragweed
Asteraceae	*	*Bidens pilosa*	Cobblers Pegs
Brassicaceae	*	*Brassica fruticulosa*	Twiggy Turnip
Lomandraceae		*Lomandra longifolia*	Spiny-headed Mat-rush
Lomariopsidaceae	*	*Nephrolepis cordifolia*	Fishbone Fern
Poaceae		*Imperata cylindrica*	Blady Grass
Verbenaceae	*	*Verbena bonariensis*	Purpletop
Climbers/ Vines			
Apocynaceae	*	*Araujia sericifera*	Moth Vine
Araliaceae	*	*Hedera helix*	English Ivy
Fabaceae (Faboideae)		*Kennedia rubicunda*	Dusky Coral Pea
Oleaceae	*	*Jasminum polyanthum*	White Jasmine

**denotes exotic species*

Appendix B

Threatened Flora Likelihood of Occurrence

Threatened Flora Likelihood of Occurrence

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Apocynaceae	*Cynanchum elegans*	White-flowered Wax Plant	E	E	0	Usually associated with dry rainforest vegetation and in coastal communities. Can occur in clay influenced woodland associated with *Eucalyptus tereticornis* and *Corymbia maculata.*	Unlikely to occur. No suitable habitat present on the subject site.
Casuarinaceae	*Allocasuarina glareicola*		E	E	0	Found in open woodland with *Eucalyptus parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla* and *Melaleuca decora* on lateritic soil.	Unlikely to occur. No suitable habitat present on the subject site.
Dilleniaceae	^^*Hibbertia spanantha*	Julian's *Hibbertia*	CE	CE	1	Found on light clay soils occuring on a shale sandstone soil transition in forest with canopy species including *Eucalyptus pilularis, E. resinifera, Corymbia gummifera* and *Angophora costata.*	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Elaeocarpaceae	*Tetratheca glandulosa*		V		5	Found in various communities from heaths and scrub to woodlands/open woodlands, and open forest. Common woodland tree species include: *Corymbia gummifera, C. eximia, Eucalyptus haemastoma, E. punctata, E. racemosa,* and/or *E. sparsifolia*. Soils are generally shallow, consisting of a yellow, clayey/sandy loam.	Unlikely to occur. No suitable habitat present on the subject site.
Ericaceae	*Epacris purpurascens* var. *purpurascens*		V		14	Found in a range of habitat types, most of which have a strong shale soil influence.	Unlikely to occur. No suitable habitat present on the subject site.
Fabaceae (Mimosoideae)	*Acacia terminalis* subsp. *terminalis*	Sunshine Wattle	E	E	7	Coastal scrub and dry sclerophyll woodland on sandy soils .	Unlikely to occur. No suitable habitat present on the subject site.
Fabaceae (Mimosoideae)	*Acacia bynoeana*	Bynoe's Wattle	E	V	0	Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins,	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						edges of roadside spoil mounds and in recently burnt patches.	
Fabaceae (Mimosoideae)	*Acacia pubescens*	Downy Wattle	V	V	0	Grows in dry sclerophyll forest and woodland in clay soils.	Unlikely to occur. No suitable habitat present on the subject site.
Geraniaceae	*Pelargonium* sp. Striatellum (G.W.Carr 10345)	Omeo Stork's-bill	E	E	0	Has a narrow habitat that is usually just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities.	Unlikely to occur. No suitable habitat present on the subject site.
Haloragaceae	*Haloragodendron lucasii*		E	E	0	Occurs on Hawkesbury Sandstone in moist sandy loam soils, preferring sheltered aspects, generally inhabiting gentle slopes below cliff lines near creeks in association with high soil moisture and phosphorous levels. It is found in association with species	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						including *Eucalyptus piperita, Corymbia gummifera,* and *Callicoma serratifolia*. The species was assumed to be extinct until 1986 and is only known currently from nine sites across a 10 km range in the Hornsby-Gordon area of the northern suburbs of Sydney.	
Malvaceae	*Lasiopetalum joyceae*		V	V	1	Found in heath on sandstone.	Unlikely to occur. No suitable habitat present on the subject site.
Myrtaceae	*Callistemon linearifolius*	Netted Bottle Brush	V		2	Found in dry sclerophyll forest.	Unlikely to occur. No suitable habitat present on the subject site.
Myrtaceae	*Darwinia biflora*		V	V	148	Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	Unlikely to occur. No suitable habitat present on the subject site.
Myrtaceae	*Eucalyptus camfieldii*	Camfield's Stringybark	V	V	8	Found in exposed areas on sandstone ridges, slopes and plateaus near tall coastal heath or low open woodland.	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	V	V	5	Occurs in dry grassy woodland on shallow soils of slopes and ridges. Prefers infertile soils derived from granite or metasedimentary rock on the lower slopes of the landscape.	Unlikely to occur. No suitable habitat present on the subject site.
Myrtaceae	*Melaleuca deanei*	Deane's Paperbark	V	V	1	Occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone. Grows in wet heath on sandstone.	Unlikely to occur. No suitable habitat present on the subject site.
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	E	V	16	Rainforest species on sandy soils.	Unlikely to occur. No suitable habitat present on the subject site.
Myrtaceae	*Leptospermum deanei*		V	V	0	Occurs in woodland on sandy alluvial soil or sand over sandstone.	Unlikely to occur. No suitable habitat present on the subject site.
Myrtaceae	*Melaleuca biconvexa*	Biconvex Paperbark	V	V	0	Occurs in damp areas, often near watercourses, on alluvium soils over shale. Vegetation communities associated with the species include 'Eucalypt open-forest'	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						with Sydney Blue Gum (*Eucalyptus saligna*), Swamp Mahogany (*Eucalyptus robusta*) and Mountain Cedar Wattle (*Acacia elata*) and in 'Paperbark scrub' with Prickly-leaved Paperbark (*Melaleuca styphelioides*), Snow-in-summer (*Melaleuca linariifolia*), White Feather Honeymyrtle (*Melaleuca decora*), Sieber's Paperbark (*Melaleuca sieberi*) and *Melaleuca nodosa*.	
Myrtaceae	*Triplarina imbricata*	Creek Triplarina	E	E	0	Occurs along watercourses in low open forest with Water Gum (*Tristaniopsis laurina*) or in montane bogs, often with *Baekea amissa*.	Unlikely to occur. No suitable habitat present on the subject site.
Orchidaceae	*Caladenia tessellata*	Thick Lip Spider Orchid	E	V	0	Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						soil.	
Orchidaceae	*Cryptostylis hunteriana*	Leafless Tongue-orchid	V	V	0	Grows in swamp-heath on sandy soils	Unlikely to occur. No suitable habitat present on the subject site.
Orchidaceae	*Genoplesium baueri*	Bauer's Midge Orchid	E	E	0	Grows in sparse dry sclerophyll forest and moss gardens over sandstone.	Unlikely to occur. No suitable habitat present on the subject site.
Poaceae	*Deyeuxia appressa*		E	E	0	A highly restricted NSW endemic known only from two pre-1942 records in the Sydney area. Was first collected in 1930 at Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown. Was then collected in 1941 from Killara, near Hornsby. Possibly extinct in wild.	Unlikely to occur. No suitable habitat present on the subject site.
Proteaceae	*Grevillea parviflora* subsp. *parviflora*	Small-flower Grevillea	V	V	1	Grows in light sandy or clay soils over thin shales, often with lateritic ironstone gravels and nodules. Is known to occur in Shale/Sandstone Transition	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						Forest.	
Rutaceae	*Asterolasia elegans*		E	E	0	Grows in wet sclerophyll forest on moist hillsides, known from only one locality, north of Maroota.	Unlikely to occur. No suitable habitat present on the subject site.
Santalaceae	*Thesium australe*	Austral Toadflax	V	V	0	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	Unlikely to occur. No suitable habitat present on the subject site.
Thymelaeaceae	*Pimelea curviflora* var. *curviflora*		V	V	0	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.	Unlikely to occur. No suitable habitat present on the subject site.
Thymelaeaceae	*Pimelea spicata*	Spiked Rice-flower	E	E	0	On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark. n the coastal Illawarra it occurs commonly in Coast Banksia open woodland	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						with a better developed shrub and grass understorey. Coastal headlands and hilltops are the favoured sites.	

**CE = Critically Endangered, E = Endangered, V = Vulnerable*

Appendix C

Threatened Fauna Likelihood of Occurrence

Threatened Fauna Likelihood of Occurrence

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Amphibia							
Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E	V	0	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.).	Unlikely to occur. No suitable habitat present on the subject site.
Myobatrachidae	*Pseudophryne australis*	Red-crowned Toadlet	V		68	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters.	Unlikely to occur. No suitable habitat present on the subject site.
Myobatrachidae	*Heleioporus australiacus*	Giant Burrowing Frog	V	V	0	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Utilises soaks or pools within first or second order streams as breeding habitat. Commonly recorded from 'hanging swamp' seepage	Unlikely to occur. No suitable habitat present on the subject site.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						lines and where small pools form from the collected water.	
Myobatrachidae	*Mixophyes balbus*	Stuttering Frog	E	V	0	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	Unlikely to occur. No suitable habitat present on the subject site.
Aves							
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V	C	67	Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands.	Unlikely to occur. No suitable habitat present on the subject site. No wetlands or rivers within at least 1km of the subject site.
Accipitridae	*Hieraaetus morphnoides*	Little Eagle	V		2	Occurs in open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	Possible but unlikely. Highly mobile, aerial species that could potentially pass over the subject site, however the subject site is very small and disturbed and the species has not been recorded commonly

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
							within the locality. Species would more likely occur in larger tracks of intact vegetation such as Lane Cove National Park.
Accipitridae	*Pandion cristatus*	Eastern Osprey	V		4	Found at littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands.	Unlikely to occur. No suitable habitat present on the subject site. No wetlands or rivers within at least 1km of the subject site.
Anatidae	*Nettapus coromandelianus*	Cotton Pygmy-Goose	E		4	Freshwater lakes, lagoons, swamps and dams, particularly those vegetated with waterlilies and other floating and submerged aquatic vegetation.	Unlikely to occur. No suitable habitat present on the subject site.
Apodidae	*Hirundapus caudacutus*	White-throated Needletail		C,J,K	0	Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Occur over most types of habitat, particularly above wooded areas including open forest and rainforest, between trees or in clearings and below the canopy.	Unlikely to occur. No suitable habitat present on the subject site and no records within the locality. Species is aerial and would unlikely utilise the subject site

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
							directly.
Apodidae	*Apus pacificus*	Fork-tailed Swift		C,J,K	0	Forages aerially over a variety of habitats usually over coastal and mountain areas with a preference for wooded areas.	Unlikely to occur. No suitable habitat present on the subject site and no records within the locality. Species is aerial and would unlikely utilise the subject site directly.
Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	E	E	2	Occurs in freshwater wetlands, and more rarely, estuarine wetlands. It favours wetlands with tall, dense vegetation, and forages in shallow water up to a depth of 0.3m. It nests in deep vegetative cover over shallow pools.	Unlikely to occur. No suitable habitat present on the subject site.
Ardeidae	*Ixobrychus flavicollis*	Black Bittern	V		7	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.).	Unlikely to occur. No suitable habitat present on the subject site.
Artamidae	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V		2	In New South Wales the species is widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. The Dusky Woodswallow is	Unlikely to occur. No suitable habitat present on the subject site.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						found in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations.	
Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	E		1	Lives in open forest and woodlands with a sparse, grassy ground layer, and fallen timber. It feeds on insects and small insects and vertebrates including frogs, lizards, and snakes. Nesting is undertaken in a scrape or small bare patch.	Unlikely to occur. No suitable habitat present on the subject site.
Cacatuidae	^^*Calyptorhynchus lathami*	Glossy Black-Cockatoo	V		8	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (*Allocasuarina littoralis*), Forest She-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*) occur. Feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species). Dependent on large hollow-bearing eucalypts for nest sites.	Unlikely to occur. Highly marginal suitable habitat present on the subject site. Although there are scattered trees of *Allocasuarina littoralis*, site is too disturbed. Species would more likely occur in larger tracks of intact vegetation such as Lane Cove National Park.
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover		M	0	Found in wetlands, especially in arid areas, and prefers saline and brackish waters.	Unlikely to occur. No suitable habitat

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
							present on the subject site.
Charadriidae	*Pluvialis fulva*	Pacific Golden Plover		C,J,K	0	Occurs in coastal habitats and occasionally around inland wetlands. Inland areas usually consist of wetlands with muddy margins and short emergent vegetation.	Unlikely to occur. No suitable habitat present on the subject site.
Charadriidae	*Charadrius bicinctus*	Double-banded Plover		M	0	Found on coastal beaches, mudflats, sewage farms, river banks, fields, dunes, upland tussock grasses and shingle.	Unlikely to occur. No suitable habitat present on the subject site.
Charadriidae	*Charadrius mongolus*	Lesser Sand Plover	V	E,C,J,K	0	Beaches of sheltered bays, harbours and estuaries with large intertidal sand/mudflats.	Unlikely to occur. No suitable habitat present on the subject site.
Charadriidae	*Charadrius leschenaultii*	Greater Sand Plover	V	V,C,J,K	0	Sheltered sandy or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	Unlikely to occur. No suitable habitat present on the subject site.
Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	E		1	Occurs in floodplain wetlands of major coastal rivers along with minor floodplains, coastal sandplain wetlands and estuaries. Species builds nest in high in trees close to	Unlikely to occur. No suitable habitat present on the subject site.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						water.	
Columbidae	*Ptilinopus superbus*	Superb Fruit-Dove	V		8	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	Unlikely to occur. No suitable habitat present on the subject site.
Cuculidae	*Cuculus optatus*	Oriental Cuckoo		M	0	Inhabits forest and woodland.	Unlikely to occur. Although suitable habitat present on the subject site, the species is sparsely recorded in NSW.
Dasyornithidae	*Dasyornis brachypterus*	Eastern Bristlebird	E	E	0	Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	Unlikely to occur. No suitable habitat present on the subject site.
Dicruridae	*Rhipidura rufifrons*	Rufous Fantail		M	0	Inhabits rainforest, dense wet forests, swamp	Unlikely to occur.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						woodlands and mangroves, preferring deep shade, and is often seen close to the ground.	No suitable habitat present on the subject site.
Dicruridae	*Myiagra cyanoleuca*	Satin Flycatcher		M	0	Found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation.	Unlikely to occur. No suitable habitat present on the subject site.
Dicruridae	*Monarcha trivirgatus*	Spectacled Monarch		M	0	Prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	Unlikely to occur. No suitable habitat present on the subject site.
Dicruridae	*Monarcha melanopsis*	Black-faced Monarch		M	0	Wetter, denser forest, often at high elevations.	Unlikely to occur. No suitable habitat present on the subject site.
Laridae	*Sternula albifrons*	Little Tern	E	C,J,K	1	Occurs in sheltered coastal environments.	Unlikely to occur. No suitable habitat present on the subject site.
Meliphagidae	*Grantiella picta*	Painted Honeyeater	V	V	0	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	Unlikely to occur. No suitable habitat present on the subject

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
							site.
Meliphagidae	*Anthochaera phrygia*	Regent Honeyeater	CE	E	0	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak.	Unlikely to occur. No suitable habitat present on the subject site.
Motacillidae	*Motacilla flava*	Yellow Wagtail		C,J,K	0	Prefers moist areas, such as the edges of sewage works and exposed mudbanks.	Unlikely to occur. No suitable habitat present on the subject site.
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V		1	Eucalypt forest and woodlands, especially with rough barked species, smooth-barks with dead branches, mallee and acacia. Nests in living trees and feeds off insects in dead trees.	Unlikely to occur. No suitable habitat present on the subject site.
Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V		3	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Also utilises isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban	Possible but unlikely. Highly mobile, aerial species that may pass over the subject site on occasion but the subject site is very small and disturbed. Species would more likely occur in larger

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						trees. Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts.	tracks of intact vegetation such as Lane Cove National Park.
Psittacidae	*Lathamus discolor*	Swift Parrot	E	CE	6	Occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.	Unlikely to occur. No suitable habitat present on the subject site.
Recurvirostridae	*Recurvirostra novaehollandiae*	Red-necked Avocet		M	0	Found in large shallow freshwater or saltwater wetlands and estuarine mudflats.	Unlikely to occur. No suitable habitat present on the subject site.
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt		M	0	Occur at freshwater and saltwater marshes, mudflats, and the shallow edges of lakes and rivers.	Unlikely to occur. No suitable habitat present on the subject site.
Rostratulidae	*Rostratula australis*	Australian Painted Snipe	E	E	0	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Tringa stagnatilis*	Marsh Sandpiper		C,J,K	0	Inhabits fresh or brackish wetlands such as	Unlikely to occur.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						rivers, water meadows, sewage farms, drains, lagoons and swamps.	No suitable habitat present on the subject site.
Scolopacidae	*Tringa nebularia*	Common Greenshank		C,J,K	0	occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Tringa brevipes*	Grey-tailed Tattler		C,J,K	0	Found on sheltered coasts with reefs and rock platforms or with intertidal mudflats.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Philomachus pugnax*	Ruff		C,J,K	0	Found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Numenius phaeopus*	Whimbrel		C,J,K	0	Found mainly on the coast, on tidal and estaurine mudflats, especially near mangroves.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Limosa limosa*	Black-tailed Godwit	V	C,J,K	0	Sheltered bays, estuaries and lagoons with large intertidal mudflats.	Unlikely to occur. No suitable habitat present on the subject

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
							site.
Scolopacidae	*Limosa lapponica*	Bar-tailed Godwit		C,J,K	0	Found mainly in coastal habitats including large intertidal sandflats, estuaries, bays and lagoons. Often occurs at seagrass and sometimes in nearby saltmarsh.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Gallinago hardwickii*	Latham's Snipe		C,J,K	0	Inhabit open, freshwater wetlands with low, dense vegetation.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Calidris ruficollis*	Red-necked Stint		C,J,K	0	Occur on the coast, in sheltered inlets, bays, lagoons, estuaries, intertidal mudflats and protected sandy or coralline shores.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Calidris melanotos*	Pectoral Sandpiper		J,K	0	Found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper		C,J,K	0	Prefers the grassy edges of shallow inland freshwater wetlands, but also occurs at other habitats including mangroves, beaches, mudflats and sewage farms.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Arenaria interpres*	Ruddy Turnstone		C,J,K	0	Mainly inhabits exposed rocks or reefs, often	Unlikely to occur.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						with shallow pools, and on beaches.	No suitable habitat present on the subject site.
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper		C,J,K	0	Inhabits coastal or inland wetlands, both saline or fresh. It is more commonly found on muddy edges or rocky shores.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Numenius madagascariensis*	Eastern Curlew		CE,C,J,K	0	Prefers sheltered coasts, especially estuaries, bays, harbours inlets and lagoons. Also known to occur in sewage farms, wetlands and mangroves. Species roosts on sandy spits and in low Saltmarsh or mangroves.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Limosa lapponica baueri*	Bar-tailed Godwit		V,C,J,K	0	Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Calidris tenuirostris*	Great Knot	V	CE,C,J,K	0	Intertidal mudflats or sandflats.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	E	CE,C,J,K	0	Inhabits intertidal mudflats of estuaries,	Unlikely to occur.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						lagoons, mangroves, as well as beaches, rocky shores and around lakes, dams and floodwaters	No suitable habitat present on the subject site.
Scolopacidae	*Calidris canutus*	Red Knot		E,C,J,K	0	Found on the coast in sandy estuaries with tidal mudflats.	Unlikely to occur. No suitable habitat present on the subject site.
Strigidae	*Ninox connivens*	Barking Owl	V		11	Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Denser vegetation is used occasionally for roosting. Nests in hollows of large, old eucalypts. Requires very large permanent territories in most habitats due to sparse prey densities.	Unlikely to occur. No suitable habitat present on the subject site.
Strigidae	*Ninox strenua*	Powerful Owl	V		389	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Also occurs in fragmented habitats.	Potential to occur. Known to utilise fragmented landscapes, may utilise the subject site as part of a larger foraging area. No breeding habitat present.
Tytonidae	*Tyto tenebricosa*	Sooty Owl	V		2	Found in rainforest, including dry rainforest,	Unlikely to occur.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						subtropical and warm temperate rainforest, as well as moist eucalypt forests, and roosts in the hollow of a tall forest tree/heavy vegetation.	No suitable habitat present on the subject site.
Mammalia							
Burramyidae	*Cercartetus nanus*	Eastern Pygmy-possum	V		3	Species is found in a broad range of habitats from rainforest to wet and dry sclerophyll forests through to woodland and heath. Woodland and heath habitats are preferred. They shelter in tree hollows, rotten stumps, holes in the ground, abandoned birds nests and Ringtail Possum dreys, and thickets of vegetation. Tree hollows are preferred for nesting but the species will also nest under tree bark and shredded bark in tree forks.	Unlikely to occur. No suitable habitat present on the subject site.
Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V	E	5	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den	Unlikely to occur. No suitable habitat present on the subject site.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						sites. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares; usually traverse their ranges along densely vegetated creeklines.	
Macropodidae	*Petrogale penicillata*	Brush-tailed Rock-wallaby	E	V	0	Occupies rock outcrops, escarpments and cliffs with features such as caves, fissures and ledges. Browses on adjacent vegetation. Has a home range of about 15 ha and shelters in caves.	Unlikely to occur. No suitable habitat present on the subject site.
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V		1	Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	Unlikely to occur. Highly marginal suitable habitat present on the subject site and species not commonly known from locality.
Muridae	*Pseudomys novaehollandiae*	New Holland Mouse		V	0	Occurs in open habitats (heathland, woodland and forest) with a heath understorey and vegetated sand dunes. The species prefers deep soft top soils in order to burrow.	Unlikely to occur. No suitable habitat present on the subject site.
Peramelidae	*Isoodon obesulus obesulus*	Southern Brown Bandicoot (eastern)	E	E	1	Within NSW, the species is rare and almost exclusively restricted to the coastal fringe of	Unlikely to occur. No suitable habitat

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						the state, from the southern side of the Hawkesbury River in the north to the Victorian border in the south. More specifically, the subspecies is considered to occur primarily in two areas: Ku-ring-gai Chase and Garigal National Parks; and in the far south-east corner of the state. Occurs within their distribution in a variety of habitats including heathland, shrubland, sedgeland, heathy open forest and woodland.	present on the subject site.
Petauridae	*Petaurus australis*	Yellow-bellied Glider	V		1	Occurs in high areas of rainfall in tall mature eucalypt forest where soils are nutrient rich. Dens in the hollows of large trees.	Unlikely to occur. No suitable habitat present on the subject site.
Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V	0	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	Unlikely to occur. No suitable habitat present on the subject site.
Pseudocheiridae	*Petauroides volans*	Greater Glider		V	0	Occurs in eucalypt forests and woodlands	Unlikely to occur.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						from north-eastern Queensland to the Central Highlands of Victoria. The species has a relatively small home range which consists of numerous tree hollows.	No suitable habitat present on the subject site.
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V	1225	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range. No roost camps present. Records of the species are scattered throughout the locality.
Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	V	0	Found in well-timbered areas containing gullies. Roosts in caves, crevices in cliffs and old mine workings frequenting low to mid-elevation dry open forest and woodland close to these features.	Unlikely to occur. No suitable habitat present on the subject site. No roost habitat nearby.
Vespertilionidae	*Miniopterus australis*	Little Bentwing-bat	V		1	Moist eucalypt forest, rainforest or dense coastal banksia scrub. Little Bentwing-bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage	Unlikely to occur. No suitable habitat present on the subject site.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						for small insects beneath the canopy of densely vegetated habitats.	
Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V		46	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range. No roosting habitat present. Records of the species are scattered throughout the locality.
Vespertilionidae	*Myotis macropus*	Southern Myotis	V		10	Roosts close to water in caves, mines, tree hollows, storm water channels, bridges, buildings or in dense foliage. Forages over streams and pools catching insects and fish.	Unlikely to occur. No suitable habitat present on the subject site. No riparian habitat present on or adjacent to the subject site.
Reptilia							
Elapidae	*Hoplocephalus bungaroides*	Broad-headed Snake	E	V	0	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in	Unlikely to occur. No suitable habitat present on the subject site.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						crevices or hollows in large trees within 500m of escarpments in summer.	
Varanidae	*Varanus rosenbergi*	Rosenberg's Goanna	V		3	Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component.	Unlikely to occur. No suitable habitat present on the subject site.
Gastropoda							
Camaenidae	*Pommerhelix duralensis*	Dural Woodland Snail		E	0	Occurs in shale-influenced-habitats, sheltering under rocks or inside curled-up bark. Requires forested habitats that have good native cover and woody debris.	Unlikely to occur. No suitable habitat present on the subject site.

**CE = Critically Endangered, E = Endangered, V = Vulnerable, C = Listed on China Australia Migratory Bird Agreement, J = Listed on Japan Australia Migratory Bird Agreement, K = Listed on Republic of Korea Australia Migratory Bird Agreement*

Appendix D

Assessments of Significance (7 Part Tests)

Assessments of Significance (7 Part Tests)

D.1 Powerful Owl

Background

The Powerful Owl is distributed from Mackay to south western Victoria, mainly on the coastal side of the Great Dividing Range. This species occurs in many vegetation types from woodland and open sclerophyll to tall open wet forest and rainforest. It requires large tracts of native vegetation but can survive in fragmented landscapes. It roosts in dense vegetation and nests in large tree hollows. The Powerful Owl is listed as Vulnerable under the TSC Act (OEH 2017c).

The species could potentially occur on the subject site as part of a wider foraging range. No breeding habitat is present as no large hollows occur on the subject site.

Assessment of Significance

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

The Powerful Owl could potentially use the subject site as foraging habitat as part of a much larger foraging range. They are a highly mobile species that accesses resources from across a wide area and would not depend upon resources contained on the subject site for its survival. The proposal is not likely to place a viable local population of the species at risk of extinction as only highly marginal foraging habitat is present. No breeding habitat occurs within the subject site as large hollows are absent. The Powerful Owl would also likely utilise much larger areas of intact vegetation in the locality such as Lane Cove National Park.

(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*

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.

Vegetation within an area of 0.09 ha will be cleared for the proposed works. This represents a relatively small area of potential foraging habitat within the locality for the Powerful Owl. The majority of the vegetation comprises of shrubs and groundcover which would not be utilised directly by the species.

The habitat occurring within the subject site comprises of a narrow strip of planted vegetation which is already relatively fragmented. The proposed works will clear all vegetation within the subject site; however it will not increase fragmentation substantially relative to current levels. The Powerful Owl is highly mobile and would be able to move across the remaining fragments.

The proposed action will not remove, modify, fragment or isolate important habitat. The proposed works will require the clearing of marginal potential foraging habitat. The subject site would only likely provide foraging habitat as part of a wider range within the locality. Much larger areas of potential habitat occur throughout the wider locality in other areas including Lane Cove National Park. These tracts of vegetation would provide more favourable roosting and foraging habitat for the Powerful Owl. It is therefore considered that the habitat provided on the subject site is not important for the long-term survival of the species in the wider locality.

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

There is no critical habitat listed for the species 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 been prepared for large forest owls, including the Powerful Owl (DEC (NSW) 2006). The ultimate aim of the recovery plan is to ensure that the species it covers persist in the wild in NSW in each region where they presently occur. The proposal is not considered to threaten the objectives of that Recovery Plan. No Threat Abatement Plan exists for this species.

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

The following key threatening processes are likely to affect the Powerful Owl:

- ‘Clearing of native vegetation’;
- ‘Invasion and establishment of exotic vines and scramblers’; and
- ‘Invasion of native plant communities by exotic perennial grasses’.

The key threatening process of ‘Clearing of native vegetation’, potentially impact habitat for the species further than current conditions. However, the vegetation on the subject site is not considered to constitute significant habitat for the Powerful Owl. The clearing of planted native vegetation is not likely to significantly impact habitat for the potentially occurring Powerful Owl, owing to its partially fragmented and degraded nature. The proposed works are not considered to exacerbate the key threatening process of invasion by exotics further than current conditions.

Conclusion

The proposed works will only clear a marginal area of potential foraging habitat (less than 0.09 ha), mainly within areas that have already been previously disturbed. No significant habitat for the Powerful Owl will be removed within the subject site. The proposal is not likely to place a viable local population of the species at risk of extinction. The Powerful Owl is a highly mobile species and would be expected to move between areas of remaining habitat within the immediate vicinity of the subject site and wider area. The project is not likely to have a significant detrimental impact upon the Powerful Owl.

D.2 Grey-headed Flying-fox

Background

The Grey-headed Flying-fox is distributed along the east coast from Bundaberg in Queensland to Melbourne, Victoria. It occurs as far west as the western slopes of the Great Dividing Range in northern NSW. It occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Grey-headed Flying-foxes migrate according to the availability of native fruits, nectar and pollen. They roost in large “camps” which are generally within 20 km of a food source (NSW Scientific Committee 2004). The Grey-headed Flying-fox is listed as Vulnerable under the TSC Act and the EPBC Act.

Potential foraging habitat occurs within the subject site, but no roosting habitat occurs as no camps are present on or near the subject site.

Assessment of Significance

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

The Grey-headed Flying-fox is likely to use the subject site as foraging habitat as part of a much larger foraging range. They are a highly mobile species that accesses resources from across a wide area (between 20 – 50km from roost camp) and would not depend upon

resources contained on the subject site for their survival. The proposal is not likely to place a viable local population of the species at risk of extinction as only a relatively small area of disturbed vegetation (less than 0.09 ha) located adjacent to a railway line will be removed. The species is known to forage on fragmented street trees as well as much larger areas of intact vegetation. No roost camps are present on or near the subject site. The nearest camp is located approximately 5 km south-west of the subject site at Gladesville (Ku-ring-gai Bat Conservation Society 2017).

(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*

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.*

Patches of vegetation within an area of 0.09 ha will be cleared for the proposed works. This represents a relatively small area of potential foraging habitat within the locality for the Grey-headed Flying-fox.

The habitat occurring within the subject site comprises of a narrow strip of planted vegetation which is already relatively fragmented. The proposed works will clear all vegetation within the subject site, however it will not increase fragmentation substantially beyond current levels. The Grey-headed Flying-fox is highly mobile and would be able to move across the remaining fragments.

The proposed action will not remove, modify, fragment or isolate important habitat. The proposed works will require the clearing of marginal potential foraging habitat. The subject

site would only likely provide foraging habitat as part of a wider range within the locality. Much larger areas of potential habitat occur throughout the wider locality in other areas including Lane Cove National Park. These tracts of vegetation would provide more favourable foraging habitat for the Grey-headed Flying-fox. It is therefore considered that the habitat provided on the subject site is not important for the long-term survival of the species in the wider locality.

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

There is no critical habitat listed for this species 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 National Draft Recovery Plan for the Grey-headed Flying-fox (DECCW 2009) has been prepared. A number of threats to this species are listed in the Plan, including the removal of critical habitat. The proposal will remove a small amount of highly marginal foraging habitat for this species, which is not critical habitat and is well-represented throughout the locality. No roost camps are present on or adjacent to the subject site. Therefore the proposal is not considered to threaten the objectives of the Recovery Plan.

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

The following key threatening processes are likely to affect the Grey-headed Flying-fox:

- 'Clearing of native vegetation';
- 'Invasion and establishment of exotic vines and scramblers'; and
- 'Invasion of native plant communities by exotic perennial grasses'.

The key threatening process of 'Clearing of native vegetation', potentially impact habitat for the species further than current conditions. However, the vegetation on the subject site is not considered to constitute significant habitat for the Grey-headed Flying-fox. The clearing of planted native vegetation is not likely to significantly impact habitat for the Grey-headed Flying-fox, owing to its partially fragmented and degraded nature.

The proposed works are not considered to exacerbate the key threatening process of invasion by exotics further than current conditions.

Conclusion

The proposed works will only clear a marginal area of habitat (less than 0.09 ha), within an area that has already been previously disturbed. No significant habitat for the Grey-headed Flying-fox will be removed within the subject site. The proposal is not likely to place a viable local population of the species at risk of extinction. It is highly mobile and would be expected to move between areas of remaining habitat within the immediate vicinity of the subject site

and wider area. The project is not likely to have a significant impact upon the Grey-headed Flying-fox.

D.3 Eastern Bentwing-bat

Background

The Eastern Bentwing-bat occurs throughout the east and north-west coast of Australia. They hunt in forested areas above the canopy, and roost primarily in caves, however derelict mines, storm-water tunnels, buildings and other man-made structures can be utilised (OEH 2017b). The species is listed as Vulnerable under the TSC Act.

Potential foraging habitat occurs within the subject site, but no roosting habitat occurs.

Assessment of Significance

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

The Eastern Bentwing-bat could potentially use the subject site as foraging habitat as part of a much larger foraging range. They are a highly mobile species that accesses resources from across a wide area and would not depend upon resources contained on the subject site for their survival. The proposal is not likely to place a viable local population of the species at risk of extinction as only highly marginal habitat will be removed. The species would also likely utilise much larger areas of intact vegetation such as Lane Cove National Park. No roost habitat is present on the subject site.

(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*

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.

Patches of vegetation within an area of 0.09 ha will be cleared for the proposed works. This represents a relatively small area of potential foraging habitat within the locality for the Eastern Bentwing-bat. Much of the vegetation present in the subject site will not be affected by the proposed works so potential foraging habitat will remain for the species.

The habitat occurring within the subject site comprises of a narrow strip of planted vegetation which is already relatively fragmented. The proposed works will all vegetation within the subject site; however it will not increase fragmentation substantially relative to current levels. The Eastern Bentwing-bat is highly mobile and would be able to move across the remaining fragments.

The proposed action will not remove, modify, fragment or isolate important habitat. The proposed works will require the clearing of marginal potential foraging habitat. The subject site would only likely provide foraging habitat as part of a wider range within the locality. Much larger areas of potential habitat occur throughout the wider locality in other areas including Lane Cove National Park. These tracts of vegetation would provide more favourable foraging habitat for the species. It is therefore considered that the habitat provided on the subject site is not important for the long-term survival of the Eastern Bentwing-bat in the wider locality.

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

There is no critical habitat listed for these species 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.

The Action Plan for Australian Bats provides a recovery outline for these species (Duncan et al. 1999). The proposed works are consistent with the objectives of this plan.

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

The following key threatening processes are likely to affect microchiropteran bats:

- 'Clearing of native vegetation';
- 'Invasion and establishment of exotic vines and scramblers'; and

- ‘Invasion of native plant communities by exotic perennial grasses’.

The key threatening process of ‘Clearing of native vegetation’, potentially impact habitat for the species further than current conditions. However, the vegetation on the subject site is not considered to constitute significant habitat for the Eastern Bentwing-bat. The clearing of planted native vegetation is not likely to significantly impact habitat for the Eastern Bentwing-bat, owing to its partially fragmented and degraded nature. The proposed works are not considered to exacerbate the key threatening process of invasion by exotics further than current conditions.

Conclusion

The proposed works will only clear a marginal area of potential, degraded habitat (less than 0.09 ha), mainly within areas that have already been previously disturbed. No significant habitat for the species will be removed within the subject site. The proposal is not likely to place a viable local population of the Eastern Bentwing-bat at risk of extinction. The species is highly mobile and would be expected to move between areas of remaining habitat within the immediate vicinity of the subject site and wider area. The project is not likely to have a significant impact upon the Eastern Bentwing-bat.

Appendix C – Stage 3

NORTHERN CORRIDOR WORKS (NCW) – PORTION 7A (FRANK CHANNON WALK)

Ecological Assessment

For:

Laing O'Rourke Australia

December 2017

Draft Report

PO Box 2474
Carlingford Court 2118

Report No. 16212RP1

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

Version	Date Issued	Amended by	Details
1	21/12/2017	EC	Draft

Approved by: [Approved By]

Position:

Signed:

Date: *21 December, 2017*

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Glossary of Terms

DoEE	Commonwealth Department of the Environment and Energy
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GPS	Global Positioning System
LGA	Local Government Area
Locality	The area within a 5 km radius of the centre of the subject site
NCW	Northern Corridor Works
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
the proposed works	Installation of support structures for overhead powerlines
Subject site	Main North and North Shore Corridor Works (MNNSCW) Portion A, located in Chatswood at the west of the rail corridor located at Frank Channon Walk. The subject site extends from Ellis Street to Nelson Street (**Figure 1.1**)
TSC Act	NSW *Threatened Species Conservation Act 1995*

Executive Summary

S1 Introduction

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been commissioned by Laing O'Rourke Australia on behalf of Transport for NSW (TfNSW) to conduct an ecological assessment of upgrade works to be undertaken for the Northern Corridor Works (NCW) – Portion 7a, located in Chatswood (the 'subject site'). The purpose of this report is to describe the current biodiversity values of the subject site and to assess the potential impacts of the proposed works on flora and fauna, particularly threatened species, populations and communities that are listed under the former New South Wales (NSW) *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth Environment *Protection and Biodiversity Conservation Act 1999* (EPBC Act).

S2 Background

The subject site is located within the Willoughby Local Government Area (LGA). It is 0.14 ha in area and comprises of a strip of vegetation located between the railway and an existing footpath.

Transport for NSW (TfNSW) is proposing to undertake upgrade works within the subject site. This will involve the removal of patches of vegetation for support structures for overhead powerlines.

S3 Methods

Database analysis, vegetation/flora surveys, fauna habitat surveys and incidental fauna observations were undertaken during December 2017. Flora surveys involved recording the presence of species using the random meander survey technique and targeted threatened flora surveys. All vascular plants were recorded or collected and later identified to species level where possible. Fauna surveys included a habitat assessment and any incidental observations of birds and other vertebrates.

S4 Results

Vegetation within the subject site was found to consist of Urban Native/ Exotic Vegetation. The area contains only planted species and does not comprise remnant native vegetation due to the species composition and their location within an artificial slope constructed along a footpath.

Surveys by Cumberland Ecology recorded 25 flora species. Of these, approximately 44% are exotic species and 56% are native (including non-endemic species). No threatened flora

species were recorded or are likely to occur within the subject site owing to its highly disturbed nature.

The desktop assessment showed that a number of threatened fauna species have been recorded from the locality and have the potential to occur within the subject site. From the desktop assessment and subsequent site inspections, three threatened fauna species are considered as having potential to occur within the subject site; the Powerful Owl (*Ninox strenua*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*). These potentially occurring fauna species are highly mobile and are expected to move between areas of remaining habitat within the immediate vicinity of the subject site and the wider area. These species are therefore not considered dependent upon the habitats present within the subject site.

S5 Impact Assessment

The proposed upgrade works will clear patches of vegetation within an area of 0.14 ha. No threatened ecological communities are present on or adjacent to the subject site. No threatened flora species have been recorded from the subject site, and due to the degraded nature of the subject site, it is considered unlikely that any occur. Accordingly, no impacts are predicted to occur to threatened ecological communities or threatened flora species as a result of the proposed development.

No threatened fauna species have been recorded, however some marginal foraging habitat for three threatened fauna species will be removed; the Powerful Owl (*Ninox strenua*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*). However none of these potentially occurring threatened fauna species are likely to be dependent on the habitats present within the subject site for their survival. These species are highly mobile species and are known to access resources from a wide area. Assessments of Significance have determined that the proposed works are unlikely to have a significant impact on these threatened fauna species.

S6 Mitigation Measures

A number of mitigation measures are recommended for the proposed project. The mitigation measures recommended to be implemented include:

- Vegetation protection;
- Erosion, sedimentation and pollution control; and
- Weed control measures.

S7 Conclusion

Despite the impacts of previous disturbance and the location of the subject site within a highly fragmented landscape, the proposed works will require the clearing of vegetation that forms marginal potential habitat for some threatened fauna species.

Patches of Urban Native/ Exotic Vegetation within an area of 0.14 ha will be cleared for the proposed upgrade works. The vegetation and habitat occurring within the subject site is highly modified as the subject site comprises of planted species, as well as exotic weeds.

Based upon the assessment undertaken in this report, no significant impact is expected to occur to threatened species, populations or communities as a result of the proposed upgrade works of the subject site. Therefore, the preparation of a Species Impact Statement (SIS) is not warranted. A referral to the Commonwealth Department of the Environment and Energy, under the EPBC Act is also not required.

cumberland ecology

Chapter **1**

Introduction

1.1 Purpose

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been commissioned by Laing O'Rourke Australia on behalf of Transport for NSW (TfNSW) to conduct an ecological assessment of upgrade works to be undertaken as part of the Northern Corridor Works (NCW) – Portion 7a, of which Frank Channon Walk comprises of a component of the project site which is located between Chatswood Station and Brand Street Artarmon. NCW is part of the Early and Enabling Works for the Sydney Metro City and South West project. The area where the proposed works will occur is the strip of vegetation between the railway line and footpath between Ellis Street and Nelson Street along Frank Channon Walk (the 'subject site') (**Figure 1.1**).

The purpose of this report is to describe the current biodiversity values of the subject site and to assess the potential impacts of the proposed upgrades on flora and fauna, particularly threatened species, populations and communities that are listed under the former New South Wales (NSW) *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is noted that the NSW *Biodiversity Conservation Act 2016* (BC Act) has replaced the TSC Act as of 25 August 2017. This report has been prepared as per the requirements of the former TSC Act in accordance with transitional provisions of the BC Act.

The specific objectives of this report are to:

- Describe the vegetation communities on the subject site;
- Describe fauna habitats and fauna usage of the subject site;
- Identify any threatened species, populations or ecological communities (as listed under the TSC Act and/or EPBC Act) existing on the subject site;
- Assess the likelihood of occurrence of threatened species, populations or communities (as listed under the TSC Act and/or EPBC Act) within the subject site;
- Assess the potential impact of the project on threatened communities, flora and fauna, including the completion of Assessments of Significance under Section 5A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act); and

- Where relevant, recommend mitigation measures to reduce the impacts of the proposed works on biodiversity values.

1.2 Background

1.2.1 Site Description

The subject site is located west of the rail corridor located at Frank Channon Walk which extends from Nelson Street to Albert Avenue in the Willoughby Local Government Area. The subject site forms the Northern Corridor Works (NCW) – Portion 7a and is approximately 0.14 ha in area. NCW is part of the Early and Enabling Works for the Sydney Metro City and South West project. The subject site comprises of a strip of vegetation between the railway line and footpath between Ellis Street and Nelson Street, along Frank Channon Walk (**Figure 1.1**).

i. Zoning

The subject site is zoned as SP2 – Infrastructure under the *Willoughby Local Environmental Plan 2012* (**Figure 1.2**).

The objectives of SP2 zoning are:

- *To provide for infrastructure and related uses.*
- *To prevent development that is not compatible with or that may detract from the provision of infrastructure.*
- *To provide for classified roads.*

The following actions are permitted without consent:

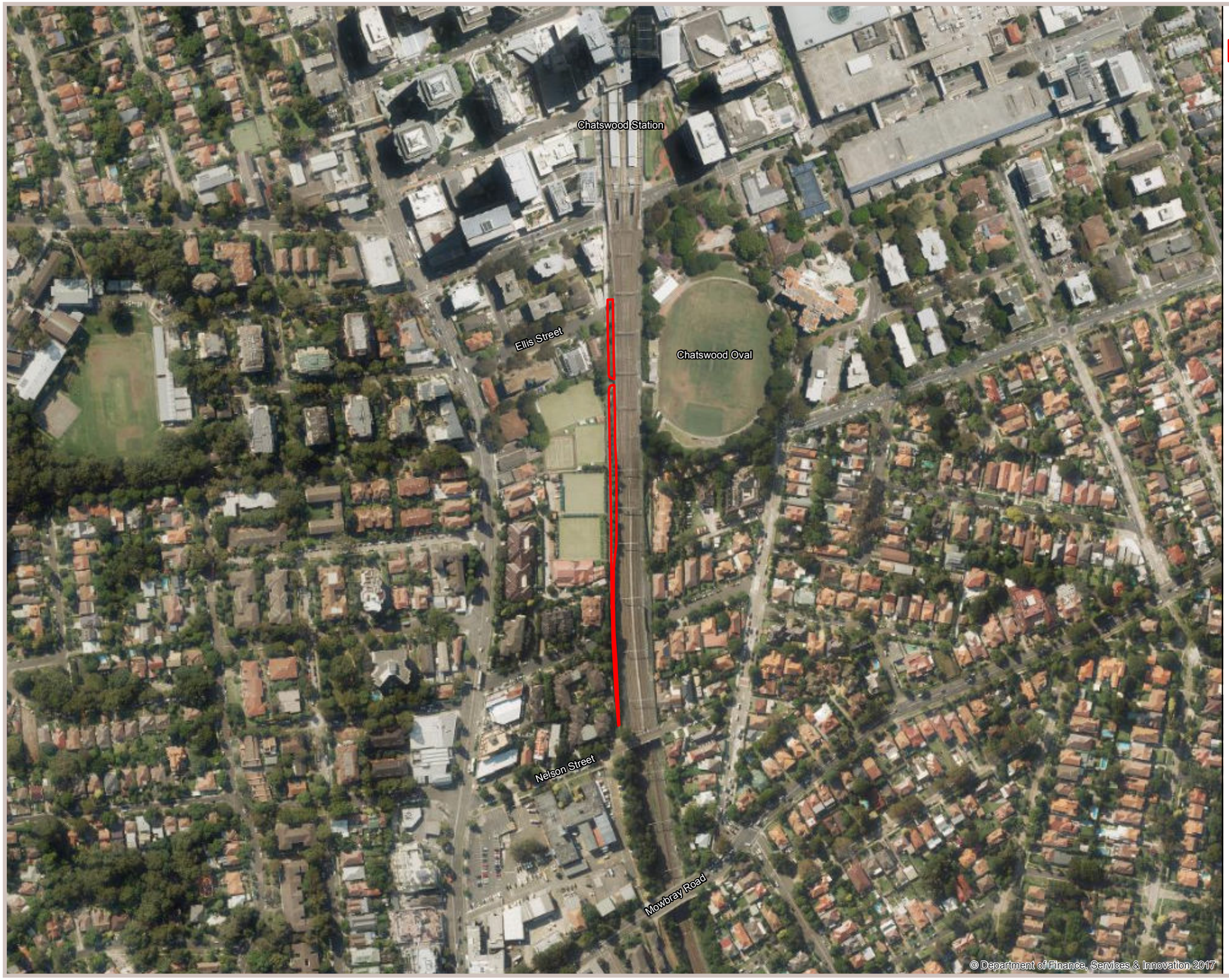
- *Nil*

The following actions are permitted with consent

- *Roads; The purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose*

1.2.2 Description of the Proposed Works

Within the subject site, patches of vegetation will require clearance for the installation of support structures for overhead powerlines.



Legend

Subject Site

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 50 100 150 m

I:\...\16212\Figures\RP1\20171221\Figure 1.1. Location_Subject Site

Figure 1.1. Location of the Subject Site

Figure 1.2. Land Zoning of the Subject Site

Chapter 2

Methodology

2.1 Database Analysis and Literature Review

Database analysis was conducted for the locality using both the NSW Office of Environment and Heritage (OEH) Atlas of NSW Wildlife (OEH 2017a) and the Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool (DoEE 2017). The locality is defined as the area within a 5 km radius of the subject site. The Atlas of NSW Wildlife Database search was used to generate records of threatened flora and fauna species listed under the TSC Act within the locality of the subject site. The Protected Matters Search Tool generated a list of Matters of National Environmental Significance listed under the EPBC Act potentially occurring within the locality of the subject site. For the purpose of this report, marine animals have been excluded. The lists generated from these databases were reviewed against available knowledge of the subject site, in conjunction with the abundance, distribution and age of records, to ascertain the likelihood of occurrence of threatened species within the subject site.

2.2 Flora Survey

Flora surveys were undertaken within the subject site on 20 December 2017 by an ecologist over an approximately one hour period. Surveys included vegetation mapping, random meander survey within the subject site and targeted threatened flora searches. Further details of each of the survey methods are provided below.

All vascular plants recorded or collected were identified using keys and nomenclature provided in Harden (1990-1993). Where known, taxonomic and nomenclatural changes have been incorporated into the results, as derived from PlantNET (Botanic Gardens Trust 2017).

2.2.1 Vegetation Mapping

Cumberland Ecology conducted vegetation surveys to revise and update the vegetation mapping prepared by OEH (2016). The vegetation within the subject site was ground-truthed to examine and verify the mapping of the condition and extent of the different vegetation communities. Where vegetation community boundaries were found to differ from the OEH mapping, the location of proposed new boundaries was recorded using a hand-held Global Positioning System (GPS) and mark-up of aerial photographs.

The resultant information was synthesised using a Geographic Information System (GIS) to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the subject site.

2.2.2 Random Meander Survey

Random meander surveys were undertaken to detect flora species located within the subject site. These surveys were undertaken within all vegetation communities.

2.2.3 Targeted Threatened Flora Surveys

Targeted threatened flora searches for species known from the locality were undertaken via random meander within areas of suitable habitat.

2.3 Fauna Survey

Fauna surveys were undertaken within the subject site on 20 December 2017. Surveys included a fauna habitat assessment recording of all fauna species observed. Further details of each of the survey methods are provided below.

2.3.1 Habitat Assessments

The assessment included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, fallen logs, bush rock and wetland areas such as creeks and soaks. Structural features considered included the nature and extent of the understorey and ground stratum and extent of canopy. The survey also included an assessment of the presence of habitat features suitable for use by threatened fauna species known from the locality.

2.3.2 Incidental Observations

Any fauna species that were observed, heard calling, or otherwise detected on the basis of tracks or signs, were recorded and listed in the total species list for the subject site.

2.4 Limitations

Vertebrate fauna and vascular flora of the locality are well known based upon a sizeable database of past records and various published reports. The surveys by Cumberland Ecology added to the existing database and helped to provide a clear indication of the likelihood that various species occur, or are likely to occur within the subject site. The data obtained from database assessment and surveys of the subject site furnished an appropriate level of information to support this assessment.

The weather conditions at the time of the flora surveys were generally favourable for plant growth and production of features required for identification of most species. Shrubs, grasses, herbs and creepers were readily identifiable in most instances. It is expected that not all flora species present would have been recorded during surveys. In addition, owing to

time constraints not all areas were able to be adequately surveyed. Despite this, it is considered that sufficient information has been collected to assess issues including conservation significance of the flora, condition and viability of bushland and likely impact on native vegetation. An assessment of the likelihood of occurrence of threatened flora species recorded within the locality of the subject site in the database searches was undertaken to supplement the flora survey.

Limited fauna surveys were undertaken for this assessment, which relied on database analysis and fauna habitat assessment. In general, opportunistic observations of fauna provide a “snapshot” of some of the fauna present that were active during time of the survey. The data produced by the surveys is intended to be indicative of the types of species that could occur and not an absolute census of all vertebrate fauna species occurring within the subject site. Therefore not all fauna utilising the subject site are likely to have been recorded during surveys. An assessment of the likelihood of occurrence of threatened and migratory fauna species listed for the locality in the database searches was undertaken to supplement the fauna surveys. The combination of these techniques is considered appropriate for assessing the habitat values of the site for threatened fauna within the subject site.

Chapter 3

Results

3.1 Vegetation Communities

Previous broad-scale mapping for the SMCMA Vegetation Mapping project (OEH 2016) indicates that the subject site itself is unmapped. However, surrounding vegetation adjacent to the subject site and in the wider area has been mapped as containing Urban Exotic/ Native Vegetation. Surveys by Cumberland Ecology for this assessment identified that only this community is present within the subject site.

The distribution of this community is shown in **Figure 3.1**. A description of this vegetation community is provided below.

3.1.1 Urban Exotic/ Native Vegetation

TSC Act Status: Not listed

EPBC Act Status: Not listed

Urban Exotic/ Native Vegetation occurs throughout the entire subject site in an area of 0.14 ha. It is evident that the area comprises of planted species and not remnant vegetation due to the species composition and location within an artificial slope constructed along a footpath (**Photograph 3.1**). Species present include planted native sub-canopy and shrub species such as *Allocasuarina littoralis* (Black She-oak), *Lophostemon confertus* (Brush Box) and *Acacia implexa* (Hickory Wattle). The dominant shrub layer is *Callistemon viminalis* (Weeping Bottlebrush) (**Photograph 3.2**). The groundcover comprises of planted natives including *Lomandra longifolia* (Spiny-headed Mat-rush), *Themeda triandra* (Kangaroo Grass) and *Dianella caerulea* var. *producta*. Exotic species are generally dominant in the groundcover with species such as *Bidens pilosa* (Cobblers Pegs), *Verbena bonariensis* (Purpletop) and *Cenchrus clandestinus* (Kikuyu Grass) (**Photograph 3.3**). Within the southern half of the subject site, the only vegetation is a wall with the exotic creeper *Ficus pumila* growing (**Photograph 3.4**).

A flora species list is provided in **Appendix A**.

Photograph 3.1 Frank Channon Walk – planted vegetation

Photograph 3.2 *Callistemon viminalis*

Photograph 3.3 Exotic dominated groundcover

Photograph 3.4 Exotic *Ficus pumila* growing along wall

3.2 Flora Species

3.2.1 General Species

There were 25 flora species recorded throughout the subject site during surveys. Species present within the subject site consists of a mix of exotics (44%) and native species including non-endemic planted species (56%). A flora species list is provided in **Appendix A**.

3.2.2 Threatened Species

No threatened flora species were recorded within the subject site. An analysis of the likelihood of occurrence on the subject site for each threatened flora species recorded within the locality is provided in **Appendix B**. It is unlikely that any threatened flora species naturally occur within the subject site as it is highly disturbed and the vegetation has been planted.

3.2.3 Priority Weeds

The *Noxious Weeds Act 1993* no longer applies and problematic weeds are handled under the NSW *Biosecurity Act 2015*. The subject site is located within the Priority region for Greater Sydney. One species present within the subject site is listed as a priority weed for the Greater Sydney region: *Anredera cordifolia* (Madeira Vine). This species is also listed as a Weed of National Significance.

Legend

- Subject Site
- Ficus pumila on Wall
- Urban Exotic/ Native Vegetation

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 20 40 60 80 m

I:\...\16212\Figures\RP1\20171221\Figure 3.1. Vegetation Communities_Subject Site

Figure 3.1. Vegetation Communities within the Subject Site

3.3 Fauna

3.3.1 Fauna Habitat

The subject site provides marginal value habitat for most fauna species. Although there are some exotic flora species within the subject site, these can provide potential foraging resources for nectivorous mammals and birds that may use the subject site from time to time as part of a larger foraging range. No nests or hollows were present within the subject site. No large remnant mature trees occur in the subject site.

3.3.2 General Species

No fauna were sighted within the subject site during the site inspection. However, it is likely that common urban adapted species such as the Noisy Miner (*Manorina melanocephala*) and Rainbow Lorikeet (*Trichoglossus haematodus*) would forage within the subject site on occasion.

3.3.3 Threatened Species

A number of threatened fauna species have been recorded from the locality and have the potential to occur within the subject site. An analysis of the likelihood of occurrence within the subject site for each threatened fauna species recorded or predicted to occur within the locality has been conducted and is presented in **Appendix C**. Three threatened fauna species are considered as having potential to occur within the subject site, the Powerful Owl (*Ninox strenua*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*). A discussion of these fauna species is provided below.

i. Powerful Owl

The Powerful Owl (*Ninox strenua*) is listed as Vulnerable under the TSC Act.

The Powerful Owl is distributed from Mackay to south western Victoria, mainly on the coastal side of the Great Dividing Range. This species occurs in many vegetation types from woodland and open sclerophyll to tall open wet forest and rainforest. It requires large tracts of native vegetation but can survive in fragmented landscapes. It roosts in dense vegetation and nests in large tree hollows (OEH 2017c).

Potential foraging habitat for this species occurs within the subject site. The species is known to utilise fragmented vegetation as well as larger tracts of forest and woodland. The subject site is considered to only provide marginal foraging habitat for this species. No large tree hollows are present so no breeding habitat is present. The Powerful Owl also would more likely nest within larger tracts of intact native vegetation.

ii. Grey-headed Flying-fox

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as Vulnerable under the TSC Act and the EPBC Act.

The Grey-headed Flying-fox is distributed along the east coast from Bundaberg in Queensland to Melbourne, Victoria. It occurs as far west as the western slopes of the Great Dividing Range in northern NSW. It occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Grey-headed Flying-foxes migrate according to the availability of native fruits, nectar and pollen. They roost in large "camps" which are generally within 20 km of a food source (NSW Scientific Committee 2004). Potential foraging habitat for this species occurs within the subject site. Grey-headed Flying-foxes live in specific roost camps, the locations of which are well-known within the Sydney region. No camps were observed within the subject site. The nearest camp is located approximately 5 km south-west of the subject site at Gladesville (Ku-ring-gai Bat Conservation Society 2017).

iii. Eastern Bentwing-bat

The Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) is listed as Vulnerable under the TSC Act.

It occurs throughout the east and north-west coast of Australia. They hunt in forested areas above the canopy, and roost primarily in caves, however derelict mines, storm-water tunnels, buildings and other manmade structures can be utilised (OEH 2017b).

Potential foraging habitat for this species occurs within the subject site. The species could forage within the subject site as part of its wider foraging range. However, no roosting habitat occurs within the vegetation on the subject site.

Chapter 4

Impact Assessment

4.1 Impacts to Vegetation Communities and Habitat

4.1.1 Vegetation Removal

The primary impact resulting from the proposed upgrade works is the clearing of vegetation and associated habitat within the subject site. Patches of vegetation within an area of 0.14 ha of Urban Exotic/ Native Vegetation will be removed within the subject site.

Past and current use of the subject site and surrounding areas has entailed clearing and modification of the majority of native vegetation. The vegetation present within the subject site is highly modified and located within an urbanised environment. The area comprises of planted species located within an artificial slope along a footpath. No remnant vegetation or Endangered Ecological Communities are present in the subject site.

4.1.2 Loss of Specific Habitat Features

In addition to the clearance of broad habitats within the subject site, the only specific fauna habitat features to be removed are nectar-producing trees. No nests or hollows were present at the time of the survey.

4.1.3 Impact on Remaining Vegetation and Habitats

The proposed works have the potential to indirectly impact remaining vegetation and habitats. These impacts include:

- Habitat fragmentation - affects biodiversity by reducing the amount of available habitat for some species to occupy due to increased distances between habitat patches;
- Edge effects – affects biodiversity through microclimatic changes in light, temperature, humidity and wind, which can favour a suite of different species and therefore cause significant changes to the ecology of the patch (Lindenmayer and Fischer 2006);
- Alteration to hydrological regimes – affects biodiversity through modification of hydrology necessary for vegetation and habitat survival, such as surface water drainage patterns; and

- Increased sedimentation and erosion – affects biodiversity through the smothering of vegetation, increasing turbidity of waterways and transportation of weed matter and nutrients; and
- Weeds and feral animals – affects biodiversity through increased competition for resources.

4.2 Impacts to Flora Species

No threatened flora species are present in the subject site or are likely to occur.

The project has the potential to result in a number of direct and indirect impacts to flora species in general within the subject site. In addition to the direct removal and modification of vegetation within the subject site, potential indirect impacts to flora species include:

- Weed invasion;
- Run-off, erosion and sedimentation; and
- Modification of microhabitat features resulting from long and short-term edge effects (e.g. changes in light filtration).

A number of mitigation measures are proposed to minimise these impacts. These are discussed further in **Chapter 5**.

4.3 Impacts to Fauna Species

The proposed works have the potential to result in a number of direct and indirect impacts to fauna species within the subject site. In addition to the direct removal and modification of vegetation within the subject site, potential indirect impacts to fauna species include:

- Habitat disturbance during the construction phase of the project (e.g. changes in noise levels);
- Runoff, erosion and sedimentation;
- Increased pollution;
- Hydrological changes resulting in altered fauna habitats; and
- Modification of microhabitat features resulting from long and short-term edge effects (e.g. changes in light filtration).

Three threatened fauna species are considered to have the potential to occur within the subject site; the Powerful Owl (*Ninox strenua*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (see ***Section 3.3.3***). The subject site provides potential foraging opportunities for these threatened fauna but is unlikely to exclusively support a local population of any threatened

fauna species. All three species are known to forage over a wide area, and may access resources from the subject site periodically. These species may forage on or near the subject site from time to time as part of a much larger range.

Assessments of Significance for the Powerful Owl (*Ninox strenua*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) have been conducted and are provided in **Appendix D**. These assessments indicate that the project will not significantly impact these species.

Chapter 5

Mitigation Measures

A number of mitigation measures are recommended for the proposed project. These measures should be implemented to minimise impacts to biodiversity values within adjoining habitats.

5.1 Vegetation Protection

To avoid unnecessary removal or damage to any adjoining vegetation outside of the subject site, the clearing area should be clearly demarcated and signed, where appropriate, to ensure no vegetation beyond these boundaries is removed. Clearing works and equipment should be excluded from areas outside the clearing area. Site inductions are to be provided by the civil contractor to ensure all site workers and visitors are aware of any no-access areas.

5.2 Erosion, Sedimentation and Pollution Control

Potential impacts to flora and fauna occurring in the construction phase that can be managed include: run-off, sedimentation, erosion and pollution. To reduce sedimentation on the subject site, erosion control measures should be implemented. This includes minimising the amount of exposed soils on the site at any given time. All soil stockpiles should be adequately covered when not in use to prevent erosion during heavy rainfall. To reduce the potential impacts of sediment/erosion runoff, it is recommended that no works be undertaken during periods of heavy rainfall. Sediment fences should be established in all areas down slope of proposed works.

5.3 Weed Control Measures

Priority weed species occurring within the subject site should be managed in order to prevent further spread. Prior to any vegetation clearance, priority weeds should be demarcated in order for these to be disposed of separately from native material. All groundcover should be disposed of in a manner that will prevent spread as the majority comprises of exotic species.

Chapter 6

Conclusion

Past and current use of the subject site has entailed clearing and modification of all the pre-existing native vegetation, and the vegetation present currently comprises a mix of planted native species and exotics. Despite the impacts of previous disturbance and location within a highly fragmented landscape, the proposed upgrade works will require the clearing of planted native vegetation that forms potential, albeit marginal habitat for some threatened fauna species.

Patches of vegetation will be cleared for the proposed development, within an area of 0.14 ha of Urban Native/Exotic Vegetation. No threatened ecological communities are present on or adjacent to the subject site. No threatened flora species have been recorded or are predicted to occur.

Some threatened fauna species have been recorded from the locality, and three have the potential to occur within the subject site based on the presence of suitable habitat and records in the locality. These are the Powerful Owl (*Ninox strenua*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*). Assessments of significance indicate that no significant impact is predicted to occur to these species as a result of the proposal.

A range of mitigation measures are recommended to be implemented for the project including:

- Vegetation protection;
- Erosion, sedimentation and pollution control; and
- Weed control measures.

No significant impact is predicted to occur to threatened species, populations or communities as a result of the proposed development. Therefore, the preparation of a Species Impact Statement (SIS) is not warranted. A referral to the Commonwealth Department of the Environment and Energy, under the EPBC Act is also not required.

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OEH. 2017b. Eastern Bentwing-bat - profile. Office of Environment and Heritage, Hurstville.

OEH. 2017c. Powerful Owl - profile. Office of Environment and Heritage, Hurstville.

Appendix A

Flora Species List

Table A.1 Flora species recorded within the subject site

Family	Exotic	Scientific Name	Common Name
Sub-canopy			
Casuarinaceae		*Allocasuarina littoralis*	Black She-oak
Fabaceae (Mimosoideae)		*Acacia implexa*	Hickory Wattle
Fabaceae (Mimosoideae)		*Acacia sp.*	
Meliaceae		*Melia azedarach*	White Cedar
Myrtaceae		*Corymbia ficifolia*	Albany Red Flowering Gum
Myrtaceae		*Lophostemon confertus*	Brush Box
Shrubs			
Euphorbiaceae		*Homalanthus populifolius*	Bleeding Heart
Myrtaceae		*Callistemon viminalis*	Weeping Bottlebrush
Proteaceae		*Banksia serrata*	Old-man Banksia
Proteaceae		*Banksia spinulosa*	Hairpin Banksia
Dicots			
Araliaceae	*	*Hydrocotyle bonariensis*	Largeleaf Pennywort
Asteraceae	*	*Ageratina adenophora*	Crofton Weed
Asteraceae	*	*Bidens pilosa*	Cobblers Pegs
Asteraceae	*	*Conyza bonariensis*	Flaxleaf Fleabane
Verbenaceae	*	*Verbena bonariensis*	Purpletop
Climbers/ Vines			
Apocynaceae	*	*Araujia sericifera*	Moth Vine
Basellaceae	*	*Anredera cordifolia*	Madeira Vine
Moraceae	*	*Ficus pumila*	Creeping Fig
Polygonaceae	*	*Acetosa sagittata*	Rambling Dock
Monocots (Grasses)			
Poaceae	*	*Cenchrus clandestinus*	Kikuyu Grass
Poaceae	*	*Ehrharta erecta*	Panic Veldtgrass
Poaceae		*Themeda triandra*	Kangaroo Grass
Monocots (Other)			
Doryanthaceae		*Doryanthes excelsa*	Giant Lily
Lomandraceae		*Lomandra longifolia*	Spiny-headed Mat-rush
Phormiaceae		*Dianella caerulea* var. *producta*	

**denotes exotic species*

Appendix B

Threatened Flora Likelihood of Occurrence

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Apocynaceae	*Cynanchum elegans*	White-flowered Wax Plant	E	E	0	Usually associated with dry rainforest vegetation and in coastal communities. Can occur in clay influenced woodland associated with *Eucalyptus tereticornis* and *Corymbia maculata.*	Unlikely to occur. No suitable habitat present on the subject site.
Casuarinaceae	*Allocasuarina glareicola*		E	E	0	Found in open woodland with *Eucalyptus parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla* and *Melaleuca decora* on lateritic soil.	Unlikely to occur. No suitable habitat present on the subject site.
Dilleniaceae	^^*Hibbertia spanantha*	Julian's Hibbertia	CE	CE	1	Found on light clay soils occuring on a shale sandstone soil transition in forest with canopy species including *Eucalyptus pilularis, E. resinifera, Corymbia gummifera* and *Angophora costata.*	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Elaeocarpaceae	*Tetratheca glandulosa*		V		5	Found in various communities from heaths and scrub to woodlands/open woodlands, and open forest. Common woodland tree species include: *Corymbia gummifera, C. eximia, Eucalyptus haemastoma, E. punctata, E. racemosa,* and/or *E. sparsifolia*. Soils are generally shallow, consisting of a yellow, clayey/sandy loam.	Unlikely to occur. No suitable habitat present on the subject site.
Ericaceae	*Epacris purpurascens var. purpurascens*		V		14	Found in a range of habitat types, most of which have a strong shale soil influence.	Unlikely to occur. No suitable habitat present on the subject site.
Fabaceae (Mimosoideae)	*Acacia terminalis subsp. terminalis*	Sunshine Wattle	E	E	7	Coastal scrub and dry sclerophyll woodland on sandy soils .	Unlikely to occur. No suitable habitat present on the subject site.
Fabaceae (Mimosoideae)	*Acacia bynoeana*	Bynoe's Wattle	E	V	0	Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins,	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						edges of roadside spoil mounds and in recently burnt patches.	
Fabaceae (Mimosoideae)	*Acacia pubescens*	Downy Wattle	V	V	0	Grows in dry sclerophyll forest and woodland in clay soils.	Unlikely to occur. No suitable habitat present on the subject site.
Geraniaceae	*Pelargonium sp. Striatellum (G.W.Carr 10345)*	Omeo Stork's-bill	E	E	0	Has a narrow habitat that is usually just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities.	Unlikely to occur. No suitable habitat present on the subject site.
Haloragaceae	*Haloragodendron lucasii*		E	E	0	Occurs on Hawkesbury Sandstone in moist sandy loam soils, preferring sheltered aspects, generally inhabiting gentle slopes below cliff lines near creeks in association with high soil moisture and phosphorous levels. It is found in association with species	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						including *Eucalyptus piperita, Corymbia gummifera,* and *Callicoma serratifolia*. The species was assumed to be extinct until 1986 and is only known currently from nine sites across a 10 km range in the Hornsby-Gordon area of the northern suburbs of Sydney.	
Malvaceae	*Lasiopetalum joyceae*		V	V	1	Found in heath on sandstone.	Unlikely to occur. No suitable habitat present on the subject site.
Myrtaceae	*Callistemon linearifolius*	Netted Bottle Brush	V		2	Found in dry sclerophyll forest.	Unlikely to occur. No suitable habitat present on the subject site.
Myrtaceae	*Darwinia biflora*		V	V	148	Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	Unlikely to occur. No suitable habitat present on the subject site.
Myrtaceae	*Eucalyptus camfieldii*	Camfield's Stringybark	V	V	8	Found in exposed areas on sandstone ridges, slopes and plateaus near tall coastal heath or low open woodland.	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	V	V	5	Occurs in dry grassy woodland on shallow soils of slopes and ridges. Prefers infertile soils derived from granite or metasedimentary rock on the lower slopes of the landscape.	Unlikely to occur. No suitable habitat present on the subject site.
Myrtaceae	*Melaleuca deanei*	Deane's Paperbark	V	V	1	Occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone. Grows in wet heath on sandstone.	Unlikely to occur. No suitable habitat present on the subject site.
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	E	V	16	Rainforest species on sandy soils.	Unlikely to occur. No suitable habitat present on the subject site.
Myrtaceae	*Leptospermum deanei*		V	V	0	Occurs in woodland on sandy alluvial soil or sand over sandstone.	Unlikely to occur. No suitable habitat present on the subject site.
Myrtaceae	*Melaleuca biconvexa*	Biconvex Paperbark	V	V	0	Occurs in damp areas, often near watercourses, on alluvium soils over shale. Vegetation communities associated with the species include 'Eucalypt open-forest'	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						with Sydney Blue Gum (*Eucalyptus saligna*), Swamp Mahogany (*Eucalyptus robusta*) and Mountain Cedar Wattle (*Acacia elata*) and in 'Paperbark scrub' with Prickly-leaved Paperbark (*Melaleuca styphelioides*), Snow-in-summer (*Melaleuca linariifolia*), White Feather Honeymyrtle (*Melaleuca decora*), Sieber's Paperbark (*Melaleuca sieberi*) and *Melaleuca nodosa*.	
Myrtaceae	*Triplarina imbricata*	Creek Triplarina	E	E	0	Occurs along watercourses in low open forest with Water Gum (*Tristaniopsis laurina*) or in montane bogs, often with *Baekea amissa*.	Unlikely to occur. No suitable habitat present on the subject site.
Orchidaceae	*Caladenia tessellata*	Thick Lip Spider Orchid	E	V	0	Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						soil.	
Orchidaceae	*Cryptostylis hunteriana*	Leafless Tongue-orchid	V	V	0	Grows in swamp-heath on sandy soils	Unlikely to occur. No suitable habitat present on the subject site.
Orchidaceae	*Genoplesium baueri*	Bauer's Midge Orchid	E	E	0	Grows in sparse dry sclerophyll forest and moss gardens over sandstone.	Unlikely to occur. No suitable habitat present on the subject site.
Poaceae	*Deyeuxia appressa*		E	E	0	A highly restricted NSW endemic known only from two pre-1942 records in the Sydney area. Was first collected in 1930 at Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown. Was then collected in 1941 from Killara, near Hornsby. Possibly extinct in wild.	Unlikely to occur. No suitable habitat present on the subject site.
Proteaceae	*Grevillea parviflora subsp. parviflora*	Small-flower Grevillea	V	V	1	Grows in light sandy or clay soils over thin shales, often with lateritic ironstone gravels and nodules. Is known to occur in Shale/Sandstone Transition	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						Forest.	
Rutaceae	*Asterolasia elegans*		E	E	0	Grows in wet sclerophyll forest on moist hillsides, known from only one locality, north of Maroota.	Unlikely to occur. No suitable habitat present on the subject site.
Santalaceae	*Thesium australe*	Austral Toadflax	V	V	0	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	Unlikely to occur. No suitable habitat present on the subject site.
Thymelaeaceae	*Pimelea curviflora var. curviflora*		V	V	0	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.	Unlikely to occur. No suitable habitat present on the subject site.
Thymelaeaceae	*Pimelea spicata*	Spiked Rice-flower	E	E	0	On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark. n the coastal Illawarra it occurs commonly in Coast Banksia open woodland	Unlikely to occur. No suitable habitat present on the subject site.

Table B.1 Threatened flora likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						with a better developed shrub and grass understorey. Coastal headlands and hilltops are the favoured sites.	

**CE = Critically Endangered, E = Endangered, V = Vulnerable*

Appendix C

Threatened Fauna Likelihood of Occurrence

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Amphibia							
Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E	V	0	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.).	Unlikely to occur. No suitable habitat present on the subject site.
Myobatrachidae	*Pseudophryne australis*	Red-crowned Toadlet	V		68	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters.	Unlikely to occur. No suitable habitat present on the subject site.
Myobatrachidae	*Heleioporus australiacus*	Giant Burrowing Frog	V	V	0	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Utilises soaks or pools within first or second order streams as breeding habitat. Commonly recorded from 'hanging swamp' seepage	Unlikely to occur. No suitable habitat present on the subject site.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						lines and where small pools form from the collected water.	
Myobatrachidae	*Mixophyes balbus*	Stuttering Frog	E	V	0	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	Unlikely to occur. No suitable habitat present on the subject site.
Aves							
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V	C	67	Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands.	Unlikely to occur. No suitable habitat present on the subject site. No wetlands or rivers within at least 1km of the subject site.
Accipitridae	*Hieraaetus morphnoides*	Little Eagle	V		2	Occurs in open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	Possible but unlikely. Highly mobile, aerial species that could potentially pass over the subject site, however the subject site is very small and disturbed and the species has not been recorded commonly

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
							within the locality. Species would more likely occur in larger tracks of intact vegetation such as Lane Cove National Park.
Accipitridae	*Pandion cristatus*	Eastern Osprey	V		4	Found at littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands.	Unlikely to occur. No suitable habitat present on the subject site. No wetlands or rivers within at least 1km of the subject site.
Anatidae	*Nettapus coromandelianus*	Cotton Pygmy-Goose	E		4	Freshwater lakes, lagoons, swamps and dams, particularly those vegetated with waterlilies and other floating and submerged aquatic vegetation.	Unlikely to occur. No suitable habitat present on the subject site.
Apodidae	*Hirundapus caudacutus*	White-throated Needletail		C,J,K	0	Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Occur over most types of habitat, particularly above wooded areas including open forest and rainforest, between trees or in clearings and below the canopy.	Unlikely to occur. No suitable habitat present on the subject site and no records within the locality. Species is aerial and would unlikely utilise the subject site

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
							directly.
Apodidae	*Apus pacificus*	Fork-tailed Swift		C,J,K	0	Forages aerially over a variety of habitats usually over coastal and mountain areas with a preference for wooded areas.	Unlikely to occur. No suitable habitat present on the subject site and no records within the locality. Species is aerial and would unlikely utilise the subject site directly.
Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	E	E	2	Occurs in freshwater wetlands, and more rarely, estuarine wetlands. It favours wetlands with tall, dense vegetation, and forages in shallow water up to a depth of 0.3m. It nests in deep vegetative cover over shallow pools.	Unlikely to occur. No suitable habitat present on the subject site.
Ardeidae	*Ixobrychus flavicollis*	Black Bittern	V		7	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.).	Unlikely to occur. No suitable habitat present on the subject site.
Artamidae	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V		2	In New South Wales the species is widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. The Dusky Woodswallow is	Unlikely to occur. No suitable habitat present on the subject site.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						found in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations.	
Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	E		1	Lives in open forest and woodlands with a sparse, grassy ground layer, and fallen timber. It feeds on insects and small insects and vertebrates including frogs, lizards, and snakes. Nesting is undertaken in a scrape or small bare patch.	Unlikely to occur. No suitable habitat present on the subject site.
Cacatuidae	^^*Calyptorhynchus lathami*	Glossy Black-Cockatoo	V		8	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (*Allocasuarina littoralis*), Forest She-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*) occur. Feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species). Dependent on large hollow-bearing eucalypts for nest sites.	Unlikely to occur. Highly marginal suitable habitat present on the subject site. Although there are scattered trees of *Allocasuarina littoralis*, site is too disturbed. Species would more likely occur in larger tracks of intact vegetation such as Lane Cove National Park.
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover		M	0	Found in wetlands, especially in arid areas, and prefers saline and brackish waters.	Unlikely to occur. No suitable habitat

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
							present on the subject site.
Charadriidae	*Pluvialis fulva*	Pacific Golden Plover		C,J,K	0	Occurs in coastal habitats and occasionally around inland wetlands. Inland areas usually consist of wetlands with muddy margins and short emergent vegetation.	Unlikely to occur. No suitable habitat present on the subject site.
Charadriidae	*Charadrius bicinctus*	Double-banded Plover		M	0	Found on coastal beaches, mudflats, sewage farms, river banks, fields, dunes, upland tussock grasses and shingle.	Unlikely to occur. No suitable habitat present on the subject site.
Charadriidae	*Charadrius mongolus*	Lesser Sand Plover	V	E,C,J,K	0	Beaches of sheltered bays, harbours and estuaries with large intertidal sand/mudflats.	Unlikely to occur. No suitable habitat present on the subject site.
Charadriidae	*Charadrius leschenaultii*	Greater Sand Plover	V	V,C,J,K	0	Sheltered sandy or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	Unlikely to occur. No suitable habitat present on the subject site.
Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	E		1	Occurs in floodplain wetlands of major coastal rivers along with minor floodplains, coastal sandplain wetlands and estuaries. Species builds nest in high in trees close to	Unlikely to occur. No suitable habitat present on the subject site.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						water.	
Columbidae	*Ptilinopus superbus*	Superb Fruit-Dove	V		8	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	Unlikely to occur. No suitable habitat present on the subject site.
Cuculidae	*Cuculus optatus*	Oriental Cuckoo		M	0	Inhabits forest and woodland.	Unlikely to occur. Although suitable habitat present on the subject site, the species is sparsely recorded in NSW.
Dasyornithidae	*Dasyornis brachypterus*	Eastern Bristlebird	E	E	0	Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	Unlikely to occur. No suitable habitat present on the subject site.
Dicruridae	*Rhipidura rufifrons*	Rufous Fantail		M	0	Inhabits rainforest, dense wet forests, swamp	Unlikely to occur.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						woodlands and mangroves, preferring deep shade, and is often seen close to the ground.	No suitable habitat present on the subject site.
Dicruridae	*Myiagra cyanoleuca*	Satin Flycatcher		M	0	Found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation.	Unlikely to occur. No suitable habitat present on the subject site.
Dicruridae	*Monarcha trivirgatus*	Spectacled Monarch		M	0	Prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	Unlikely to occur. No suitable habitat present on the subject site.
Dicruridae	*Monarcha melanopsis*	Black-faced Monarch		M	0	Wetter, denser forest, often at high elevations.	Unlikely to occur. No suitable habitat present on the subject site.
Laridae	*Sternula albifrons*	Little Tern	E	C,J,K	1	Occurs in sheltered coastal environments.	Unlikely to occur. No suitable habitat present on the subject site.
Meliphagidae	*Grantiella picta*	Painted Honeyeater	V	V	0	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	Unlikely to occur. No suitable habitat present on the subject

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
							site.
Meliphagidae	*Anthochaera phrygia*	Regent Honeyeater	CE	E	0	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak.	Unlikely to occur. No suitable habitat present on the subject site.
Motacillidae	*Motacilla flava*	Yellow Wagtail		C,J,K	0	Prefers moist areas, such as the edges of sewage works and exposed mudbanks.	Unlikely to occur. No suitable habitat present on the subject site.
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V		1	Eucalypt forest and woodlands, especially with rough barked species, smooth-barks with dead branches, mallee and acacia. Nests in living trees and feeds off insects in dead trees.	Unlikely to occur. No suitable habitat present on the subject site.
Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V		3	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Also utilises isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban	Possible but unlikely. Highly mobile, aerial species that may pass over the subject site on occasion but the subject site is very small and disturbed. Species would more likely occur in larger

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						trees. Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts.	tracks of intact vegetation such as Lane Cove National Park.
Psittacidae	*Lathamus discolor*	Swift Parrot	E	CE	6	Occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.	Unlikely to occur. No suitable habitat present on the subject site.
Recurvirostridae	*Recurvirostra novaehollandiae*	Red-necked Avocet		M	0	Found in large shallow freshwater or saltwater wetlands and estuarine mudflats.	Unlikely to occur. No suitable habitat present on the subject site.
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt		M	0	Occur at freshwater and saltwater marshes, mudflats, and the shallow edges of lakes and rivers.	Unlikely to occur. No suitable habitat present on the subject site.
Rostratulidae	*Rostratula australis*	Australian Painted Snipe	E	E	0	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Tringa stagnatilis*	Marsh Sandpiper		C,J,K	0	Inhabits fresh or brackish wetlands such as	Unlikely to occur.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						rivers, water meadows, sewage farms, drains, lagoons and swamps.	No suitable habitat present on the subject site.
Scolopacidae	*Tringa nebularia*	Common Greenshank		C,J,K	0	occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Tringa brevipes*	Grey-tailed Tattler		C,J,K	0	Found on sheltered coasts with reefs and rock platforms or with intertidal mudflats.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Philomachus pugnax*	Ruff		C,J,K	0	Found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Numenius phaeopus*	Whimbrel		C,J,K	0	Found mainly on the coast, on tidal and estaurine mudflats, especially near mangroves.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Limosa limosa*	Black-tailed Godwit	V	C,J,K	0	Sheltered bays, estuaries and lagoons with large intertidal mudflats.	Unlikely to occur. No suitable habitat present on the subject

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
							site.
Scolopacidae	*Limosa lapponica*	Bar-tailed Godwit		C,J,K	0	Found mainly in coastal habitats including large intertidal sandflats, estuaries, bays and lagoons. Often occurs at seagrass and sometimes in nearby saltmarsh.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Gallinago hardwickii*	Latham's Snipe		C,J,K	0	Inhabit open, freshwater wetlands with low, dense vegetation.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Calidris ruficollis*	Red-necked Stint		C,J,K	0	Occur on the coast, in sheltered inlets, bays, lagoons, estuaries, intertidal mudflats and protected sandy or coralline shores.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Calidris melanotos*	Pectoral Sandpiper		J,K	0	Found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper		C,J,K	0	Prefers the grassy edges of shallow inland freshwater wetlands, but also occurs at other habitats including mangroves, beaches, mudflats and sewage farms.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Arenaria interpres*	Ruddy Turnstone		C,J,K	0	Mainly inhabits exposed rocks or reefs, often	Unlikely to occur.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						with shallow pools, and on beaches.	No suitable habitat present on the subject site.
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper		C,J,K	0	Inhabits coastal or inland wetlands, both saline or fresh. It is more commonly found on muddy edges or rocky shores.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Numenius madagascariensis*	Eastern Curlew		CE,C,J,K	0	Prefers sheltered coasts, especially estuaries, bays, harbours inlets and lagoons. Also known to occur in sewage farms, wetlands and mangroves. Species roosts on sandy spits and in low Saltmarsh or mangroves.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Limosa lapponica baueri*	Bar-tailed Godwit		V,C,J,K	0	Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Calidris tenuirostris*	Great Knot	V	CE,C,J,K	0	Intertidal mudflats or sandflats.	Unlikely to occur. No suitable habitat present on the subject site.
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	E	CE,C,J,K	0	Inhabits intertidal mudflats of estuaries,	Unlikely to occur.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						lagoons, mangroves, as well as beaches, rocky shores and around lakes, dams and floodwaters	No suitable habitat present on the subject site.
Scolopacidae	*Calidris canutus*	Red Knot		E,C,J,K	0	Found on the coast in sandy estuaries with tidal mudflats.	Unlikely to occur. No suitable habitat present on the subject site.
Strigidae	*Ninox connivens*	Barking Owl	V		11	Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Denser vegetation is used occasionally for roosting. Nests in hollows of large, old eucalypts. Requires very large permanent territories in most habitats due to sparse prey densities.	Unlikely to occur. No suitable habitat present on the subject site.
Strigidae	*Ninox strenua*	Powerful Owl	V		389	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Also occurs in fragmented habitats.	Potential to occur. Known to utilise fragmented landscapes, may utilise the subject site as part of a larger foraging area. No breeding habitat present.
Tytonidae	*Tyto tenebricosa*	Sooty Owl	V		2	Found in rainforest, including dry rainforest,	Unlikely to occur.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						subtropical and warm temperate rainforest, as well as moist eucalypt forests, and roosts in the hollow of a tall forest tree/heavy vegetation.	No suitable habitat present on the subject site.
Mammalia							
Burramyidae	*Cercartetus nanus*	Eastern Pygmy-possum	V		3	Species is found in a broad range of habitats from rainforest to wet and dry sclerophyll forests through to woodland and heath. Woodland and heath habitats are preferred. They shelter in tree hollows, rotten stumps, holes in the ground, abandoned birds nests and Ringtail Possum dreys, and thickets of vegetation. Tree hollows are preferred for nesting but the species will also nest under tree bark and shredded bark in tree forks.	Unlikely to occur. No suitable habitat present on the subject site.
Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V	E	5	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den	Unlikely to occur. No suitable habitat present on the subject site.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						sites. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares; usually traverse their ranges along densely vegetated creeklines.	
Macropodidae	*Petrogale penicillata*	Brush-tailed Rock-wallaby	E	V	0	Occupies rock outcrops, escarpments and cliffs with features such as caves, fissures and ledges. Browses on adjacent vegetation. Has a home range of about 15 ha and shelters in caves.	Unlikely to occur. No suitable habitat present on the subject site.
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V		1	Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	Unlikely to occur. Highly marginal suitable habitat present on the subject site and species not commonly known from locality.
Muridae	*Pseudomys novaehollandiae*	New Holland Mouse		V	0	Occurs in open habitats (heathland, woodland and forest) with a heath understorey and vegetated sand dunes. The species prefers deep soft top soils in order to burrow.	Unlikely to occur. No suitable habitat present on the subject site.
Peramelidae	*Isoodon obesulus obesulus*	Southern Brown Bandicoot (eastern)	E	E	1	Within NSW, the species is rare and almost exclusively restricted to the coastal fringe of	Unlikely to occur. No suitable habitat

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						the state, from the southern side of the Hawkesbury River in the north to the Victorian border in the south. More specifically, the subspecies is considered to occur primarily in two areas: Ku-ring-gai Chase and Garigal National Parks; and in the far south-east corner of the state. Occurs within their distribution in a variety of habitats including heathland, shrubland, sedgeland, heathy open forest and woodland.	present on the subject site.
Petauridae	*Petaurus australis*	Yellow-bellied Glider	V		1	Occurs in high areas of rainfall in tall mature eucalypt forest where soils are nutrient rich. Dens in the hollows of large trees.	Unlikely to occur. No suitable habitat present on the subject site.
Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V	0	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	Unlikely to occur. No suitable habitat present on the subject site.
Pseudocheiridae	*Petauroides volans*	Greater Glider		V	0	Occurs in eucalypt forests and woodlands	Unlikely to occur.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						from north-eastern Queensland to the Central Highlands of Victoria. The species has a relatively small home range which consists of numerous tree hollows.	No suitable habitat present on the subject site.
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V	1225	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range. No roost camps present. Records of the species are scattered throughout the locality.
Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	V	0	Found in well-timbered areas containing gullies. Roosts in caves, crevices in cliffs and old mine workings frequenting low to mid-elevation dry open forest and woodland close to these features.	Unlikely to occur. No suitable habitat present on the subject site. No roost habitat nearby.
Vespertilionidae	*Miniopterus australis*	Little Bentwing-bat	V		1	Moist eucalypt forest, rainforest or dense coastal banksia scrub. Little Bentwing-bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage	Unlikely to occur. No suitable habitat present on the subject site.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						for small insects beneath the canopy of densely vegetated habitats.	
Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V		46	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range. No roosting habitat present. Records of the species are scattered throughout the locality.
Vespertilionidae	*Myotis macropus*	Southern Myotis	V		10	Roosts close to water in caves, mines, tree hollows, storm water channels, bridges, buildings or in dense foliage. Forages over streams and pools catching insects and fish.	Unlikely to occur. No suitable habitat present on the subject site. No riparian habitat present on or adjacent to the subject site.
Reptilia							
Elapidae	*Hoplocephalus bungaroides*	Broad-headed Snake	E	V	0	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in	Unlikely to occur. No suitable habitat present on the subject site.

Table C.1 Threatened fauna likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						crevices or hollows in large trees within 500m of escarpments in summer.	
Varanidae	*Varanus rosenbergi*	Rosenberg's Goanna	V		3	Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component.	Unlikely to occur. No suitable habitat present on the subject site.
Gastropoda							
Camaenidae	*Pommerhelix duralensis*	Dural Woodland Snail		E	0	Occurs in shale-influenced-habitats, sheltering under rocks or inside curled-up bark. Requires forested habitats that have good native cover and woody debris.	Unlikely to occur. No suitable habitat present on the subject site.

**CE = Critically Endangered, E = Endangered, V = Vulnerable, C = Listed on China Australia Migratory Bird Agreement, J = Listed on Japan Australia Migratory Bird Agreement, K = Listed on Republic of Korea Australia Migratory Bird Agreement*

Appendix D

Assessments of Significance (7 Part Tests)

D.1 Powerful Owl

Background

The Powerful Owl is distributed from Mackay to south western Victoria, mainly on the coastal side of the Great Dividing Range. This species occurs in many vegetation types from woodland and open sclerophyll to tall open wet forest and rainforest. It requires large tracts of native vegetation but can survive in fragmented landscapes. It roosts in dense vegetation and nests in large tree hollows. The Powerful Owl is listed as Vulnerable under the TSC Act (OEH 2017c).

The species could potentially occur on the subject site as part of a wider foraging range. No breeding habitat is present as no large hollows occur on the subject site.

Assessment of Significance

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

The Powerful Owl could potentially use the subject site as foraging habitat as part of a much larger foraging range. They are a highly mobile species that accesses resources from across a wide area and would not depend upon resources contained on the subject site for its survival. The proposal is not likely to place a viable local population of the species at risk of extinction as only highly marginal foraging habitat is present. No breeding habitat occurs within the subject site as large hollows are absent. The Powerful Owl would also likely utilise much larger areas of intact vegetation in the locality such as Lane Cove National Park.

(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*

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.

Patches of vegetation within an area of 0.14 ha will be cleared for the proposed works. This represents a relatively small area of potential foraging habitat within the locality for the Powerful Owl. Much of the vegetation present in the subject site will not be affected by the proposed works so potential foraging habitat will remain.

The habitat occurring within the subject site comprises of a narrow strip of planted vegetation which is already relatively fragmented. The proposed works will clear patches of vegetation; however it will not increase fragmentation substantially relative to current levels. The Powerful Owl is highly mobile and would be able to move across the remaining fragments.

The proposed action will not remove, modify, fragment or isolate important habitat. The proposed works will require the clearing of patches of marginal potential foraging habitat. The subject site would only likely provide foraging habitat as part of a wider range within the locality. Much larger areas of potential habitat occur throughout the wider locality in other areas including Lane Cove National Park. These tracts of vegetation would provide more favourable roosting and foraging habitat for the Powerful Owl. It is therefore considered that the habitat provided on the subject site is not important for the long-term survival of the species in the wider locality.

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

There is no critical habitat listed for the species 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 been prepared for large forest owls, including the Powerful Owl (DEC (NSW) 2006). The ultimate aim of the recovery plan is to ensure that the species it covers persist in the wild in NSW in each region where they presently occur. The proposal is not considered to threaten the objectives of that Recovery Plan. No Threat Abatement Plan exists for this species.

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

The following key threatening processes are likely to affect the Powerful Owl:

- 'Clearing of native vegetation';

- ‘Invasion and establishment of exotic vines and scramblers’; and
- ‘Invasion of native plant communities by exotic perennial grasses’.

The key threatening process of ‘Clearing of native vegetation’, potentially impact habitat for the species further than current conditions. However, the vegetation on the subject site is not considered to constitute significant habitat for the Powerful Owl. The clearing of planted native vegetation is not likely to significantly impact habitat for the potentially occurring Powerful Owl, owing to its partially fragmented and degraded nature. The proposed works are not considered to exacerbate the key threatening process of invasion by exotics further than current conditions.

Conclusion

The proposed works will only clear a marginal area of potential foraging habitat (less than 0.14 ha), mainly within areas that have already been previously disturbed. No significant habitat for the Powerful Owl will be removed within the subject site. The proposal is not likely to place a viable local population of the species at risk of extinction. The Powerful Owl is a highly mobile species and would be expected to move between areas of remaining habitat within the immediate vicinity of the subject site and wider area. The project is not likely to have a significant detrimental impact upon the Powerful Owl.

D.2 Grey-headed Flying-fox

Background

The Grey-headed Flying-fox is distributed along the east coast from Bundaberg in Queensland to Melbourne, Victoria. It occurs as far west as the western slopes of the Great Dividing Range in northern NSW. It occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Grey-headed Flying-foxes migrate according to the availability of native fruits, nectar and pollen. They roost in large “camps” which are generally within 20 km of a food source (NSW Scientific Committee 2004). The Grey-headed Flying-fox is listed as Vulnerable under the TSC Act and the EPBC Act.

Potential foraging habitat occurs within the subject site, but no roosting habitat occurs as no camps are present on or near the subject site.

Assessment of Significance

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

The Grey-headed Flying-fox is likely to use the subject site as foraging habitat as part of a much larger foraging range. They are a highly mobile species that accesses resources from across a wide area (between 20 – 50km from roost camp) and would not depend upon resources contained on the subject site for their survival. The proposal is not likely to place a viable local population of the species at risk of extinction as only a relatively small area of

disturbed vegetation (less than 0.14 ha) located adjacent to a railway line will be removed. The species is known to forage on fragmented street trees as well as much larger areas of intact vegetation. No roost camps are present on or near the subject site. The nearest camp is located approximately 5 km south-west of the subject site at Gladesville (Ku-ring-gai Bat Conservation Society 2017).

(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*

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.*

Patches of vegetation within an area of 0.14 ha will be cleared for the proposed works. This represents a relatively small area of potential foraging habitat within the locality for the Grey-headed Flying-fox. Much of the vegetation present in the subject site will not be affected by the proposed works so potential foraging habitat will remain for the species.

The habitat occurring within the subject site comprises of a narrow strip of planted vegetation which is already relatively fragmented. The proposed works will clear patches of vegetation, however it will not increase fragmentation substantially beyond current levels. The Grey-headed Flying-fox is highly mobile and would be able to move across the remaining fragments.

The proposed action will not remove, modify, fragment or isolate important habitat. The proposed works will require the clearing of marginal potential foraging habitat. The subject site would only likely provide foraging habitat as part of a wider range within the locality.

Much larger areas of potential habitat occur throughout the wider locality in other areas including Lane Cove National Park. These tracts of vegetation would provide more favourable foraging habitat for the Grey-headed Flying-fox. It is therefore considered that the habitat provided on the subject site is not important for the long-term survival of the species in the wider locality.

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

There is no critical habitat listed for this species 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 National Draft Recovery Plan for the Grey-headed Flying-fox (DECCW 2009) has been prepared. A number of threats to this species are listed in the Plan, including the removal of critical habitat. The proposal will remove a small amount of highly marginal foraging habitat for this species, which is not critical habitat and is well-represented throughout the locality. No roost camps are present on or adjacent to the subject site. Therefore the proposal is not considered to threaten the objectives of the Recovery Plan.

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

The following key threatening processes are likely to affect the Grey-headed Flying-fox:

- 'Clearing of native vegetation';
- 'Invasion and establishment of exotic vines and scramblers'; and
- 'Invasion of native plant communities by exotic perennial grasses'.

The key threatening process of 'Clearing of native vegetation', potentially impact habitat for the species further than current conditions. However, the vegetation on the subject site is not considered to constitute significant habitat for the Grey-headed Flying-fox. The clearing of planted native vegetation is not likely to significantly impact habitat for the Grey-headed Flying-fox, owing to its partially fragmented and degraded nature.

The proposed works are not considered to exacerbate the key threatening process of invasion by exotics further than current conditions.

Conclusion

The proposed works will only clear a marginal area of habitat (less than 0.14 ha), within an area that has already been previously disturbed. No significant habitat for the Grey-headed Flying-fox will be removed within the subject site. The proposal is not likely to place a viable local population of the species at risk of extinction. It is highly mobile and would be expected to move between areas of remaining habitat within the immediate vicinity of the subject site

and wider area. The project is not likely to have a significant impact upon the Grey-headed Flying-fox.

D.3 Eastern Bentwing-bat

Background

The Eastern Bentwing-bat occurs throughout the east and north-west coast of Australia. They hunt in forested areas above the canopy, and roost primarily in caves, however derelict mines, storm-water tunnels, buildings and other man-made structures can be utilised (OEH 2017b). The species is listed as Vulnerable under the TSC Act.

Potential foraging habitat occurs within the subject site, but no roosting habitat occurs.

Assessment of Significance

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

The Eastern Bentwing-bat could potentially use the subject site as foraging habitat as part of a much larger foraging range. They are a highly mobile species that accesses resources from across a wide area and would not depend upon resources contained on the subject site for their survival. The proposal is not likely to place a viable local population of the species at risk of extinction as only highly marginal habitat will be removed. The species would also likely utilise much larger areas of intact vegetation such as Lane Cove National Park. No roost habitat is present on the subject site.

(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*

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.

Patches of vegetation within an area of 0.14 ha will be cleared for the proposed works. This represents a relatively small area of potential foraging habitat within the locality for the Eastern Bentwing-bat. Much of the vegetation present in the subject site will not be affected by the proposed works so potential foraging habitat will remain for the species.

The habitat occurring within the subject site comprises of a narrow strip of planted vegetation which is already relatively fragmented. The proposed works will clear patches of vegetation; however it will not increase fragmentation substantially relative to current levels. The Eastern Bentwing-bat is highly mobile and would be able to move across the remaining fragments.

The proposed action will not remove, modify, fragment or isolate important habitat. The proposed works will require the clearing of marginal potential foraging habitat. The subject site would only likely provide foraging habitat as part of a wider range within the locality. Much larger areas of potential habitat occur throughout the wider locality in other areas including Lane Cove National Park. These tracts of vegetation would provide more favourable foraging habitat for the species. It is therefore considered that the habitat provided on the subject site is not important for the long-term survival of the Eastern Bentwing-bat in the wider locality.

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

There is no critical habitat listed for these species 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.

The Action Plan for Australian Bats provides a recovery outline for these species (Duncan et al. 1999). The proposed works are consistent with the objectives of this plan.

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

The following key threatening processes are likely to affect microchiropteran bats:

- 'Clearing of native vegetation';
- 'Invasion and establishment of exotic vines and scramblers'; and

- ‘Invasion of native plant communities by exotic perennial grasses’.

The key threatening process of ‘Clearing of native vegetation’, potentially impact habitat for the species further than current conditions. However, the vegetation on the subject site is not considered to constitute significant habitat for the Eastern Bentwing-bat. The clearing of planted native vegetation is not likely to significantly impact habitat for the Eastern Bentwing-bat, owing to its partially fragmented and degraded nature. The proposed works are not considered to exacerbate the key threatening process of invasion by exotics further than current conditions.

Conclusion

The proposed works will only clear a marginal area of potential, degraded habitat (less than 0.14 ha), mainly within areas that have already been previously disturbed. No significant habitat for the species will be removed within the subject site. The proposal is not likely to place a viable local population of the Eastern Bentwing-bat at risk of extinction. The species is highly mobile and would be expected to move between areas of remaining habitat within the immediate vicinity of the subject site and wider area. The project is not likely to have a significant impact upon the Eastern Bentwing-bat.

Appendix D – Stage 4

Appendix A

Ecological Assessment

A.1 Introduction

Laing O'Rourke was commissioned by Transport for New South Wales to undertake a signal power upgrade of the North Shore Line (the 'Project'). The Project will allow for an increase in rail traffic and will support the transition of the Epping to Chatswood rail line (ECRL) to Rapid Transit.

As part of the Project, a linear area of vegetation is required to be removed in order to facilitate piling works. The vegetation to be removed is located within the rail corridor between Drake Street and Brand Street, Artarmon (hereafter referred to as the 'Site') (see **Figure 1** in **Appendix B**). All vegetation to be removed has been previously mapped by the Office of Environment and Heritage (OEH) as part of the Native Vegetation of the Sydney Metropolitan Area project (OEH 2013). All vegetation within the Site has been mapped as Urban Exotic/Native. This community is not listed as a threatened ecological community under the NSW *Biodiversity Conservation Act 2016* (BC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Project has been previously approved as a State Significant Infrastructure project under the recently repealed NSW *Threatened Species Conservation Act 1995*. This ecological assessment forms part of the post-approval due diligence process in order to determine what management/mitigation and/or offsetting requirements need to be implemented.

A.2 Proposed Works

In order to complete the Project, piling works are required within the Site. To facilitate the piling works, all vegetation within the Site must be removed. As part of the works, one dam/retention basin will also be removed.

A.3 Methods

A Site inspection was undertaken by an ecologist on 12 April, 2018 in the company of the Project's Environmental Advisor. The inspection involved traversing the Site on foot and visually inspecting the areas where vegetation disturbance is proposed.

Field notes regarding the general condition and composition of the vegetation within the Site were made. This included documenting the species and location of all native vegetation to be disturbed with particular attention to native shrubs and trees over 3 m in height, threatened species, and any habitat features that could be utilised by native fauna. Photographs were taken at various locations of proposed disturbance to document the general condition and composition of the vegetation within the Site.

A discussion on-Site was carried out as required to ascertain the level of clearing (overstorey, understorey, groundcover), the nature of clearing (trimming, scrubbing etc) and the extent of clearing within the Site where disturbance works are to be located.

A.4 Key Findings

A.4.1 Impacts on Vegetation

All vegetation within the Site exists as an isolated narrow linear patch of vegetation that is exposed to a high degree of edge effects being bound by the rail corridor and developed areas (see **Photograph 1** in **Appendix C**). Most of the Site's vegetation has been previously cleared and contains a ground layer that is dominated by exotic species. Due to previous land uses in areas adjacent to the Site, native vegetation present within the Site is unlikely to be viable in the long-term. Although native canopy trees are present, the presence of exotic and native species that are not endemic to the area make it likely that most of the woody vegetation within the Site has been previously planted. Therefore, the vegetation within the Site to be disturbed by the Project is considered to conform to the vegetation community Urban Exotic/Native, as currently mapped by OEH (2013).

i. Canopy/Midstorey

For the purposes of this report, any individuals over 3 m in height were considered to be a canopy/midstorey species. The Project will require moderate disturbance to native canopy/midstorey species as 15 native canopy/midstorey individuals will be removed (see **Photograph 2** in **Appendix C**). Six of these individuals are likely to be planted as they are either not endemic to the area (*Callistemon salignus* and *Acacia saligna*) or occur outside of their typical habitat (*Melaleuca styphelioides*). The locations and details of the canopy/midstorey individuals to be removed are provided in **Figure 1** and **Table 1** below.

The Project will also require the removal of 14 exotic canopy/midstorey species which are also identified in **Figure 1** and **Table 1**.

Table 1 Details of Trees/shrubs to be removed

Tree Number	Scientific Name	Common Name	Status	DBH** (cm)	Height (m)	Canopy (m^2)	Notes
1	*Ligustrum lucidum*	Broad-leaved Privet	*OWRC	10	6	7	
2	*Cinnamomum camphora*	Camphor Laurel	*OWRC	4-8	6	10 (combined)	10 individuals
3	*Homalanthus populifolius*	Bleeding Heart		6	6	6 (combined)	3 individuals
4	*Cinnamomum camphora*	Camphor Laurel	*OWRC	30	10	12	
5	*Pittosporum undulatum*	Native Daphne		10	10	5	
6	*Callistemon salignus*	Willow Bottlebrush	Planted	6	5	5	2 individuals
7	*Homalanthus populifolius*	Bleeding Heart		15	6	3	

Table 1 Details of Trees/shrubs to be removed

Tree Number	Scientific Name	Common Name	Status	DBH** (cm)	Height (m)	Canopy (m^2)	Notes
8	*Casuarina glauca*	Swamp Oak		4	5	3	
9	*Acacia saligna*	Golden Wreath Wattle	Planted	4	3	5	2 individuals
10	*Camellia sp.*		*	10	9	4	
11	*Syncarpia glomulifera*	Turpentine		10	12	3	
12	*Casuarina glauca*	Swamp Oak		40	13	10	
13	*Melaleuca styphelioides*	Prickly-leaved Tea Tree	Planted	12	5	5	
14	*Melaleuca styphelioides*	Prickly-leaved Tea Tree	Planted	12	5	5	
15	*Pittosporum undulatum*	Native Daphne		8	6	3	
16	*Musa sp.*	Banana Tree	*	10	7	5	
TOTAL						**91 m^2**	**29 Individuals**

* = *Exotic*

***DBH (Diameter at breast height)*

OWRC = other weed of regional concern (LLS: Greater Sydney 2017)

i. Understorey

The Project will require the removal of all understorey vegetation within the Site. The understorey is highly degraded as much of the Site has been previously cleared for works associated with the existing rail line. Native species are present in small numbers and include regrowth *Homalanthus populifolius* (Bleeding Heart) and *Pittosporum undulatum* (Native Daphne). The majority of the understorey is dominated by exotic and planted native species including *Cinnamomum camphora* (Camphor Laurel), *Ligustrum lucidum* (Broad-leaved Privet) and *Acacia saligna* (Golden Wreath Wattle). Both *Cinnamomum camphora* (Camphor Laurel) and *Ligustrum lucidum* are listed as weeds of regional concern within the Greater Sydney area (LLS: Greater Sydney 2017).

ii. Groundcover

The proposed works will require the removal of all groundcover vegetation within the Site. The groundcover is highly degraded and comprised almost entirely of exotic species such as *Bidens pilosa* (Cobbler's Pegs), *Asparagus aethiopicus* (Ground Asparagus), *Ageratina adenophora* (Crofton Weed), *Chloris gayana* (Rhodes Grass), *Anredera cordifolia* (Madeira Vine), *Plantago lanceolata* (Lamb's Tongue), *Eragrostis curvula* (African Lovegrass), *Pennisetum clandestinum* (Kikuyu Grass), *Cynodon dactylon* (Couch), *Ipomoea* spp. (Morning Glory), *Ricinus communis* (Castor Oil Plant), *Verbena bonariensis* (Purpletop) and *Setaria parviflora*.

iii. Weeds listed under the Greater Sydney Regional Strategic Weed Management Plan

Table 2 below contains a list of weed species recorded within the Site that are listed under the Greater Sydney Regional Strategic Weed Management Plan (LLS: Greater Sydney 2017). The Greater Sydney Regional Strategic Weed Management Plan identifies the status and management strategies for each species included in the plan.

Table 2 Weeds listed in the Greater Sydney Regional Strategic Weed Management Plan recorded within the Site

Scientific Name	Common Name	Status
Anredera cordifolia	Madeira Vine	SP
Asparagus aethiopicus	Ground Asparagus	SP
Chloris gayana	Rhodes Grass	OWRC
Cinnamomum camphora	Camphor Laurel	OWRC
Ipomoea spp.	Morning Glory	OWRC
Ligustrum lucidum	Broad-leaved Privet	OWRC
Pennisetum clandestinum	Kikuyu	OWRC

SP=State Priority

OWRC=other weed of regional concern

A.4.2 Impacts to Threatened Species

i. Threatened Flora

No threatened flora species were recorded during the survey.

The groundcover that is proposed to be removed has been previously cleared and is either comprised of bare ground or exotic species. Due to the condition of the understorey, the Site is considered unlikely to provide suitable habitat for any threatened flora species known to occur in the locality.

ii. Threatened Fauna

One habitat feature consisting of a small dam/retention basin was recorded during the survey (see **Figure 1** and **Photograph 3**). The dam contains dense aquatic vegetation consisting of *Typha orientalis* (Broadleaf Cumbungi). The Striped Marsh Frog (*Limnodynastes peronii*) was heard calling within the dam/retention basin. The habitat is surrounded by highly disturbed areas and lacks connectivity to any nearby habitats for amphibians. Therefore, the proposed dam is considered to provide suitable habitat for only commonly occurring native amphibians, and no threatened amphibians such as the Green and Golden Bell Frog (*Litoria aurea*) are likely to utilise the dam.

No other significant habitat features such as, tree hollows, fallen logs or bushrock were identified within the Site.

With the exception of the dam/retention basin, it is likely that native fauna, including threatened species (primarily birds and bats), would only occasionally make use of the vegetation within the Site for foraging and are not likely dependent on it for their survival. Therefore, the Project is unlikely to have a significant impact on any threatened species that may utilise the Site for foraging on occasion.

A.5 Recommendations

The following recommendations are made to minimise impacts of the Project on the biodiversity values of the Site.

A.5.1 Vegetation Clearance

The limits of clearing should be clearly demarcated to ensure areas of vegetation outside of the Site are not impacted. All clearing staff should be informed of the clearing boundary prior to undertaking works.

A.5.2 Dam dewatering process

It is recommended that an ecologist be present during the dewatering of the dam within the Site. Prior to removing any vegetation, an ecologist will search through the dam and attempt to capture any fauna. Following the search, the attending ecologist will supervise the removal of all vegetation within the dam and search for any fauna. Once all vegetation has been removed, water may be pumped out. It is recommended that the pump intake be covered with a mesh screen to reduce the likelihood of any remaining fauna not captured being sucked into the pump. Any fauna captured will be relocated to suitable habitat located nearby the Site.

A.5.3 Removal of State Priority and other weeds of regional concern

Due to the presence of weeds listed as ‘other weeds of regional concern’ and ‘State Priority’ under the Greater Sydney Regional Strategic Weed Management Plan (LLS: Greater Sydney 2017), it is recommended that all vegetation removed not be reused as mulch within the Site or off-site.

A.5.4 Sediment/Erosion Runoff

To reduce the potential impacts of sediment/erosion runoff, it is recommended that no works be undertaken during periods of heavy rainfall. Additionally, sediment/erosion controls such as sediment fencing should be installed in all areas down slope of proposed works. All sediment/erosion controls should be to ‘Blue Book’ standards.

A.6 Conclusion

The Project requires limited disturbance to native vegetation in order to access and undertake the required piling works. Although a small number of native trees/shrubs will be removed as a result of the Project, the majority of the required clearance works will primarily impact exotic or planted native species. Impacts on native vegetation will be limited to the removal of 15 native trees/shrubs, four of which are not endemic to the area. All native vegetation to be impacted is either abundant in the area, comprised of planted individuals or is not endemic to the area.

All vegetation proposed to be removed currently exists in narrow linear patches that have heavily degraded understories that are exposed to a high degree of edge effects. Due to their location, degraded understories and high exposure to edge effects, the vegetation to be impacted is unlikely to survive in the long-term.

No threatened plant species were observed during the Site inspection and none are likely to occur due to the degraded nature of the Site's understorey.

No threatened fauna are likely to be dependent on the habitat within the Site to be removed as only one small dam/retention basin that is exposed to a high degree of edge effects is present. Therefore, the Project is unlikely to impact on any threatened fauna species that may utilise the Site periodically as part of a much broader foraging range.

If all mitigation measures recommended in **Section A.5** are implemented, the Project is unlikely to have a significant impact on any of the biodiversity values of the Site or the greater locality.

A.7 References

LLS: Greater Sydney, editor. 2017. Greater Sydney Regional Strategic Weed Management Plan 2017 - 2022. Local Land Services NSW.

OEH. 2013. The Native Vegetation of the Sydney Metropolitan Area. Office of Environment and Heritage, Sydney.

Appendix B

Figures

Legend

The Site

Dam/retention basin

Trees/shrubs to be removed

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:

Data Source:

cumberland ecology

I:\...\16212\Figures\Letter 14\20180417\Figure 1. Location of the Site

Figure 1. Location of the Site

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Appendix C

Photographs

Photograph 1 Condition of the Site

Photograph 2 Canopy trees within the Site

Photograph 3 Dam/retention basin within the Site

Appendix E – Stage 5

Appendix A

Ecological Assessment

A.1 Introduction

Laing O'Rourke was commissioned by Transport for New South Wales (TfNSW) to undertake a signal power upgrade of the North Shore Line known as the Main North and North Shore Corridor Works (the 'Project'). The Project will allow for an increase in traffic and to support the transition of Epping to Chatswood rail line to Rapid Transit. The Project is comprised of seven portions. This ecological assessment pertains to portion seven, which includes three linear sections of vegetation that are located between Artarmon Station and St. Leonards Station. These three sections are referred to individually as Areas 1-3 and they are referred to collectively as the 'Site' (see **Figure 1** and **Figure 2**).

As part of the Project, some areas of vegetation are required to be trimmed/removed in order to access and construct laydown areas. Proposed disturbances to vegetation include the following:

- Trees (including canopy and sub-canopy): limited to trimming of no more than 10% of the tree's total canopy;
- Shrubs: includes both trimming and removal, depending on the area of the Site the shrub is located; and
- Groundcovers: entire removal of the individuals.

A.2 Methods

A site inspection was undertaken by an ecologist on 4 July, 2018 in the company of an Environmental Manager. The inspection involved traversing the Site on foot and visually inspecting the areas where vegetation disturbance is proposed.

Field notes regarding the general condition and composition of the vegetation within the Site were made. This included documenting the species and location of all native vegetation to be disturbed with particular attention to native shrubs and trees, threatened species, and any habitat features that could be utilised by native fauna. Photographs were taken at various locations of proposed disturbance to document the general condition and composition of the vegetation within the Site.

A.3 Results

A.3.1 Vegetation Communities

All vegetation communities within the Site are comprised of isolated narrow linear patches. These patches are exposed to a high degree of edge effects as they are bound by the rail corridor and developed areas. The majority of the Site has been previously cleared and contains a degraded ground layer primarily consisting of exotic species.

The areas surveyed within the Site have not been previously mapped by the NSW Office of the Environment (OEH); however, areas adjoining the site have been mapped previously (OEH 2013). The vegetation communities previously mapped by OEH in areas near the Site include Urban Exotic/Native and Coastal Sandstone Foreshores Forest. Neither of these communities are listed under the BC Act or EPBC Act.

Field surveys confirmed that Urban Native/Exotic and Coastal Sandstone Foreshores Forest also occur within the Site. A description of each vegetation community occurring within the Site is provided below.

i. Urban Native/Exotic

Approximately 0.03 ha of Urban Native/Exotic vegetation occurs within the Site as two separate patches. The majority of this community within the Site is characterised by a canopy comprised of *Lophostemon confertus* (Bush Box) and scattered occurrences of *Eucalyptus fibrosa* (Red Ironbark), *Eucalyptus piperita* (Sydney Peppermint) and *Acacia parramattensis* (Parramatta Wattle) (See **Photograph 1**).

The ground stratum of the community is dominated by exotic species including *Genista linifolia* (Flaxleaf Broom) *Asparagus aethiopicus* (Ground Asparagus), *Cardiospermum grandiflorum* (Balloon Vine), *Senna pendula* (Senna), *Lantana camara* (Lantana), *Bidens pilosa* (Cobblers Peg's) and *Ipomoea purpurea* (Common Morning Glory) (See **Photograph 2)**

Photograph 1 Urban Native/Exotic overhanging canopy to be trimmed for the Project

Photograph 2 Urban Native/Exotic community with exotic understorey to be removed

ii. Coastal Sandstone Foreshores Forest

Approximately 0.05 ha of Coastal Sandstone Foreshores Forest (CSFF) exists within the Site as one linear patch. The canopy/midstorey within this community consists of *Angophora costata* (Smooth Barked Apple), *Hakea salicifolia* (Willow Leaved Hakea), *Allocasuarina littoralis* (Black She-Oak), *Acacia implexa* (Hickory Wattle), *Casuarina glauca* (Swamp She-Oak) and *Cinnamomum camphora* (Camphor Laurel) (See **Photograph 3**).

The ground stratum of the community is characterised primarily of native grasses and ferns including *Lomandra longifolia* (Spiny-head Mat-rush) and *Pteridium esculentum (*Bracken Fern) with scattered occurrences of exotic species such as *Cardiospermum grandiflorum* (Balloon Vine) and *Cynodon dactylon* (Couch Grass) (See **Photograph 3 and 4**) The latter exotic species is widely cultivated as a lawn grass and may have been introduced into the area.

Photograph 3 **CSFF overhanging canopy to be trimmed for the Project**

Photograph 4 **Native groundcover within the CSFF to be removed consisting of *Pteridium esculentum* and *Lomandra longifolia***

A.3.2 Threatened Flora

No threatened flora species were recorded and none are considered likely to occur within the Site due to its degraded nature as a result of previous clearing works.

A.3.3 Priority Weeds

A total of seven Priority weeds listed under the *Biosecurity Act 2015* were recorded from the site. **Table 1** below identifies the species recorded and their status.

Table 1 Weeds listed under the Biosecurity Act 2015

Scientific Name	Common Name	Status
Asparagus aethiopicus	Ground Asparagus	SP
Cardiospermum grandiflorum	Balloon Vine	OWRC
Cinnamomum camphora	Camphor Laurel	OWRC
Ipomoea indica	Common Morning Glory	OWRC
Lantana camara	Lantana	SP
Senecio madagascariensis	Fireweed	SP
Senna pendula	Senna	OWRC

Key: OWRC = other weed of regional concern, RP = regional priority weed, SP = state priority weed

A.3.4 Fauna Habitat

The vegetation within the Site primarily offers foraging habitat for a range of native birds, bats and arboreal mammals in the form of flowering plants. However, the Site is highly degraded due to its location close to the rail corridor and surrounding urban areas, and therefore the only fauna likely to utilise the habitats in the Site are widespread, urban adapted native species and exotic fauna species.

No important fauna habitat in the form of hollow-bearing trees, logs or bush-rock was identified from the Site. The habitats present in the Site are not likely to be important for any threatened fauna species.

A.4 Impact Assessment

A.4.1 Urban Exotic/Native

i. Area 1

The Project will require the trimming of canopy and lateral limbs of some trees within the Urban Exotic/Native community that occurs within Area 1 of the Site (see **Figure 1**). Approximately 7m^2 of canopy will be trimmed, which represents less than 10% of total canopy cover. No canopy trees will be removed for the project.

The removal of all exotic understorey and ground covers will be undertaken in Area 1, consisting of but not limited to, *Senna pendula* (Senna), *Bidens pilosa* (Cobblers Peg's), *Cardiospermum grandiflorum* (Balloon Vine) and *Asparagus aethiopicus* (Ground Asparagus) will take place for the proposed Project. **Table 2** details a list of all Urban Exotic/Native trees/shrubs that may be impacted within Area 1.

Table 2 Details of trees likely to be impacted within Area 1

Scientific Name	Common Name	Exotic/Native	Number of Trees	Tree Type
Lophostemon confertus	Bush Box	Native	4	Canopy
Eucalyptus fibrosa	Red Ironbark	Native	1	Canopy
Eucalyptus piperita	Sydney Peppermint	Native	1	Canopy
Acacia parramattensis	Parramatta Wattle	Native	1	Sub-canopy

ii. Area 2

The Project will require the removal of approximately 0.01 ha of vegetation within Area 2 (see **Figure 1**). The vegetation to be removed is comprised entirely of shrubs and groundcover species. Plant species to be removed include the following exotic shrubs/herbs and vines: *Lantana camara* (Lantana), *Ipomoea purpurea* (Common Morning Glory) and *Bidens pilosa* (Cobblers Peg's).

A.4.2 Coastal Sandstone Forest Foreshore

i. Area 3

The Project will require the trimming of canopy and lateral limbs of the CSFF community that occurs within Area 3 of the Site. Approximately 9m^2 of canopy will be trimmed, which represents less than 10% of total canopy cover. No trees will be removed, and only some canopy limbs are required to be trimmed.

The removal of the exotic *Cardiospermum grandiflorum* (Balloon Vine) growing within the canopy will also take place for the Project. Furthermore, the removal of native ground covers including *Lomandra longifolia* (Spiny-head Mat-rush) and *Pteridium esculentum* (Bracken Fern) from Area 3 is required for the Project. **Table 3** details a list of all trees/shrubs that may be impacted in Area 3.

Table 3 Details of trees likely to be impacted within Area 3

Scientific Name	Common Name	Exotic/Native	Number of Individuals	Type
Lophostemon confertus	Brush box	Native	1	Canopy

Table 3 Details of trees likely to be impacted within Area 3

Scientific Name	Common Name	Exotic/Native	Number of Individuals	Type
Eucalyptus saligna	Sydney Blue Gum	Native	3	Saplings
Angophora costata	Smooth bark Apple	Native	5	Small tree
Hakea salicifolia	Willow-leafed Hakea	Native	1	Shrub
Allocasuarina littoralis	Black She-oak	Native	3	Small tree
Cinnamomum camphora	Camphor Laurel	Exotic	1	Small tree
Acacia implexa	Hickory Wattle	Native	1	Canopy
Melaleuca armillaris	Bracelet Honey Myrtle	Native	1	Canopy
Acacia longifolia	Sydney Golden Wattle	Native	1	Small tree
Casuarina glauca	Swamp She-oak	Native	1	Canopy
Casuarina glauca	Swamp She-oak	Native	1	Small tree

A.4.3 Threatened Flora

No threatened flora species were recorded during the survey.

The majority of the groundcover that is proposed to be disturbed has been previously cleared and is either comprised of bare ground or exotic species. Due to the condition of the understorey, the Site is considered unlikely to provide suitable habitat for any threatened flora species known to occur in the locality.

A.4.4 Priority Weeds

The proposed works have the potential to result in the removal of seven priority weed species listed under the *Biosecurity Act 2015*. Due to the presence of these species, recommendations have been made within **Section A.6** to minimise the spread of these species within and/or outside of the Site.

A.4.5 Fauna Habitat

No significant habitat features were recorded during site surveys.

The proposed works will remove marginally important foraging habitat for native fauna. No canopy trees will be removed, and less than 10% of the existing canopy cover present in the site will be removed by the trimming of limbs, and therefore the vast majority of the habitat present will remain. The Site is located in a degraded urban environment, and large areas of

similar types of vegetation are present in the wider locality. Although habitats in the Site may be used periodically by some hardy, urban adapted native fauna species, the habitat to be removed is unlikely to represent a long-term important resource for any fauna species and is likely to be used only on occasion as part of a broader foraging range. No important habitat for threatened fauna species will be removed by the project.

A.5 Recommendations

The following recommendations are made to minimise impacts of the proposed works on the biodiversity values of the Site.

A.5.1 Vegetation Clearance

The limits of clearing should be clearly demarcated to ensure areas of vegetation outside of the Site are not impacted.

If trees/shrubs within the areas need to be entirely removed, it is recommended that an ecologist be on-site to document the species removed along with their biometric data (e.g. diameter at breast height (DBH), height, canopy cover). This will assist with refining the TfNSW offsetting requirements associated with the proposed works. If vegetation disturbance is limited to trimming only, an ecologist is not required to be present for vegetation removal.

A.5.2 Weed Removal

Due to the presence of weeds listed under the *Biosecurity Act 2015* within the Site, it is recommended that all vegetation removed not be reused as mulch within the Site or off-site. Additionally, all vegetation removed from the Site should be covered during transport and taken to an appropriate waste facility.

A.6 Conclusion

The proposed works require limited disturbance to native vegetation in order to access and construct laydown areas. An estimated 7m^2 of Urban Native/Exotic and 9m^2 of Coastal Sandstone Foreshores Forest are to be trimmed for the Project. These communities are not listed under the BC Act or the EPBC Act. No canopy trees will be removed for the Project and less than 10% of the total canopy cover within the Site will be removed by the trimming of limbs. Furthermore, the vegetation within the Site exists as linear patches that are highly degraded and have been previously exposed to edge effects and weed infestations. Accordingly, the project will not result in any long-term impacts on the ecological values of each community.

No threatened plant species were identified during site surveys and none are likely to occur due to the degraded nature of the Site. No threatened fauna are likely to be dependent on the Site, with the exception of foraging habitat as part of a broad range for native species.

With the implementation of the mitigation measures recommended in **Section A.6**, the proposed works are unlikely to have a significant impact on any of the biodiversity values of the Site or the greater locality.

A.7 References

OEH (2013). The Native Vegetation of the Sydney Metropolitan Area. Volume 2: Vegetation Community Profiles. Sydney, NSW Office of Environment and Heritage.

Appendix B

Figures

Legend

Subject Site

Vegetation Community

Urban Native/Exotic Vegetation

Vegetation Communities (OEH)

Urban_E/N: Urban Exotic/Native

Data Source:
OEH (2016). The Native Vegetation of the Sydney Metropolitan Area. Office of Environment and Heritage NSW.

Image Source:
Image © NearMap 2018
Dated: 6-5-2018

Coordinate System: MGA Zone 56 (GDA 94)

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I:\...\16212\Figures\Letter 20\20180710\Figure 1. Area 1 and 2 of The Site

Figure 1. Area 1 and 2 of The Site

Legend

The Site

Vegetation Community (CE)

Coastal Sandstone Foreshore Forest

Vegetation Communities (OEH)

S_DSF06: Coastal Sandstone Foreshores Forest

Urban_E/N: Urban Exotic/Native

Data Source:
OEH (2016). The Native Vegetation of the Sydney Metropolitan Area. Office of Environment and Heritage NSW.

Image Source:
Image © NearMap 2018
Dated: 6-5-2018

Coordinate System: MGA Zone 56 (GDA 94)

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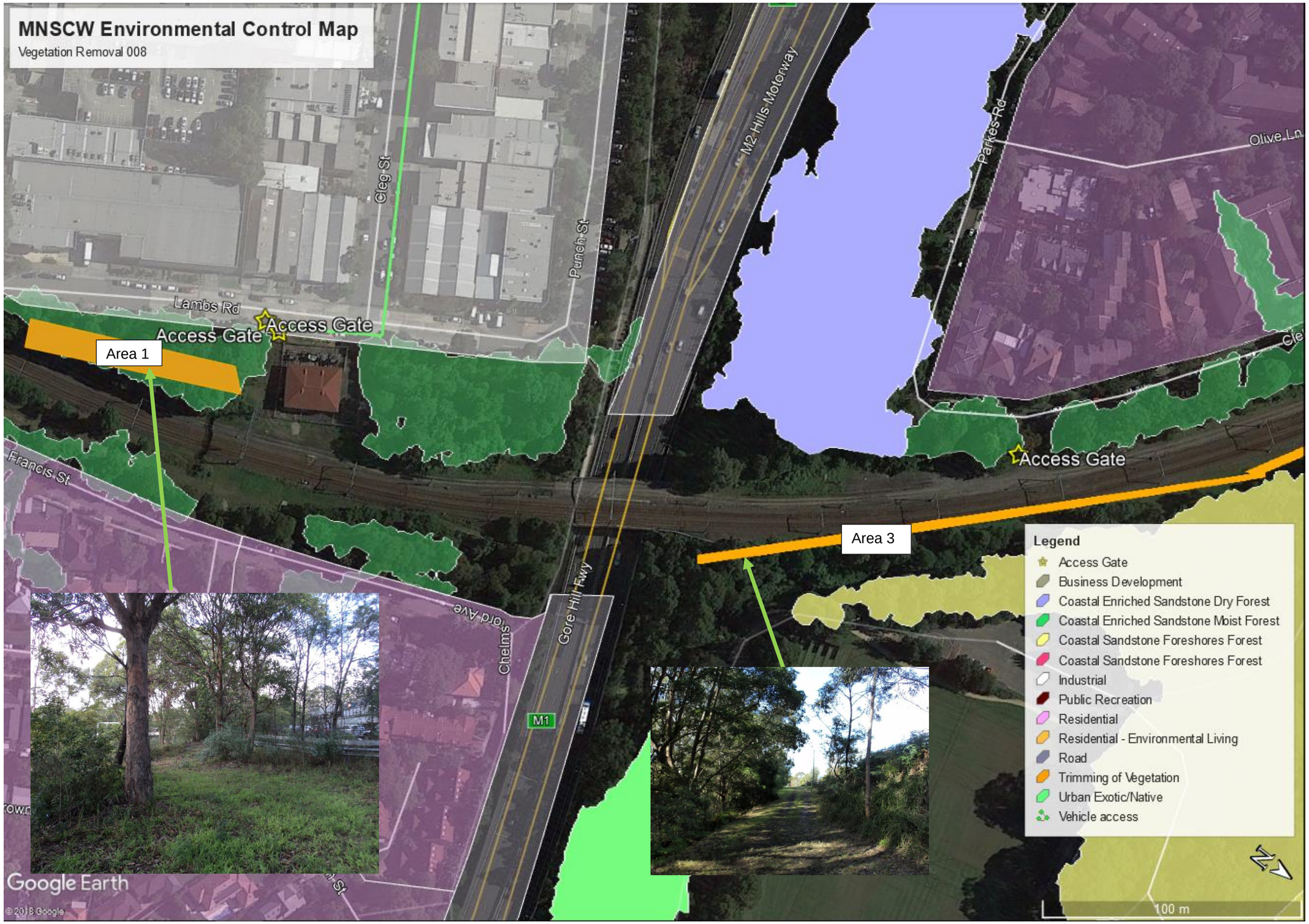
I:\...\16212\Figures\Letter 20\20180710\Figure 2. Area 3 of The Site

Figure 2. Area 3 of The Site

Appendix 2 – Environmental Control Map


MNSCW Environmental Control Map
Vegetation Removal 008
Cleg St
Punch St
M2 Hills Motorway
Parkes Rd
Olive Ln
Lambs Rd
Access Gate
Access Gate
Area 1
Access Gate
Francis St
Area 3
Chelms
Gore Hill Fwy
M1
Legend
Access Gate
Business Development
Coastal Enriched Sandstone Dry Forest
Coastal Enriched Sandstone Moist Forest
Coastal Sandstone Foreshores Forest
Coastal Sandstone Foreshores Forest
Industrial
Public Recreation
Residential
Residential - Environmental Living
Road
Trimming of Vegetation
Urban Exotic/Native
Vehicle access
Google Earth
© 2018 Google
100 m


MNSCW Environmental Control Map
Vegetation Removal 008
Hampden Rd
McMillan Rd
Cleland Rd
Olive Ln
Parkes Rd
Access Gate
Access Gate
Access Gate
Burra Rd
Pyrl Rd
Cooney Rd
Legend
Access Gate
Business Development
Coastal Enriched Sandstone Dry Forest
Coastal Enriched Sandstone Moist Forest
Coastal Sandstone Foreshores Forest
Coastal Sandstone Foreshores Forest
Industrial
Public Recreation
Residential
Residential - Environmental Living
Road
Trimming of Vegetation
Urban Exotic/Native
Vehicle access
Google Earth
© 2018 Google
100 m

Appendix F – Stage 6

Appendix A

Ecological Assessment

A.1 Introduction

Laing O'Rourke was commissioned by Sydney Metro (the 'proponent') to undertake works to facilitate a signal power upgrade of the North Shore Line (the 'Project'). The Project will allow for an increase in traffic and will support the transition of the Epping to Chatswood rail line (ECRL) to Rapid Transit. The Project is comprised of seven portions.

Cumberland Ecology was engaged by Laing O'Rourke on behalf of the proponent to undertake an ecological assessment of portion seven, including two linear sections of vegetation that are located along Valetta Lane, and between Mowbray Road and Brand Street, Artarmon (the 'Site') (see **Figure B.1** and **Figure B.2**).

A.2 Proposed Works

As part of the Project, areas of vegetation within the Site are required to be trimmed/removed in order to facilitate the following:

- Laydown area located along Valetta Land; and
- Removal of existing fencing and installation of new security fencing from Mowbray Road to Brand Street.

All vegetation to be impacted has been previously mapped by the Office of Environment and Heritage (OEH) as part of the Native Vegetation of the Sydney Metropolitan Area project (OEH 2013). The vegetation within the Site has been mapped by OEH as Urban Exotic/Native which is not listed under either the NSW *Biodiversity Conservation Act 2016* (BC Act) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In order to complete the Project, canopy and shrubs located between the rail corridor and Valetta Lane will be trimmed for a proposed laydown area. Additional areas of exotic dominated groundcovers will be removed. Between Mowbray and Brand Street, all vegetation encroaching on the existing fence will need to be trimmed in order to remove and replace an existing security fence. The removal of exotic dominated groundcover species will also be required for this area.

A.3 Methods

A site inspection was undertaken by an ecologist on 6 August, 2018 in the company of the Project's Engineer and Environmental Officer. The inspection involved traversing the Site on foot and visually inspecting the areas where vegetation disturbance is proposed.

Field notes regarding the general condition and composition of the vegetation within the Site were made. This included documenting the species and location of all vegetation to be disturbed with particular attention to native shrubs and trees, threatened species, and any habitat features that could be utilised by native fauna. Photographs were taken at various locations of proposed disturbance to document the general condition and composition of the vegetation within the Site.

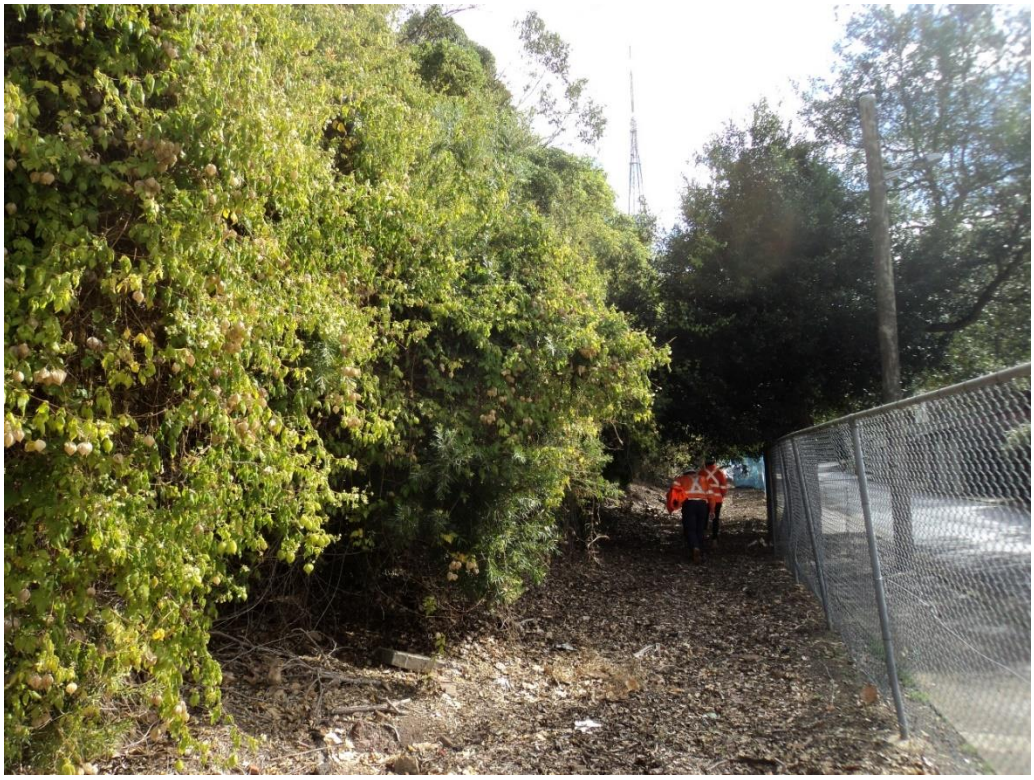
A.4 Results

A.4.1 Vegetation Communities

All vegetation within the Site exists as isolated narrow linear patches of vegetation that are exposed to a high degree of edge effects being bound by the rail corridor and developed residential areas. Most of the Site's vegetation has been previously cleared and contains a ground layer that is dominated by exotic species. All areas of vegetation proposed to be disturbed have been determined to conform to the vegetation community Urban Exotic/Native, as previously mapped by OEH (2013). A description of the Urban Exotic/Native vegetation community occurring within the Site is provided below.

i. Urban Exotic/Native

Urban Exotic/Native vegetation occurs in all areas of the Site. The majority of this community occurs alongside previously cleared areas and is comprised of shrubs, and small and mature trees (see **Photograph 1** and **Photograph 2**). Groundcover species are present in some areas but are generally sparse as the majority of this layer has been previously cleared. Exotic mature and small trees present include *Quercus robur* (English Oak), *Cinnamomum camphora* (Camphor laurel), *Erythrina x sykesii* (Coral Tree), *Jacaranda mimosifolia* (Jacaranda) and *Ligustrum lucidum* (Broad-leaved Privet). Native mature and small trees include *Waterhousea* sp., *Acmena smithii* (Lily Pilly), *Syzygium* sp. and *Pittosporum undulatum* (Native Daphne). All native mature and small trees are planted individuals. Shrub species present include regrowth canopy and small trees. Areas of midstorey contain dense patches of the exotic vines *Cardiospermum grandiflorum* (Balloon Vine) and *Anredera cordifolia* (Madeira Vine). The groundcover is sparse and is comprised primarily of exotic species including *Cenchrus clandestinus* (Kikuyu Grass), *Asparagus aethiopicus* (Ground Asparagus) and *Bryophyllum delagoense* (Mother-of-Millions). Native groundcover is limited to *Cynodon dactylon* (Couch Grass) and *Nephrolepis cordifolia* (Fishbone Fern).



Photograph 1 **Area of Urban Exotic/Native to be trimmed alongside Valetta Lane**

Photograph 2 **Area of Urban Exotic/Native to be trimmed between Mowbray Road and Brand Street**

A.4.2 Threatened Flora

One *Syzygium* sp. mature tree was recorded that could not be positively identified to species level as no fruit was able to be collected. This species is likely to be *Syzygium paniculatum* (Magenta Lily Pilly) which is listed as endangered under the BC Act and vulnerable under the EPBC Act. The individual has been planted as a streetscape tree and therefore, its conservation value is limited (see **Photograph 3**).

Photograph 3 *Syzygium* sp. mature tree present along Valetta Lane

A.4.3 Weeds listed under the Biosecurity Act 2015

A total of five weeds listed under the *Biosecurity Act 2015* were recorded within the Site. **Table 1** below identifies the weed species recorded and their status.

Table 1 Weeds listed under the *Biosecurity Act 2015*

Scientific Name	Common Name	Status
Asparagus aethiopicus	Ground Asparagus	SP
Bryophyllum delagoense	Mother-of-Millions	OWRC
Cardiospermum grandiflorum	Balloon Vine	OWRC

Table 1 Weeds listed under the *Biosecurity Act 2015*

Scientific Name	Common Name	Status
Ligustrum lucidum	Large-leaved Privet	OWRC
Cinnamomum camphora	Camphor Laurel	OWRC

Key: OWRC = other weed of regional concern, SP = state priority weed

A.4.4 Fauna Habitat

The Site primarily offers foraging habitat for a range of native birds, bats and arboreal mammals in the form of flowering plants. In addition to foraging habitat, the Site offers potential nesting habitat for the Common Ring-tail Possum (*Pseudocheirus peregrinus*) as several dreys were recorded within areas of dense *Cardiospermum grandiflorum* (Balloon Vine) located alongside Valetta Lane (see **Figure B.1**).

A.5 Impact Assessment

A.5.1 Urban Exotic/Native

The Project will require the trimming/removal of approximately 35.75 m^2 of this community within the Site. **Table 2** and **Table 3** contain the details of all Urban Exotic/Native trees (both small and mature) that are proposed to be impacted (trimming only) which includes: ten mature exotic trees, 19 mature native trees (all planted), three small exotic trees and 10 small native trees (all planted). In addition, some areas of exotic dominated groundcover vegetation will be removed.

Table 2 Details of trees (mature and small) to be trimmed alongside Valetta Lane

Tree Id	Scientific Name	Common Name	Proposed Works	No. of Individuals	DBH (cm)	Height (m)	Canopy (m^2)	Impact Area (m^2)
1	*Pittosporum undulatum*	Native Daphne	Trimming of ~20% foliage cover	2	10	6	6 (combined)	1.2
2	*Syzygium* sp. (likely paniculatum)	'-	Trimming of <10% foliage cover	1	50	8	10	1
3	*Pittosporum undulatum*	Native Daphne	Trimming of <10% foliage cover	3	10-15	8-10	10 (combined)	1
4	*Cinnamomum camphora*	Camphor laurel	Trimming of ~15% foliage cover	1	60	10	10	1.5
5	*Quercus robur*	English Oak	Trimming of ~25% foliage cover	1	70	15	10	2.5

Table 2 Details of trees (mature and small) to be trimmed alongside Valetta Lane

Tree Id	Scientific Name	Common Name	Proposed Works	No. of Individuals	DBH (cm)	Height (m)	Canopy (m^2)	Impact Area (m^2)
6	*Quercus robur*	English Oak	Trimming of ~25% foliage cover	1	60	20	10	2.5
7	*Jacaranda mimosifolia*	Jacaranda	Trimming of ~10% foliage cover	1	35	10	10	1
8	*Pittosporum undulatum*	Jacaranda	Trimming of ~20% foliage cover	1	15	10	5	1
9	*Jacaranda mimosifolia*	Jacaranda	Trimming of ~35% foliage cover	1	50	15	20	7
9	*Erythrina x sykesii*	Coral Tree	Trimming of ~10% foliage cover	1	30	10	10	1
10	*Jacaranda mimosifolia*	Jacaranda	Trimming of ~10% foliage cover	1	20	8	6	0.6
Total				**14**	**-**	**-**	**107**	**20.3**

**DBH (Diameter at breast height)*

Note: Small trees = 10-19cm dbh, Mature trees = >19cm dbh

Table 3 Details of trees (mature and small) to be trimmed between Mowbray Road and Brand Street

Tree Id	Scientific Name	Common Name	Proposed Works	No. of Individuals	DBH (cm)	Height (m)	Canopy (m^2)	Impact Area (m^2)
11	*Ligustrum lucidum*	Large-leaved Privet	Trimming of ~25% foliage cover	1	10	5	4	1
12	*Ligustrum lucidum*	Large-leaved Privet	Trimming of ~25% foliage cover	1	15	8	5	1.25
13	*Erythrina x sykesii*	Coral Tree	Trimming of <10% foliage cover	1	20	7	3	0.3
14	*Acmena smithii*	Lily Pilly	Trimming of ~10% foliage cover	4	5-10	3-8	10 (combined)	1
15	*Waterhousea sp.*		Trimming of ~10% foliage cover	18	20-25	8-12	117 (combined)	11.7
16	*Quercus robur*	English Oak	Trimming of ~10% foliage cover	1	15	4	2	0.2
Total				**26**	**-**	**-**	**141**	**15.45**

**DBH (Diameter at breast height)*

Note: Small trees = 10-19cm dbh, Mature trees = >19cm dbh

A.5.2 Threatened Flora

One *Syzygium* sp. mature tree was recorded that could not be positively identified to species level as no fruit was able to be collected. As a precaution, this individual is considered to be *Syzygium paniculatum* (Magenta Lily Pilly) which is listed as endangered under the BC Act and vulnerable under the EPBC Act. Although listed under both the BC Act and EPBC Act, this individual has limited conservation value as it has been planted and does not occur within its natural habitat. The proposed works will require the trimming of lateral branches only which will result in the tree being retained. With consideration of the proposed works and the minimal conservation value the tree provides, the proposed impacts on the individual are considered to be minor and are not assessed further within this report.

No other threatened flora species were recorded during the survey.

The majority of the groundcover that is proposed to be disturbed has been previously cleared and is either comprised of bare ground or exotic species. Due to the condition of the understorey, the Site is considered unlikely to provide suitable habitat for any threatened flora species known to occur in the locality.

A.5.3 Weeds Listed Under the Biosecurity Act 2015

The proposed works have the potential to result in the removal of five weed species listed under the *Biosecurity Act 2015*. Due to the presence of these species, recommendations have been made within ***Section A.6*** to minimise the spread of these species within and/or outside of the Site.

A.5.4 Fauna Habitat

Fauna habitat features recorded during the survey included several dreys suitable for the Common Ring-tail Possum (*Pseudocheirus peregrinus*) within dense areas of *Cardiospermum grandiflorum* (Balloon Vine) (see **Figure B.1**). The proposed works will remove these possum dreys and potentially impact on any residing individuals. In order to minimise impacts on the Common Ring-tail Possum (*Pseudocheirus peregrinus*), recommendations have been made within ***Section A.6.***

No other habitat features were recorded during the survey.

The proposed works will remove a small amount of foraging habitat for native fauna, but the habitat to be removed is unlikely to be important for the long-term survival of any fauna species as this type of habitat is widespread in the locality and large areas of similar vegetation will remain. The species that may potentially utilise this habitat are expected to be all highly mobile species (e.g. possums, birds and bats) and the habitat to be removed would likely only be utilised on occasion as part of a broader foraging range. The majority of the existing habitat will be retained and the only impact will be the minor trimming of branches.

A.6 Recommendations

The following recommendations are made to minimise impacts of the proposed works on the biodiversity values of the Site.

A.6.1 Marking the Limits of Vegetation Clearance

The limits of clearing should be clearly demarcated to ensure areas of vegetation outside of the Site are not impacted. The amount of vegetation to be trimmed should be the minimum required for the project.

A.6.2 Weed Removal

Due to the presence of weeds listed under the *Biosecurity Act 2015* within the Site, it is recommended that all vegetation removed not be reused as mulch within the Site or off-site. Additionally, all vegetation removed from the Site should be covered during transport and taken to an appropriate waste facility.

A.6.3 Fauna Habitat Removal

Due to the presence of possum dreys within dense areas of of *Cardiospermum grandiflorum* (Balloon Vine) located alongside Valetta Road, it is recommended that a fauna ecologist checks all dreys prior to clearing, relocates any residing fauna to adjacent habitat to be retained and destroys the dreys.

A.7 Conclusion

The proposed works requires the trimming/removal of approximately 35.75 m^2 of Urban Exotic/Native vegetation within the Site. This community is not listed under the BC Act or the EPBC Act and offers little ecological value other than potential nesting habitat for some fauna species including the Common Ring-tail Possum (*Pseudocheirus peregrinus*) within dense areas of *Cardiospermum grandiflorum* (Balloon Vine). Proposed impacts to mature and small trees will be limited to trimming only and all individuals will be retained *in-situ*.

Potentially one *Syzygium paniculatum* (Magenta Lily Pilly) mature tree listed under both the BC Act and EPBC Act will be impacted by the proposed works, but disturbance to the individual is limited to the trimming of lateral branches only. This individual has been planted as part of a streetscape and has minimal conservation value. Therefore, no further assessment of this tree is required.

No threatened fauna species are likely to be dependent on the habitat within the Site to be impacted, and if they occur they are expected to only utilise the Site periodically as part of a much broader foraging range. The extent of habitat removal is minor and the vast majority of the existing habitat will remain, with disturbance being limited to the trimming of some branches. Therefore, the proposed works are unlikely to impact on any threatened fauna species.

If all mitigation measures recommended in ***Section A.6*** are implemented, the proposed works are unlikely to have a significant impact on any of the biodiversity values of the Site or the greater locality.

A.8 References

OEH. 2013. The Native Vegetation of the Sydney Metropolitan Area. Office of Environment and Heritage, Sydney.

Appendix B

Figures

Legend

- The Site
- Trees to be trimmed
- Common Ringtail Possum dreys

Image Source:
Nearmap © Image
(18/01/2018)

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 5 10 15 20 m

I:\...\16212\Figures\Letter 24\20180808\Figure B.1. The site_Valetta Lane

Figure B.1. The site (Valetta Lane)

Legend

The Site

Trees to be trimmed

Image Source:
Nearmap © Image
(18/01/2018)

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 10 20 30 40 m

I:\...\16212\Figures\Letter 24\20180808\Figure B.2. The site_Mowbray

Figure B.2. The site (Mowbray Road to Brand Street)

Appendix 2 – Environmental Control Map


NCW Veg Trimming/Removal 002
Environmental Control Map
Legend
Access Gate
Local Centre
Neighbourhood Centre
Public Recreation
Residential
Road
Trimming of vegetation
Urban Exotic/Native Vegetation
Vehicle access
Vehicle access from site
Palmer St
Hampden Rd
Area 1 – Brand to Mowbray
Trimming of overhanging vegetation
Access via Brand Street
Access Gate
Access Gate
Drake St
Raleigh St
Hawkins St
Elizabeth St
Google Earth
© 2018 Google
80 m

Appendix G – Stage 7

Appendix A

Ecological Assessment

A.1 Introduction

Laing O'Rourke was commissioned by Sydney Metro (the 'proponent') to undertake works to facilitate a signal power upgrade of the North Shore Line (the 'Project'). The Project will allow for an increase in traffic and will support the transition of the Epping to Chatswood rail line (ECRL) to Rapid Transit. The Project is comprised of seven portions.

Cumberland Ecology was engaged by Laing O'Rourke on behalf of the proponent to undertake an ecological assessment of portion seven, including two linear sections of vegetation that are located between Drake Street to Nelson Street, Artarmon and near the Chatswood Oval, Chatswood (hereafter referred to as the 'Site') (see **Figure B.1** and **Figure B.2**).

A.2 Proposed Works

As part of the Project, areas of vegetation within the Site are required to be trimmed/removed in order to facilitate the following:

- Removal of existing fencing and installation of new security fencing from Drake Street to Mowbray Road and near Chatswood Oval; and
- Removal of existing fencing and installation of new acoustic fencing from Mowbray Road to Nelson Street.

All vegetation to be impacted has been previously mapped by the Office of Environment and Heritage (OEH) as part of the Native Vegetation of the Sydney Metropolitan Area project (OEH 2013). The vegetation within the Site has been mapped by OEH as Urban Exotic/Native which is not listed under either the NSW *Biodiversity Conservation Act 2016* (BC Act) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In order to complete the Project, canopy and shrubs located within the Site will be trimmed/removed in order to facilitate the fencing works. Additional areas of exotic dominated and/or planted native groundcovers will also be removed.

A.3 Methods

A site inspection was undertaken by an ecologist on 6 August, 2018 in the company of the Project's Engineer and Environmental Officer. The inspection involved traversing the Site on foot and visually inspecting the areas where vegetation disturbance is proposed.

Field notes regarding the general condition and composition of the vegetation within the Site were made. This included documenting the species and location of all vegetation to be disturbed with particular attention to native shrubs and trees, threatened species, and any habitat features that could be utilised by native fauna. Photographs were taken at various locations of proposed disturbance to document the general condition and composition of the vegetation within the Site.

A.4 Results

A.4.1 Vegetation Communities

All vegetation within the Site exists as isolated narrow linear patches of vegetation that are exposed to a high degree of edge effects being bound by the rail corridor and developed areas. Most of the Site's vegetation has been previously cleared and contains a ground layer that is dominated by exotic species. Some areas do contain native groundcover species primarily comprised of planted individuals. All areas of vegetation proposed to be disturbed have been determined to conform to the vegetation community Urban Exotic/Native, as previously mapped by OEH (2013). A description of the Urban Exotic/Native vegetation community occurring within the Site is provided below.

i. Urban Exotic/Native

Urban Exotic/Native vegetation occurs in all areas of the Site. The majority of this community occurs alongside previously cleared areas and is comprised of shrubs, and small and mature trees (see **Photograph 1** and **Photograph 2**). Groundcover species are present in some areas but are generally sparse as the majority of this layer has been previously cleared. Exotic mature and small trees present include *Cinnamomum camphora* (Camphor laurel), *Jacaranda mimosifolia* (Jacaranda), *Araucaria heterophylla* (Norfolk Island Pine) and planted oak (*Quercus* sp.) trees. Native mature and small trees include *Pittosporum undulatum* (Native Daphne) *Homalanthus populifolius* (Bleeding Heart) and *Acacia fimbriata* (Fringed Wattle). Shrub species present include regrowth canopy and small trees along with the following exotic or planted native species: *Nerium oleander* (Oleander), *Olea europaea* subsp. *cuspidata* (African Olive), *Ligustrum lucidum* (Large-leaved Privet), *Cotoneaster glaucophyllus* (Glaucous Cotoneaster), *Lagerstroemia* sp. (Crepe Myrtle), *Camellia* sp., *Tecoma capensis* (Cape Honeysuckle) and *Callistemon citrinus* (Crimson Bottlebrush). Areas of midstorey contain dense patches of the exotic vines in places including *Cardiospermum grandiflorum* (Balloon Vine), *Hedera helix* (English Ivy), *Ipomoea indica* (Morning Glory) and *Jasminum polyanthum* (White Jasmine). The groundcover is sparse and is comprised primarily of exotic species including *Cenchrus clandestinus* (Kikuyu Grass), *Asparagus aethiopicus* (Ground Asparagus) and *Senecio madagascariensis* (Fireweed). Native groundcover is limited to *Cynodon dactylon* (Couch Grass), *Nephrolepis cordifolia* (Fishbone Fern) and planted *Lomandra* spp.

Photograph 1 **Area of Urban Exotic/Native to be trimmed near Raleigh Street**

Photograph 2 **Area of Urban Exotic/Native to be trimmed near Chatswood Oval**

A.4.2 Threatened Flora

No threatened flora species were recorded during the survey.

A.4.3 Weeds listed under the Biosecurity Act 2015

A total of ten weeds listed under the *Biosecurity Act 2015* were recorded within the Site. **Table 1** below identifies the weed species recorded and their status under the Greater Sydney Region Weed Management Plan (LLS: Greater Sydney 2017).

Table 1 Weeds listed under the *Biosecurity Act 2015* recorded within the Site

Scientific Name	Common Name	Status
Asparagus aethiopicus	Ground Asparagus	SP
Cardiospermum grandiflorum	Balloon Vine	OWRC
Cinnamomum camphora	Camphor Laurel	OWRC
Cotoneaster glaucophyllus	Glaucous Cotoneaster	OWRC
Ipomoea indica	Morning Glory	OWRC
Jasminum polyanthum	White Jasmine	OWRC
Ligustrum lucidum	Large-leaved Privet	OWRC
Olea europaea subsp. *cuspidata*	African Olive	RP
Senecio madagascariensis	Fireweed	SP
Tecoma capensis	Cape Honeysuckle	OWRC

Key: OWRC = other weed of regional concern, SP = state priority weed, RP = regional priority weed

A.4.4 Fauna Habitat

The Site primarily offers foraging habitat for a range of native birds, bats and arboreal mammals in the form of flowering plants. In addition to foraging habitat, the Site offers potential nesting habitat for the Common Ring-tail Possum (*Pseudocheirus peregrinus*) as one drey was recorded within an area of dense *Ipomoea indica* (Morning Glory) located near the Chatswood Oval (see **Photograph 3** and **Figure B.2**).

Photograph 3 **Possum drey recorded near Chatswood Oval (see Figure B.2) within dense vine of *Ipomoea indica***

A.5 Impact Assessment

A.5.1 Urban Exotic/Native

The Project will require the trimming/removal of approximately 63.6 m^2 of this community within the Site. **Table 2** contain the details of all Urban Exotic/Native trees (both small and mature) and shrubs that are proposed to be trimmed or removed. Native vegetation to be disturbed includes the trimming of one mature tree, the removal of four small trees, the removal of one shrub and the trimming of 23 shrubs. Impacts to exotic vegetation includes the removal of two mature trees, the trimming of nine mature trees, the trimming of ten small trees, the removal of one shrub and the trimming of 13 shrubs.

Table 2 Details of trees (mature and small) and shrubs to be trimmed/removed by the proposed works

Figure ID	Scientific Name	Common Name	Status	Proposed Works	No. of Individuals	DBH (cm)	Height (m)	Canopy (m^2)	Impact Area (m^2)
Drake Street to Raleigh Street									
1	*Pittosporum undulatum*	Native Daphne	P	Trimming of ~50% foliage cover	1	20	8	5	2.5
2	*Ligustrum lucidum*	Large-leaved Privet	*	Trimming of ~10% foliage cover	5	10-15	8	10 (combined)	1
3	*Quercus* sp.	Oak	*	Removal	1	8	6	3	3
4	*Nerium oleander*	Oleander	*	Trimming of ~10% foliage cover	8	5	6	10 (combined)	1
5	*Quercus* sp.	Oak	*	Removal	1	35	10	10	10
6	*Lagerstroemia* sp.	Crepe Myrtle	*	Trimming of ~10% foliage cover	4	5-9	3-6	24 (combined)	2.4
7	*Cotoneaster glaucophyllus*	Glaucous Cotoneaster	*	Trimming of ~15% foliage cover	1	15	8	8	1.2
8	*Jacaranda mimosifolia*	Jacaranda	*	Trimming of ~10% foliage cover	1	25	8	15	1.5
Raleigh Street to Mowbray Street									
9	*Pittosporum undulatum*	Native Daphne	P	Trimming of ~10% foliage cover	20	5-9	3-6	40 (combined)	4
10	*Olea europaea* subsp. *cuspidata* *Ligustrum lucidum*	African Olive Large-leaved Privet	* *	Trimming of ~10% foliage cover	1	10	8	5	1
11	*Camellia* sp.		*	Trimming of ~10% foliage cover	1	8	5	4	0.4
12	*Pittosporum undulatum*	Native Daphne	P	Trimming of ~10% foliage cover	1	5	4	3	0.3

Table 2 Details of trees (mature and small) and shrubs to be trimmed/removed by the proposed works

Figure ID	Scientific Name	Common Name	Status	Proposed Works	No. of Individuals	DBH (cm)	Height (m)	Canopy (m^2)	Impact Area (m^2)
13	*Jacaranda mimosifolia*	Jacaranda	*	Trimming of ~50% foliage cover	1	10	5	5	2.5
Mowbray Street to Nelson Street									
14	*Callistemon citrinus*	Crimson Bottlebrush	P	Removal	2	5	1.5	4 (combined)	4
15	*Jacaranda mimosifolia*	Jacaranda	*	Trimming of ~25% foliage cover	1	20	7	6	1.5
16	*Jacaranda mimosifolia*	Jacaranda	*	Trimming of ~20% foliage cover	1	10	5	3	0.6
17	*Jacaranda mimosifolia*	Jacaranda	*	Trimming of ~20% foliage cover	1	20	8	6	1.2
18	*Jacaranda mimosifolia*	Jacaranda	*	Trimming of ~20% foliage cover	1	18	6	5	1
	Tecoma capensis	Cape Honeysuckle	*	Removal	1	20	2	5	5
19	*Tecoma capensis*	Cape Honeysuckle	*	Trimming of ~20% foliage cover	3	20	2	15 (combined)	3
Chatswood Oval									
20	*Homalanthus populifolius*	Bleeding Heart		Removal	1	10	3	2	2
21	*Acacia fimbriata*	Fringed Wattle		Trimming of ~50% foliage cover	2	8	3	10 (combined)	5
22	*Homalanthus populifolius*	Bleeding Heart		Removal	2	10	2	5 (combined)	5
23	*Araucaria heterophylla*	Norfolk Island Pine	*	Trimming of <10% foliage cover	1	200	25	15	1.5
24	*Araucaria heterophylla*	Norfolk Island Pine	*	Trimming of <10% foliage cover	1	110	25	15	1.5
25	*Cinnamomum camphora*	Camphor Laurel	*	Trimming of <10% foliage cover	1	60	20	15	1.5

**DBH (Diameter at breast height)*

Note: Shrubs = 5-9cm dbh, Small trees = 10-19cm dbh, Mature trees = >19cm dbh

*Status: * = exotic, P = planted native*

A.5.2 Threatened Flora

No other threatened flora species were recorded during the survey.

The majority of the groundcover that is proposed to be disturbed has been previously cleared and is primarily comprised of bare ground or exotic species. Some areas due contain native planted species within the groundlayer. Due to the condition of the understorey, the Site is considered unlikely to provide suitable habitat for any threatened flora species known to occur in the locality.

A.5.3 Weeds Listed Under the Biosecurity Act 2015

The proposed works have the potential to result in the removal of ten weed species listed under the *Biosecurity Act 2015*. Due to the presence of these species, recommendations have been made within ***Section A.6*** to minimise the spread of these species within and/or outside of the Site.

A.5.4 Fauna Habitat

Fauna habitat features recorded during the survey included one drey suitable for the Common Ring-tail Possum (*Pseudocheirus peregrinus*) within dense areas of *Ipomoea indica* (Morning Glory) (see **Figure B.2**). The proposed works will remove the possum drey and potentially impact on any residing individuals. In order to minimise impacts on the Common Ring-tail Possum (*Pseudocheirus peregrinus*), recommendations have been made within ***Section A.6.***

No other habitat features were recorded during the survey.

The proposed works will remove a small amount of foraging habitat for native fauna, but the habitat to be removed is unlikely to be important for the long-term survival of any fauna species as this type of habitat is widespread in the locality and large areas of similar vegetation will remain. The species that may potentially utilise this habitat are expected to be all highly mobile species (e.g. possums, birds and bats) and the habitat to be removed would likely only be utilised on occasion as part of a broader foraging range. The majority of the existing habitat will be retained and the only impact will be the minor trimming of branches.

A.6 Recommendations

The following recommendations are made to minimise impacts of the proposed works on the biodiversity values of the Site.

A.6.1 Marking the Limits of Vegetation Clearance

The limits of clearing should be clearly demarcated to ensure areas of vegetation outside of the Site are not impacted. The amount of vegetation to be removed/trimmed should be the minimum required for the project.

A.6.2 Weed Removal

Due to the presence of weeds listed under the *Biosecurity Act 2015* within the Site, it is recommended that all vegetation removed not be reused as mulch within the Site or off-site. Additionally, all vegetation removed from the Site should be covered during transport and taken to an appropriate waste facility.

A.6.3 Fauna Habitat Removal

Due to the presence of a possum drey located nearby the Chatswood Oval, it is recommended that a fauna ecologist checks the drey prior to clearing, and if present relocates any residing fauna to adjacent habitat to be retained prior to destruction of the drey.

A.7 Conclusion

The proposed works requires the trimming/removal of approximately 63.6 m^2 of Urban Exotic/Native vegetation within the Site. This community is not listed under the BC Act or the EPBC Act and offers little ecological value other than potential nesting habitat for some fauna species including the Common Ring-tail Possum (*Pseudocheirus peregrinus*) within dense areas of the exotic vine *Ipomoea indica* (Morning Glory). The majority of the proposed impacts to vegetation is limited to trimming only and the majority of the individuals to be impacted will be retained *in-situ*.

No threatened flora species were recorded within the Site and none are considered to have the potential to occur due to the degraded condition of the Site. Therefore, the proposed works are unlikely to impact on any threatened flora species.

No threatened fauna species are likely to be dependent on the habitat within the Site to be impacted, and if they occur they are expected to only utilise the Site periodically as part of a much broader foraging range. The extent of habitat removal is minor and the vast majority of the existing habitat will remain, with disturbance being limited to the trimming of some branches. Therefore, the proposed works are unlikely to impact on any threatened fauna species.

If all mitigation measures recommended in ***Section A.6*** are implemented, the proposed works are unlikely to have a significant impact on any of the biodiversity values of the Site or the greater locality.

A.8 References

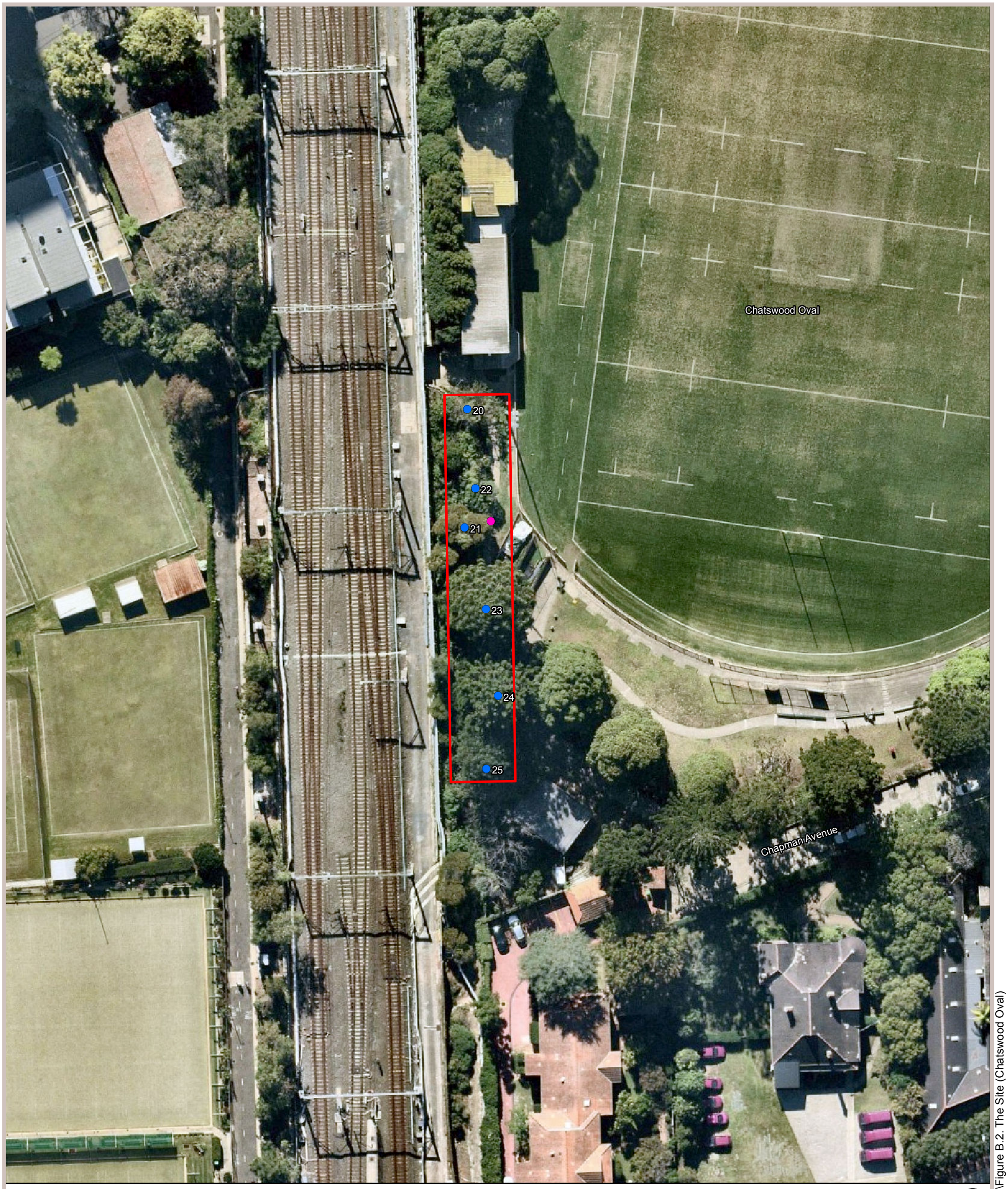
LLS: Greater Sydney, editor. 2017. Greater Sydney Regional Strategic Weed Management Plan 2017 - 2022. Local Land Services NSW.

OEH. 2013. The Native Vegetation of the Sydney Metropolitan Area. Office of Environment and Heritage, Sydney.

Appendix B

Figures

Figure B.1. The Site (Drake Street to Nelson Street)



Legend

- The Site
- Trees/Shrubs to be Trimmed
- Common Ringtail Possum Drey

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2018
Dated: 6/5/2018

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I:\...\16212\Figures\Letter 26\20180813\Figure B.2. The Site (Chatswood Oval)

Figure B.2. The Site (Chatswood Oval)

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Appendix H – Stage 8

Appendix A

Ecological Assessment

A.1 Introduction

Laing O'Rourke was commissioned by Sydney Metro (the 'proponent') to undertake works to facilitate a signal power upgrade of the North Shore Line (the 'Project'). The Project will allow for an increase in traffic and will support the transition of the Epping to Chatswood rail line (ECRL) to Rapid Transit. The Project is comprised of seven portions.

Cumberland Ecology was engaged by Laing O'Rourke on behalf of the proponent to undertake an ecological assessment of portion seven, including one linear section of vegetation that is located between Hopetoun Avenue and near the Chatswood Oval, Chatswood (hereafter referred to as the 'Site') (see **Figure B.1**).

A.2 Proposed Works

As part of the Project, areas of vegetation within the Site are required to be removed in order to facilitate laydown areas and site access.

Parts of the Site are mapped by the Office of Environment and Heritage (OEH) as part of the Native Vegetation of the Sydney Metropolitan Area project (OEH 2013) while other parts are unmapped. OEH mapped vegetation includes Urban Exotic/Native which is not listed under either the NSW *Biodiversity Conservation Act 2016* (BC Act) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In order to complete the Project, all vegetation within the Site is proposed to be removed.

A.3 Methods

A site inspection was undertaken by an ecologist on 25 October, 2018 in the company of the Project's Environmental Officer. The inspection involved traversing the Site on foot and visually inspecting the areas where vegetation disturbance is proposed.

Field notes regarding the general condition and composition of the vegetation within the Site were made. This included documenting the species and location of vegetation to be removed with particular attention to native shrubs and trees, threatened species, and any habitat features that could be utilised by native fauna. Photographs were taken at various locations of proposed disturbance to document the general condition and composition of the vegetation within the Site.

A.4 Results

A.4.1 Vegetation Communities

All vegetation within the Site exists as isolated narrow linear patches that are exposed to a high degree of edge effects being bound by the rail corridor and developed areas. Most of the Site's vegetation has been previously cleared and contains a ground layer that is dominated by exotic species. Some areas do contain native groundcover species primarily comprised of regrowth

canopy species, all of which have been planted. All areas of vegetation proposed to be disturbed have been determined to conform to the vegetation community Urban Exotic/Native, as previously mapped by OEH (2013). A description of the Urban Exotic/Native vegetation community occurring within the Site is provided below.

i. Urban Exotic/Native

Urban Exotic/Native vegetation occurs in all areas of the Site that contain vegetation. All of this community occurs alongside previously cleared areas and is comprised of a degraded understorey, shrubs, and small and mature trees (see **Photograph 1** and **Photograph 2**). Groundcover species are present in some areas but are generally sparse as the majority of this layer has been previously cleared. Native mature and small trees present include *Eucalyptus microcorys* (Tallowwood), *Melaleuca decora*, *Acacia parramattensis* (Parramatta Wattle), *Casuarina glauca* (Swamp Oak), *Allocasuarina littoralis* (Black She-oak) *Homalanthus populifolius* (Bleeding Heart) and *Acacia fimbriata* (Fringed Wattle). Shrub species present include regrowth canopy and small trees along with the following exotic *Genista linifolia* (Flaxleaf Broom). The groundcover is sparse and is comprised primarily of exotic species including *Avena barbata* (Bearded Oats), *Bidens pilosa* (Cobbler's Pegs), *Abutilon grandiflorum*, *Cirsium vulgare* (Spear Thistle) and *Ipomoea* spp. Native groundcover is limited to canopy species and planted *Lomandra* spp.

Photograph 1 Area of Urban Exotic/Native vegetation to be removed near Hopetoun Avenue

Photograph 2 Characteristic condition of groundcover vegetation to be removed

A.4.2 Threatened Flora

No threatened flora species were recorded during the survey.

A.4.3 Weeds listed under the Biosecurity Act 2015

One weed listed under the *Biosecurity Act 2015* (Biosecurity Act) was recorded within the Site; *Ipomoea* spp. Individuals of this species were scattered throughout much of the Site. This species is listed as a 'other weed of regional concern' under the Biosecurity Act's Greater Sydney Region Weed Management Plan (LLS: Greater Sydney 2017).

A.4.4 Fauna Habitat

The Site primarily offers foraging habitat for a range of urban adapted native birds, bats and arboreal mammals in the form of flowering plants. No significant habitat features such as tree-hollows, nests, bush rock or woody debris were recorded.

A.5 Impact Assessment

A.5.1 Vegetation Removal

The Project will require the removal of approximately 52.95 m^2 of Urban Exotic/Native vegetation community within the Site. **Table 1** contains the details of all Urban Exotic/Native trees (both small and mature) and shrubs that are proposed to be removed. Native vegetation to be removed includes two mature trees, five small trees and eight shrubs. An additional two exotic shrubs will also be removed. In addition to the removal of trees and shrubs, the proposed works will also remove groundcover vegetation that is highly degraded and dominated by exotic species. All native vegetation to be impacted is either planted or common to the area.

Table 1 Details of trees (mature and small) and shrubs proposed to be removed

Tree/ Shrub ID	Scientific Name	Common Name	Status	No. of Individuals	DBH* (cm)	Height (m)	Canopy (m2)
1	*Melaleuca decora*		P	1	9	3	0.8
2	*Genista linifolia*	Flaxleaf Broom	*	1	5	2	0.05
3	*Casuarina glauca*	Swamp Oak	P	1	15	4	0.8
4	*Melaleuca decora*		P	1	5	2	0.05
5	*Acacia parramattensis*	Parramatta Wattle	P	1	20	4	12.6
6	*Allocasuarina littoralis*	Black She-oak	P	1	5	3	0.8
7	*Melaleuca decora*		P	1	5	2	0.8
8	*Melaleuca decora*		P	1	5	2	0.8
9	*Eucalyptus microcorys*	Tallowwood	P	1	10	3	3.1
10	*Eucalyptus microcorys*	Tallowwood	P	1	5	2	3.1
11	*Eucalyptus microcorys*	Tallowwood	P	1	5	1.5	0.8
12	*Melaleuca decora*		P	1	5	3	0.8
13	*Casuarina glauca*	Swamp Oak	P	1	15	4	4.9
14	*Melaleuca decora*		P	1	15	3.5	0.8
15	*Genista linifolia*	Flaxleaf Broom	*	1	5	3	0.05
16	*Homalanthus populifolius*	Bleeding Heart	N	1	15	2.5	3.1
17	*Acacia fimbriata*	Fringed Wattle	P	1	25	3	19.6
		Total					**52.95**

**DBH (Diameter at breast height)*

Note: Shrubs = 5-9cm dbh, Small trees = 10-19cm dbh, Mature trees = >19cm dbh

*Status: * = exotic, P = planted native, N = native*

A.5.2 Threatened Flora

No threatened flora species were recorded during the survey.

The majority of the groundcover that is proposed to be disturbed has been previously cleared and is primarily comprised of bare ground or exotic species, although some areas contain native planted species within the groundlayer. Due to the condition of the understorey, the Site is considered unlikely to provide suitable habitat for any threatened flora species known to occur in the locality.

A.5.3 Weeds Listed Under the Biosecurity Act 2015

The proposed works will result in the removal of one weed species listed under the Biosecurity Act. Due to the presence of a Biosecurity Act listed weed, recommendations have been made within ***Section A.6*** to minimise the spread of this species within and/or outside of the Site.

A.5.4 Fauna Habitat

No fauna habitat features were recorded during the survey.

The proposed works will remove a small amount of foraging habitat for native fauna, but the habitat to be removed is unlikely to be important for the long-term survival of any fauna species as this type of habitat is widespread in the locality and large areas of similar vegetation will remain. The species that may potentially utilise this habitat are expected to be all highly mobile species (e.g. possums, birds and bats) and the habitat to be removed would likely only be utilised on occasion as part of a broader foraging range.

A.6 Recommendations

The following recommendations are made to minimise impacts of the proposed works on the biodiversity values of the Site and its surrounds.

A.6.1 Marking the Limits of Vegetation Clearance

The limits of clearing should be clearly demarcated to ensure areas of vegetation outside of the Site are not impacted. The amount of vegetation to be removed should be the minimum required for the project.

A.6.2 Weed Removal

Due to the presence of a weed listed under the Biosecurity Act within the Site, it is recommended that all vegetation removed not be reused as mulch within the Site or off-site. Additionally, all vegetation removed from the Site should be covered during transport and taken to an appropriate waste facility.

A.7 Conclusion

The proposed works requires the trimming/removal of approximately 52.95 m^2 of Urban Exotic/Native vegetation within the Site. This community is not listed under the BC Act or the EPBC Act and offers little ecological value other than marginal foraging habitat for mobile urban adapted fauna species.

No threatened flora species were recorded within the Site and none are considered to have the potential to occur due to the degraded condition of the Site. Therefore, the proposed works are unlikely to impact on any threatened flora species.

No threatened fauna species are likely to be dependent on the habitat within the Site to be impacted, and if they occur they are expected to only utilise the Site periodically as part of a much broader foraging range. The extent of habitat removal is minor and limited to edge effected areas that offer minimal habitat value to native fauna. Therefore, the proposed works are unlikely to impact on any threatened fauna species.

If all mitigation measures recommended in ***Section A.6*** are implemented, the proposed works are unlikely to have a significant impact on any of the biodiversity values of the Site or the greater locality.

A.8 References

LLS: Greater Sydney, editor. 2017. Greater Sydney Regional Strategic Weed Management Plan 2017 - 2022. Local Land Services NSW.

OEH. 2013. The Native Vegetation of the Sydney Metropolitan Area. Office of Environment and Heritage, Sydney.

Appendix B

Figures

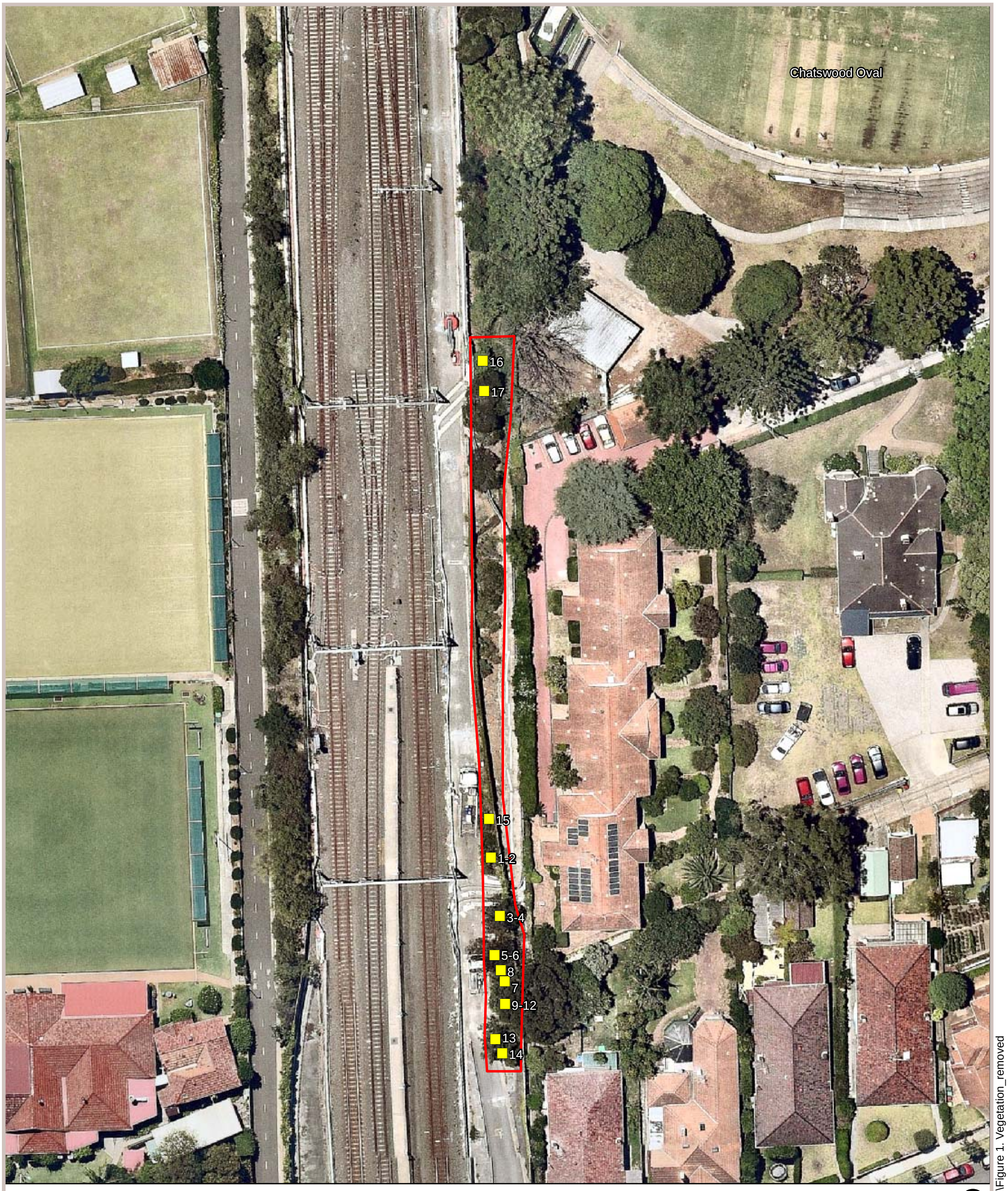

Figure 1. Vegetation proposed to be removed

Appendix I – Stage 9

Vegetation Removal or Trimming Approval Form

Note: All required documentation and supporting information must be provided to the approving authority at least 10 business days prior to the planned dates of vegetation removal or trimming work.

State Environmental Planning Policy (Infrastructure), Clause 5(3) and 5(4) (Infrastructure)		
1	The works are part of ...	☒ Construction (Cl 5(3)(f)); or
		☐ Maintenance (Cl 5(4)(f))
2	Is the activity on land reserved under the National Parks and Wildlife Act (National Park, historic site, state conservation area, nature reserve or Aboriginal area)?	☒ No, if No go to 4a
		☐ Yes, if Yes go to 3
3	If yes, are the proposed works authorised under the NPW Act, has an existing interest (authority permit, lease, licence or occupancy) or has an easement been granted for this purpose?	☐ Yes (attach details)
		☐ No, If No see NWRL environment team. This form cannot be used.

4. Property details		
4a	Property location, ownership and zoning details. [attach map]	Please refer to ECM in Appendix 3. ECM to be read in conjunction with text within ECM table. **Land zoning** – SP2 - Infrastructure – Railway **Local Environmental Plan:** Willoughby City Council LEP 2012; **Ownership:** Sydney Trains **Local Government Area (LGA):** Willoughby
4b	Property description (e.g. drainage, landform, visual characteristics)	Vegetation within the study area (i.e. rail corridor adjacent to Lambs Road, Artarmon – refer to ECM in Appendix 3) exists as isolated narrow linear patches of vegetation that are exposed to a high degree of edge effects being bound by the rail corridor and developed areas. The majority of the Site has been previously cleared and contains a degraded ground layer primarily consisting of exotic species. The vegetation communities previously mapped by OEH in areas near the Site include Urban Exotic/Native and Coastal Sandstone Foreshores Forest (CSFF). Neither of these communities are listed under the NSW Biodiversity Conservation Act 2016 (BC Act) or Environment and Protection Biodiversity Conservation Act 1999 (EPBC Act). Field surveys confirmed that Urban Native/Exotic and Coastal Sandstone Foreshores Forest also occur within the Site. This vegetation mapping was confirmed by Cumberland previously through a survey undertaken in July 2018 (Appendix 2) with a review of current vegetation to be removed and trimmed having been undertaken as part of this application (Appendix 1). There are no watercourses naturally occurring nearby the proposed vegetation removal areas and no open stormwater drains are present within the vicinity of the proposed vegetation removal sites. Land comprises of rail corridor, which includes ballast, cess/track drainage, stabilised access roads, rail tracks and rail infrastructure. The area immediately adjacent to the study area consists of low to medium density residential areas and industrial developments. Vegetation works will be undertaken during standard construction hours to minimise noise impacts to the community.
4c	Current use of property.	Rail Corridor
4d	Current owner of land where vegetation is located. If vegetation is located on land NOT owned by NWRL or RailCorp, attach written consent	Sydney Trains

<table>
<tr><td></td><td>of the owner for submission of the application.</td><td></td></tr>
<tr><td colspan="3">5. Species details</td></tr>
<tr><td>5a</td><td>Has an ecologist been consulted? [attach report]</td><td>Yes. A detailed site inspection was undertaken by an Ecologist (from Cumberland Ecology) on 4 July 2018. Refer attached Ecological Assessment in Appendix 2. A review of current vegetation trimming and removal requirements was undertaken on 22 January 2019. Refer attached Ecological Assessment in Appendix 1.</td></tr>
<tr><td>5b</td><td>Species to be removed/trimmed</td><td>Removal of approximately 26m2 of Urban Exotic/ Native vegetation (removal of three trees and the trimming of two trees lateral branches), the majority of which is limited to a non-endemic native species (i.e. Lophostemon confertus) that is commonly planted as a street tree.

Details of vegetation to be impacted are listed below in Section 5c and identified in Figure 1 in Appendix 1</td></tr>
<tr><td>5c</td><td>Height of tree, diameter of trunk at 1m above ground level and diameter of canopy, or description of shrub/grass (i.e. height, form, etc.).</td><td>
<table>
<tr><th>Vegetation Species</th><th>Exotic/Native</th><th>Proposed Works</th><th>Height (m)*</th><th>DBH (cm)*</th><th>Estimated Impact (m2)*</th></tr>
<tr><td>Lophostemon confertus (Brush Box)</td><td>Native (non-endemic)</td><td>Removal</td><td>15-20</td><td>30-50</td><td>~8</td></tr>
<tr><td>Lophostemon confertus (Brush Box)</td><td>Native (non-endemic)</td><td>Removal</td><td>15-20</td><td>30-50</td><td>~8</td></tr>
<tr><td>Lophostemon confertus (Brush Box)</td><td>Native (non-endemic)</td><td>Removal</td><td>15-20</td><td>30-50</td><td>~8</td></tr>
<tr><td>Eucalyptus fibrosa (Red Ironbark)</td><td>Native</td><td>Trimming of lateral branches</td><td>15-20</td><td>30-50</td><td>~1</td></tr>
<tr><td>Eucalyptus punctate (Grey Gum)</td><td>Native</td><td>Trimming of lateral branches</td><td>15-20</td><td>30-50</td><td>~1</td></tr>
<tr><td colspan="6">*estimated are based on photographs provided by LOR</td></tr>
</table>
</td></tr>
<tr><td>5d</td><td>Condition of vegetation (i.e. healthy, damaged, dying, etc.).</td><td>Healthy</td></tr>
<tr><td>5e</td><td>Is the vegetation a threatened species or part of an Endangered Ecological Community, listed under NSW or Commonwealth legislation? [attach ecologist report]</td><td>The vegetation due to be removed is isolate and small in size, and is not listed as a threatened ecological community under the BC Act or EPBC Act.
No threatened flora species were recorded and none are considered likely to occur within the Site due to its degraded nature as a result of previous clearing works.
Refer to attached Ecological Assessment in Appendix 1 & 2 for further detail.</td></tr>
<tr><td rowspan="2">5f</td><td rowspan="2">If Yes, is the impact significant? [attach ecologist report]</td><td>☒ No. Refer Ecological Assessment in Appendix 1 & 2</td></tr>
<tr><td>☐ Yes, If Yes, see P&E Staff. This form cannot be used.</td></tr>
<tr><td>5g</td><td>Is the species subject to a Local Government Tree Preservation Order?
If yes, has the Council been consulted? [Attach response from Council]</td><td>No.</td></tr>
</table>

5h	Does the vegetation provide habitat for any other species?	The habitat to be removed is likely to be used by urban adapted species for foraging on occasion as part of a much broader foraging range and is unlikely to be important to the long-term survival of any threatened spices known to occur in the area.		
5i	Does the tree have any local aesthetic value, historical significance, or personal value? [Attach response from Council]	No.		
6. Details of actions				
6a	Reason for removal	To allow for the installation of material storage containers for possession and non-possession related works associated with the Project.		
6b	Justify why alternatives not used (e.g.; modifying the scope or method of work) to avoid the need to remove/cut/lopped/ringbarked the vegetation.	No alternatives are feasible as vegetation trimming is required to facilitate vehicular access/movements and positioning of storage containers. The area has been identified as the most suitable site, given that the site has been cleared previously and due to the proximity to worksites within the rail corridor for material storage (e.g. cables and cable drums, sleepers, track, ballast and capping materials) required to facilitate project works.		
6c	Proposed method of removal. Will an arborist be used or consulted? [if yes attach report]	Chain saws and/or wood chipping truck will be utilised for vegetation removal. Qualified arborists from Get Lopped Tree Services will be engaged to perform the works.		
6d	Will any other species be affected by the vegetation being removed/cut/ lopped/ringbarked?	No.		
6e	Detail measures proposed to stabilise area after removal/ cut/ lopped/ringbarked	No stabilisation would be required.		
6f	Is the vegetation considered to be remnant vegetation?	☐ Yes, if yes see question 6g		
		☒ No, if no go to question 6h		
6g	If Yes, detail the vegetation replacement/replanting/regeneration activity that will be completed. (see NWRL Sustainability Target P5.2)	N/A		
6h	Will any facilities or services be affected during removal/ cutting/ lopping/ ringbarking of the vegetation? (e.g. underground gas/water mains, overhead communication cables or power lines)	Sydney Trains Detailed Site Survey (DSS) drawings will be used to analyse the area and signed-off/tool-box talked during pre-start briefs to identify existing facilities/services in the area prior to undertaking the works. Permits to be in place for all works at this location.		
7. Approval details				
7a	Proposed by – Name:	Charlotte Malone		
	Company:	Laing O'Rourke		
	Signature		Date	Revision 1 – 22 January 2019

	Council Notified by (Name):	N/A	Date:	N/A
	Council Comments (attach):	N/A		
		Landowner notified? ☐Yes ☒ No		
7b	**Supported by (signature and date):**			
	Nominated Environmental Representative:		Date:	
	Principal Manager, Sustainability, Environment & Planning, Project Delivery Northwest:		Date:	
7c	**If Part V of EP&A Act Approved by (signature & date):**			
	Principal Manager, Sustainability, Environment & Planning:		Date:	
	Conditions of Approval:			
7d	**If Part 5.1 of EP&A Act**			
	Is the vegetation removal/cutting/lopping/ringbarking consistent with the approved project?	☐ Yes ☐ No		
	Approved by (signature & date):			
	Principal Manager, Environment, Sustainability & Planning:		Date:	
	Conditions of Approval:			

Appendix 1 – Ecological Assessment (22 January 2019)

22 January 2019

Charlotte Malone
Environmental Manager
Laing O'Rourke Australia
Level 5, 39 Chandos Street
St. Leonards, NSW, 2065

Cumberland Ecology
PO Box 2474
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ECOLOGICAL ASSESSMENT OF VEGETATION DISTURBANCE ASSOCIATED WITH ACCESS TRACKS AND LAYDOWN AREAS FOR PORTION 7 OF THE MAIN NORTH AND NORTH SHORE CORRIDOR WORKS

Dear Charlotte,

Cumberland Ecology has been engaged by Laing O'Rourke (the 'client') on behalf of Transport for New South Wales to undertake an ecological assessment (the 'assessment') of vegetation proposed to be trimmed/removed (the 'proposed works') in order to facilitate the Main North and North Shore Corridor Works (the 'project'). The details of our assessment are provided below.

1. Introduction

The area subject to the proposed works is identified in **Figure 1** of **Appendix A** and is hereafter referred to as the 'site'. Areas immediately adjacent to the site have been assessed previously for the project (ref. 16212-Let20).

Vegetation mapping of the site has been undertaken previously by the NSW Office of the Environment (OEH) (OEH 2013), which identifies the site as containing the vegetation community Urban Exotic/Native, which is not listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This vegetation mapping was confirmed by Cumberland Ecology previously through a survey undertaken as part of the previous assessment (ref. 16212-Let20).

2. Impact Assessment

The proposed works will result in the removal of approximately 26 m^2 of Urban Exotic/Native vegetation (removal of three trees and the trimming of two trees' lateral branches), the majority of which is limited to a non-endemic native species (i.e.

Lophostemon confertus) that is commonly planted as a street tree. The details of the vegetation to be impacted are provided in **Table 1** below and identified in **Figure 1** of **Appendix A**. Photographs of the vegetation to be impacted provided by the client are located in **Appendix B.**

Table 1 Details of vegetation proposed to be impacted

Tree ID	Scientific Name	Common Name	Exotic/ Native	Proposed Works	Height (m)*	DBH (cm)*	Estimated Impact (m^2)*
1	*Lophostemon confertus*	Brush Box	Native (non-endemic)	Removal	15-20	30-50	~8
2	*Lophostemon confertus*	Brush Box	Native (non-endemic)	Removal	15-20	30-50	~8
3	*Lophostemon confertus*	Brush Box	Native (non-endemic)	Removal	15-20	30-50	~8
4	*Eucalyptus fibrosa*	Red Ironbark	Native	Trimming of lateral branches	15-20	30-50	~1
5	*Eucalyptus punctata*	Grey Gum	Native	Trimming of lateral branches	15-20	30-50	~1

estimates are based on photographs provided by the client

Based on the information provided by the client and the results of previous surveys in the area, the proposed works are considered likely to have minimal impacts on the biodiversity values of the area. The vegetation to be removed is isolated and small in size, and is not listed as a threatened ecological community under the BC Act or EPBC Act. The habitat to be removed is likely to be utilised by urban adapted species for foraging on occasion as part of a much broader foraging range and is unlikely to be important to the long-term survival of any threatened species known to occur in the area. Based on the photos provided, none of the vegetation contains tree hollows or is considered likely to, due to the species and age of trees being impacted.

3. Recommendations

Although the proposed works are considered to have negligible impacts on biodiversity values, the following recommendations are made to minimise any impacts on biodiversity values:

- The limits of clearing should be clearly demarcated to ensure areas of vegetation outside of the site are not impacted;
- If any fauna is encountered within vegetation being impacted by the proposed works all works should cease until the individual(s) have vacated the area;

- In the unlikely event that fauna is injured during the proposed works, all works should cease and a qualified animal carer or ecologist should be contacted. Works should not re-commence until the attending animal carer/ecologist provides approval; and
- The offsetting of all vegetation removed should be undertaken in accordance with the project's conditions of approval.

4. Conclusion

If the recommendations identified above are implemented, the proposed works are unlikely to have a significant impact on the biodiversity values of the area and no further assessments of the site are considered to be required.

5. References

OEH (2013). The Native Vegetation of the Sydney Metropolitan Area. Volume 2: Vegetation Community Profiles. Sydney, NSW Office of Environment and Heritage.

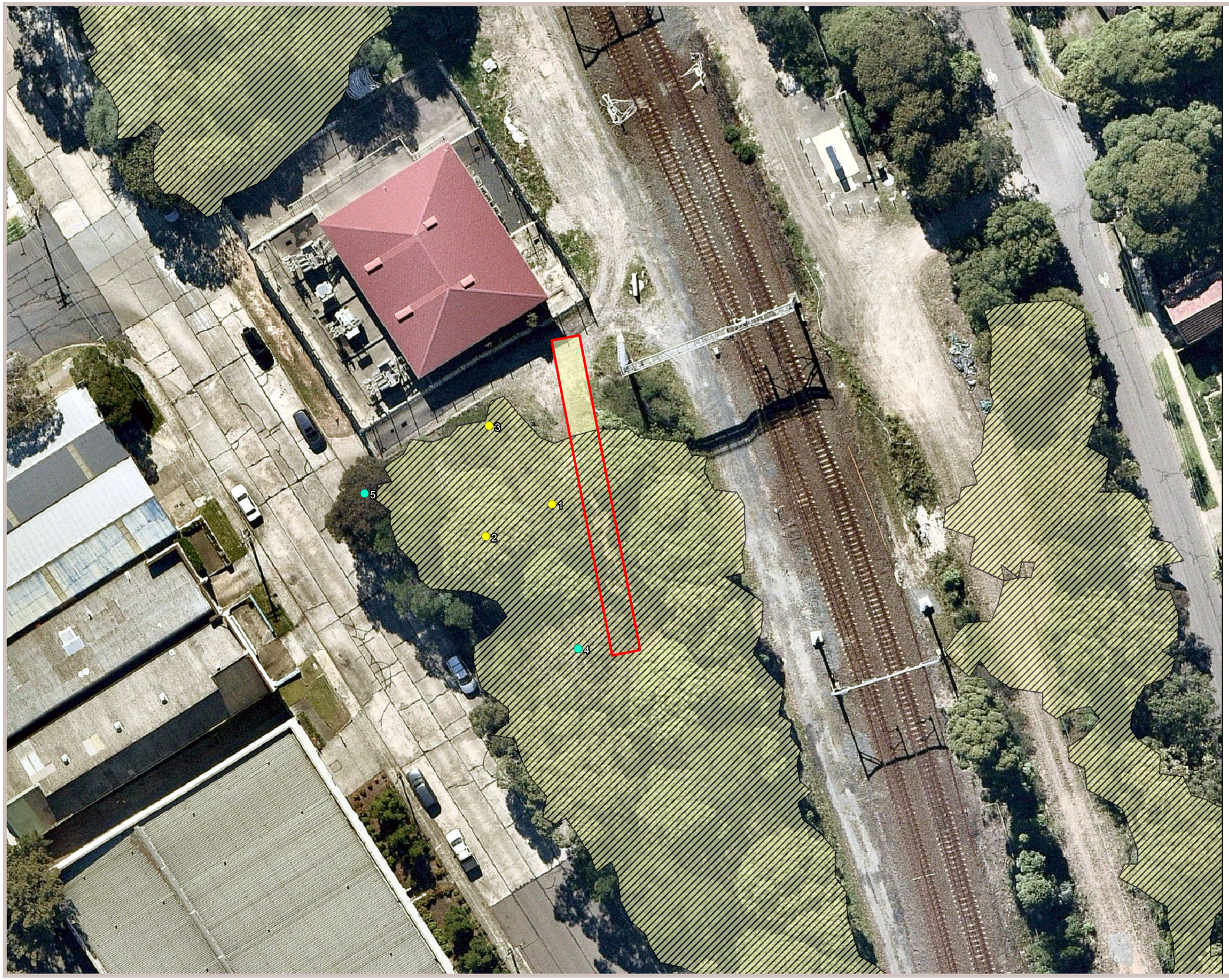
If you would like to discuss any aspect of our assessment, please do not hesitate to contact Mikael Peck on 02 9868 1933.

Yours sincerely,

Mikael Peck
Project Manager/ Ecologist
mikael.peck@cumberlandecology.com.au

Appendix A

Figure



Legend

Area assessed for 16212-Let20

Vegetation Community

Urban Native/Exotic Vegetation

Vegetation Communities (OEH)

Urban_E/N: Urban Exotic/Native

Proposed works

Tree to be removed

Tree to be trimmed

Data Source:
OEH (2016). The Native Vegetation of the Sydney Metropolitan Area. Office of Environment and Heritage NSW.

Image Source:
Image © NearMap 2018
Dated: 6-5-2018

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 10 m

I:\...\16212\Figures\Letter 29\20190121\Figure 1. Location of proposed works

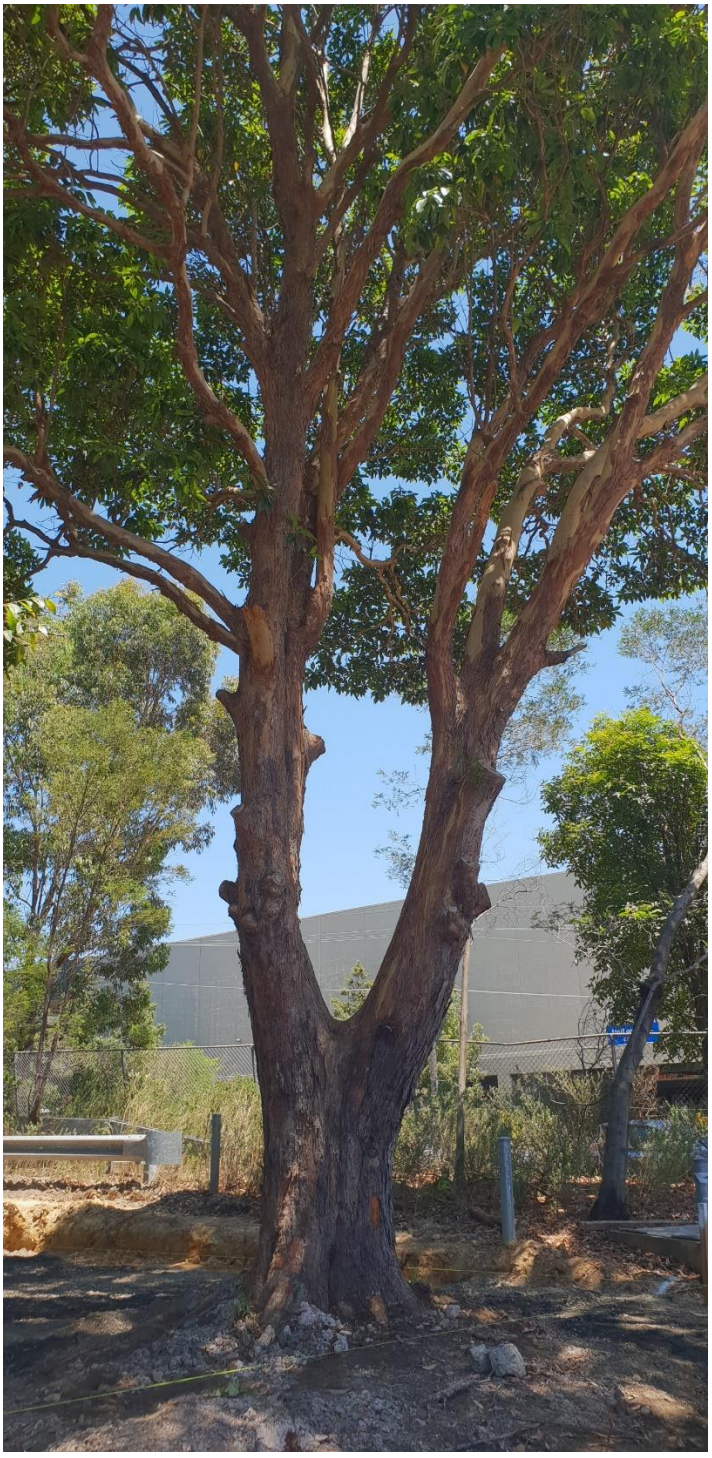
Figure 1. Location of proposed works

Appendix B

Photographs

Photograph 1 ***Lophostemon confertus*** **proposed to be removed (see Tree 1 in Table 1 and Figure 1)**

Photograph 2 ***Lophostemon confertus*** **proposed to be removed (see Tree 2 in Table 1 and Figure 1)**



Photograph 3 ***Lophostemon confertus*** **proposed to be removed (see Tree 3 in Table 1 and Figure 1)**

Photograph 4 ***Eucalyptus fibrosa*** **proposed to be trimmed (see Tree 4 in Table 1 and Figure 1)**

Photograph 5 ***Eucalyptus punctata*** **proposed to be trimmed (see Tree 5 in Table 1 and Figure 1)**

Appendix 2 – Ecological Assessment (4 July 2018)

10 July 2018

Chris Standing
Environmental and Sustainability Manager
Laing O'Rourke Australia
Level8, 100 Christie Street
St. Leonards, NSW, 2065

Cumberland Ecology
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ECOLOGICAL ASSESSMENT: VEGETATION DISTURBANCE ASSOCIATED WITH ACCESS TRACKS AND LAYDOWN AREAS FOR PORTION 7 OF THE MAIN NORTH AND NORTH SHORE CORRIDOR WORKS IN ARTARMON

Dear Chris,

Cumberland Ecology was engaged by Laing O'Rourke on behalf of Transport for New South Wales (the 'proponent') to undertake an ecological assessment of three separate linear sections of vegetation that are proposed to be trimmed/removed (the 'proposed works') in order to provide access to, and construct laydown areas for the Main North and North Shore Corridor Works. The sections of land subject to the proposed works are located within the rail corridor between Artarmon Station and St. Leonards Station (hereafter referred to as the 'Site').

Our ecological assessment is attached at **Appendix A** and is supported by figures at **Appendix B**.

If you would like to discuss any aspect of our assessment, please do not hesitate to contact Mikael Peck on 02 9868 1933.

Yours sincerely,

Mikael Peck
Project Manager/ Ecologist
mikael.peck@cumberlandecology.com.au

Appendix A

Ecological Assessment

A.1 Introduction

Laing O'Rourke was commissioned by Transport for New South Wales (TfNSW) to undertake a signal power upgrade of the North Shore Line known as the Main North and North Shore Corridor Works (the 'Project'). The Project will allow for an increase in traffic and to support the transition of Epping to Chatswood rail line to Rapid Transit. The Project is comprised of seven portions. This ecological assessment pertains to portion seven, which includes three linear sections of vegetation that are located between Artarmon Station and St. Leonards Station. These three sections are referred to individually as Areas 1-3 and they are referred to collectively as the 'Site' (see **Figure 1** and **Figure 2**).

As part of the Project, some areas of vegetation are required to be trimmed/removed in order to access and construct laydown areas. Proposed disturbances to vegetation include the following:

- Trees (including canopy and sub-canopy): limited to trimming of no more than 10% of the tree's total canopy;
- Shrubs: includes both trimming and removal, depending on the area of the Site the shrub is located; and
- Groundcovers: entire removal of the individuals.

A.2 Methods

A site inspection was undertaken by an ecologist on 4 July, 2018 in the company of an Environmental Manager. The inspection involved traversing the Site on foot and visually inspecting the areas where vegetation disturbance is proposed.

Field notes regarding the general condition and composition of the vegetation within the Site were made. This included documenting the species and location of all native vegetation to be disturbed with particular attention to native shrubs and trees, threatened species, and any habitat features that could be utilised by native fauna. Photographs were taken at various locations of proposed disturbance to document the general condition and composition of the vegetation within the Site.

A.3 Results

A.3.1 Vegetation Communities

All vegetation communities within the Site are comprised of isolated narrow linear patches. These patches are exposed to a high degree of edge effects as they are bound by the rail corridor and developed areas. The majority of the Site has been previously cleared and contains a degraded ground layer primarily consisting of exotic species.

The areas surveyed within the Site have not been previously mapped by the NSW Office of the Environment (OEH); however, areas adjoining the site have been mapped previously (OEH 2013). The vegetation communities previously mapped by OEH in areas near the Site include Urban Exotic/Native and Coastal Sandstone Foreshores Forest. Neither of these communities are listed under the BC Act or EPBC Act.

Field surveys confirmed that Urban Native/Exotic and Coastal Sandstone Foreshores Forest also occur within the Site. A description of each vegetation community occurring within the Site is provided below.

i. Urban Native/Exotic

Approximately 0.03 ha of Urban Native/Exotic vegetation occurs within the Site as two separate patches. The majority of this community within the Site is characterised by a canopy comprised of *Lophostemon confertus* (Bush Box) and scattered occurrences of *Eucalyptus fibrosa* (Red Ironbark), *Eucalyptus piperita* (Sydney Peppermint) and *Acacia parramattensis* (Parramatta Wattle) (See **Photograph 1**).

The ground stratum of the community is dominated by exotic species including *Genista linifolia* (Flaxleaf Broom) *Asparagus aethiopicus* (Ground Asparagus), *Cardiospermum grandiflorum* (Balloon Vine), *Senna pendula* (Senna), *Lantana camara* (Lantana), *Bidens pilosa* (Cobblers Peg's) and *Ipomoea purpurea* (Common Morning Glory) (See **Photograph 2)**

Photograph 1 Urban Native/Exotic overhanging canopy to be trimmed for the Project

Photograph 2 Urban Native/Exotic community with exotic understorey to be removed

ii. Coastal Sandstone Foreshores Forest

Approximately 0.05 ha of Coastal Sandstone Foreshores Forest (CSFF) exists within the Site as one linear patch. The canopy/midstorey within this community consists of *Angophora costata* (Smooth Barked Apple), *Hakea salicifolia* (Willow Leaved Hakea), *Allocasuarina littoralis* (Black She-Oak), *Acacia implexa* (Hickory Wattle), *Casuarina glauca* (Swamp She-Oak) and *Cinnamomum camphora* (Camphor Laurel) (See **Photograph 3**).

The ground stratum of the community is characterised primarily of native grasses and ferns including *Lomandra longifolia* (Spiny-head Mat-rush) and *Pteridium esculentum (*Bracken Fern) with scattered occurrences of exotic species such as *Cardiospermum grandiflorum* (Balloon Vine) and *Cynodon dactylon* (Couch Grass) (See **Photograph 3 and 4**) The latter exotic species is widely cultivated as a lawn grass and may have been introduced into the area.

Photograph 3 **CSFF overhanging canopy to be trimmed for the Project**

Photograph 4 **Native groundcover within the CSFF to be removed consisting of *Pteridium esculentum* and *Lomandra longifolia***

A.3.2 Threatened Flora

No threatened flora species were recorded and none are considered likely to occur within the Site due to its degraded nature as a result of previous clearing works.

A.3.3 Priority Weeds

A total of seven Priority weeds listed under the *Biosecurity Act 2015* were recorded from the site. **Table 1** below identifies the species recorded and their status.

Table 1 Weeds listed under the Biosecurity Act 2015

Scientific Name	Common Name	Status
Asparagus aethiopicus	Ground Asparagus	SP
Cardiospermum grandiflorum	Balloon Vine	OWRC
Cinnamomum camphora	Camphor Laurel	OWRC
Ipomoea indica	Common Morning Glory	OWRC
Lantana camara	Lantana	SP
Senecio madagascariensis	Fireweed	SP
Senna pendula	Senna	OWRC

Key: OWRC = other weed of regional concern, RP = regional priority weed, SP = state priority weed

A.3.4 Fauna Habitat

The vegetation within the Site primarily offers foraging habitat for a range of native birds, bats and arboreal mammals in the form of flowering plants. However, the Site is highly degraded due to its location close to the rail corridor and surrounding urban areas, and therefore the only fauna likely to utilise the habitats in the Site are widespread, urban adapted native species and exotic fauna species.

No important fauna habitat in the form of hollow-bearing trees, logs or bush-rock was identified from the Site. The habitats present in the Site are not likely to be important for any threatened fauna species.

A.4 Impact Assessment

A.4.1 Urban Exotic/Native

i. Area 1

The Project will require the trimming of canopy and lateral limbs of some trees within the Urban Exotic/Native community that occurs within Area 1 of the Site (see **Figure 1**). Approximately 7m^2 of canopy will be trimmed, which represents less than 10% of total canopy cover. No canopy trees will be removed for the project.

The removal of all exotic understorey and ground covers will be undertaken in Area 1, consisting of but not limited to, *Senna pendula* (Senna), *Bidens pilosa* (Cobblers Peg's), *Cardiospermum grandiflorum* (Balloon Vine) and *Asparagus aethiopicus* (Ground Asparagus) will take place for the proposed Project. **Table 2** details a list of all Urban Exotic/Native trees/shrubs that may be impacted within Area 1.

Table 2 Details of trees likely to be impacted within Area 1

Scientific Name	Common Name	Exotic/Native	Number of Trees	Tree Type
Lophostemon confertus	Bush Box	Native	4	Canopy
Eucalyptus fibrosa	Red Ironbark	Native	1	Canopy
Eucalyptus piperita	Sydney Peppermint	Native	1	Canopy
Acacia parramattensis	Parramatta Wattle	Native	1	Sub-canopy

ii. Area 2

The Project will require the removal of approximately 0.01 ha of vegetation within Area 2 (see **Figure 1**). The vegetation to be removed is comprised entirely of shrubs and groundcover species. Plant species to be removed include the following exotic shrubs/herbs and vines: *Lantana camara* (Lantana), *Ipomoea purpurea* (Common Morning Glory) and *Bidens pilosa* (Cobblers Peg's).

A.4.2 Coastal Sandstone Forest Foreshore

i. Area 3

The Project will require the trimming of canopy and lateral limbs of the CSFF community that occurs within Area 3 of the Site. Approximately 9m^2 of canopy will be trimmed, which represents less than 10% of total canopy cover. No trees will be removed, and only some canopy limbs are required to be trimmed.

The removal of the exotic *Cardiospermum grandiflorum* (Balloon Vine) growing within the canopy will also take place for the Project. Furthermore, the removal of native ground covers including *Lomandra longifolia* (Spiny-head Mat-rush) and *Pteridium esculentum* (Bracken Fern) from Area 3 is required for the Project. **Table 3** details a list of all trees/shrubs that may be impacted in Area 3.

Table 3 Details of trees likely to be impacted within Area 3

Scientific Name	Common Name	Exotic/Native	Number of Individuals	Type
Lophostemon confertus	Brush box	Native	1	Canopy

Table 3 Details of trees likely to be impacted within Area 3

Scientific Name	Common Name	Exotic/Native	Number of Individuals	Type
Eucalyptus saligna	Sydney Blue Gum	Native	3	Saplings
Angophora costata	Smooth bark Apple	Native	5	Small tree
Hakea salicifolia	Willow-leafed Hakea	Native	1	Shrub
Allocasuarina littoralis	Black She-oak	Native	3	Small tree
Cinnamomum camphora	Camphor Laurel	Exotic	1	Small tree
Acacia implexa	Hickory Wattle	Native	1	Canopy
Melaleuca armillaris	Bracelet Honey Myrtle	Native	1	Canopy
Acacia longifolia	Sydney Golden Wattle	Native	1	Small tree
Casuarina glauca	Swamp She-oak	Native	1	Canopy
Casuarina glauca	Swamp She-oak	Native	1	Small tree

A.4.3 Threatened Flora

No threatened flora species were recorded during the survey.

The majority of the groundcover that is proposed to be disturbed has been previously cleared and is either comprised of bare ground or exotic species. Due to the condition of the understorey, the Site is considered unlikely to provide suitable habitat for any threatened flora species known to occur in the locality.

A.4.4 Priority Weeds

The proposed works have the potential to result in the removal of seven priority weed species listed under the *Biosecurity Act 2015*. Due to the presence of these species, recommendations have been made within **Section A.6** to minimise the spread of these species within and/or outside of the Site.

A.4.5 Fauna Habitat

No significant habitat features were recorded during site surveys.

The proposed works will remove marginally important foraging habitat for native fauna. No canopy trees will be removed, and less than 10% of the existing canopy cover present in the site will be removed by the trimming of limbs, and therefore the vast majority of the habitat present will remain. The Site is located in a degraded urban environment, and large areas of

similar types of vegetation are present in the wider locality. Although habitats in the Site may be used periodically by some hardy, urban adapted native fauna species, the habitat to be removed is unlikely to represent a long-term important resource for any fauna species and is likely to be used only on occasion as part of a broader foraging range. No important habitat for threatened fauna species will be removed by the project.

A.5 Recommendations

The following recommendations are made to minimise impacts of the proposed works on the biodiversity values of the Site.

A.5.1 Vegetation Clearance

The limits of clearing should be clearly demarcated to ensure areas of vegetation outside of the Site are not impacted.

If trees/shrubs within the areas need to be entirely removed, it is recommended that an ecologist be on-site to document the species removed along with their biometric data (e.g. diameter at breast height (DBH), height, canopy cover). This will assist with refining the TfNSW offsetting requirements associated with the proposed works. If vegetation disturbance is limited to trimming only, an ecologist is not required to be present for vegetation removal.

A.5.2 Weed Removal

Due to the presence of weeds listed under the *Biosecurity Act 2015* within the Site, it is recommended that all vegetation removed not be reused as mulch within the Site or off-site. Additionally, all vegetation removed from the Site should be covered during transport and taken to an appropriate waste facility.

A.6 Conclusion

The proposed works require limited disturbance to native vegetation in order to access and construct laydown areas. An estimated 7m^2 of Urban Native/Exotic and 9m^2 of Coastal Sandstone Foreshores Forest are to be trimmed for the Project. These communities are not listed under the BC Act or the EPBC Act. No canopy trees will be removed for the Project and less than 10% of the total canopy cover within the Site will be removed by the trimming of limbs. Furthermore, the vegetation within the Site exists as linear patches that are highly degraded and have been previously exposed to edge effects and weed infestations. Accordingly, the project will not result in any long-term impacts on the ecological values of each community.

No threatened plant species were identified during site surveys and none are likely to occur due to the degraded nature of the Site. No threatened fauna are likely to be dependent on the Site, with the exception of foraging habitat as part of a broad range for native species.

With the implementation of the mitigation measures recommended in **Section A.6**, the proposed works are unlikely to have a significant impact on any of the biodiversity values of the Site or the greater locality.

A.7 References

OEH (2013). The Native Vegetation of the Sydney Metropolitan Area. Volume 2: Vegetation Community Profiles. Sydney, NSW Office of Environment and Heritage.

Appendix B

Figures

Legend

Subject Site

Vegetation Community

Urban Native/Exotic Vegetation

Vegetation Communities (OEH)

Urban_E/N: Urban Exotic/Native

Data Source:
OEH (2016). The Native Vegetation of the Sydney Metropolitan Area. Office of Environment and Heritage NSW.

Image Source:
Image © NearMap 2018
Dated: 6-5-2018

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 25 m

I:\...\16212\Figures\Letter 20\20180710\Figure 1. Area 1 and 2 of The Site

Figure 1. Area 1 and 2 of The Site

Legend

The Site

Vegetation Community (CE)

Coastal Sandstone Foreshore Forest

Vegetation Communities (OEH)

S_DSF06: Coastal Sandstone Foreshores Forest

Urban_E/N: Urban Exotic/Native

Data Source:
OEH (2016). The Native Vegetation of the Sydney Metropolitan Area. Office of Environment and Heritage NSW.

Image Source:
Image © NearMap 2018
Dated: 6-5-2018

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 20 m

I:\...\16212\Figures\Letter 20\20180710\Figure 2. Area 3 of The Site

Figure 2. Area 3 of The Site

Appendix 3 – Environmental Control Map

Tree Trimming/Removal		
ID	**Aspect**	**Description**
1	**Project**	• This ECM is a supplementary document to MNNSCW CEMP and applies to the tree trimming and removal site identified within this Removal or Trimming of Vegetation Application Form.
2	**Work Stages**	• Activities associated with this application are planned to be undertaken in January/February 2019 once approved by Sydney Metro.
3	**General**	• All staff and contractors will be trained on this ECM, general environmental issues, location of sensitive areas and erosion/sediment controls. • This ECM will be displayed on site sheds and HSE Notice Board.
4	**Contamination**	• In the event of encountering contaminated soil, works will be stopped, hygienist will be engaged and spoil will be classified/disposed of accordingly. • Unexpected contamination finds will be reported to site supervisor, HSE Manager, Sydney Trains and Sydney Metro.
5	**Air Quality**	• No air quality related issues are expected to be encountered. • Weather will be monitored daily on site (BOM).
6	**Waste**	• Mulch containing noxious weed will not be reused onsite or off-site. It will be disposed of off-site to a licenced facility. Waste disposal records will be maintained. • Removal of wastes from site will be undertaken by a licensed contractor as required by the POEP Act and with appropriate approvals, if required, for contaminated materials etc.
7	**Soils and water**	• No soil/water related issue are expected to arise from these trimming works.
8	**Heritage**	• Stop works protocols will be followed in the event of unexpected finds. • Unexpected finds of heritage items must be reported to LOR Environmental Manager, Sydney Trains and Sydney Metro.
9	**Noise and Vibration**	• All works will be completed in compliance with Sydney Metro CEMF, MNNSCW Planning Approval and relevant addendum, Construction Noise Strategy and EPL 12208/EPA requirements. • All plant used onsite will have non-tonal alarms. Plant would be switched off when not in use, regularly maintained, and noisy equipment would be repaired or replaced. • Local council, Sydney Trains and community will be notified regarding these works.
10	**Traffic and Transport**	• Access requirements will be managed by using existing driveways and hardstand roads into the site areas. • All plant operators will be given an induction covering environmental controls relevant to their activities. • No additional traffic control will be required for these works.
11	**Utilities Management**	• Sydney Trains DSS will be referred to for all services present in the area prior to works. Any impacts to utilities will be reported to site HSE Manager, supervisor, Sydney Trains and Sydney Metro.
12	**Biodiversity**	• Limits of clearing will be established on-site prior to vegetation trimming and removal works. • Trees requiring trimming and removal will be identified and marked prior to works commencing. • If vegetation other than that identified in the ecological assessment is affected, further assessment would be undertaken and approval would be sought from Sydney Metro prior to trimming or removal. If trees/shrubs within the areas need to be entirely removed, an ecologist will be present on-site to document the species removed along with their biometric data (e.g. diameter at breast height (DBH), height, canopy cover). • If threatened flora or fauna species are identified on site, work near these species would stop immediately, a spotter/catcher/ecologist would be engaged to survey the site and advise on species management. • Stockpiles, plant, equipment and materials will be located on existing cleared areas, away from the drip zone of other trees and native vegetation. • Soil and vegetation containing weed material (if applicable) will be removed from machinery prior to any movements off site. Mulch would be disposed of at a licenced disposal site and not reused onsite or off-site.
13	**Chemical and fuel storage and use**	• No fuels are required to be stored onsite for these works. • All chemicals (including herbicides) brought onto site must be verified and registered in an SDS. SDS will be kept on site. • Spill kits would be located onsite and portable spill kits would also be available in site vehicles along with fire extinguishers. • All plant will be checked daily to ensure there is no leaking oil, fuel or other liquids.
14	**Imported materials**	• No materials are required to be imported for these works.
15	**No-go zones**	• Tree trimming/removal and removal of weeds/grass will be restricted to the rail corridor. All construction activities outside the MNNSCW site boundary will undergo a review for potential environmental impacts and require approval from Sydney Metro.
Standard Working Hours		
Audible construction works unless otherwise approved by the Environmental Manager will be restricted to: • **7:00AM to 6:00PM - Monday to Friday** • **8:00AM to 1:00PM - Saturdays** No work on Sundays or public holidays • Any works outside of the hours above require OOHW and Sydney Metro and LOR Environmental Manager's Approval		

"High noise impact works and activities must only be undertaken:

a) between the hours of 8:00am to 6:00pm Monday to Friday;
b) between the hours of 8:00am to 1:00pm Saturday; and

in continuous blocks not exceeding 3 hours each with a minimum respite from those activities and works of not less than 1 hour between each block"

Contact Information		
Position	**Name**	**Phone**
LOR Project Leader	Anthony Deacy	0467 762 897
LOR Construction Manager	Martin O'Brien	0457 560 728
LOR Environment Manager	Chris Standing	0431 338 578
LOR WHS Manager	Clive Hunter	0428 412 130
ER	Annabelle Reyes	0437 343 178
Sydney Metro Environmental Manager	Andrew Hendy	0475 983 494
Sydney Metro Northwest Info Line		1800 019 989
Sydney Trains Info Line		131 500
Environmental Line / Pollution Incident Response Line		131 555
Office of Environment & Heritage Pollution Line		131 555
Emergency		000 or 112 (mobiles)
WIRES		1300 094 737

Appendix 4 – Traffic/Pedestrian Management

No additional Traffic Control is required for these works.

Appendix J – Stage 10

Vegetation Removal or Trimming Approval Form

Note: All required documentation and supporting information must be provided to the approving authority at least 10 business days prior to the planned dates of vegetation removal or trimming work.

State Environmental Planning Policy (Infrastructure), Clause 5(3) and 5(4) (Infrastructure)		
1	The works are part of ...	☒ Construction (Cl 5(3)(f)); or ☐ Maintenance (Cl 5(4)(f))
2	Is the activity on land reserved under the National Parks and Wildlife Act (National Park, historic site, state conservation area, nature reserve or Aboriginal area)?	☒ No, if No go to 4a ☐ Yes, if Yes go to 3
3	If yes, are the proposed works authorised under the NPW Act, has an existing interest (authority permit, lease, licence or occupancy) or has an easement been granted for this purpose?	☐ Yes (attach details) ☐ No, If No see NWRL environment team. This form cannot be used.

4. Property details		
4a	Property location, ownership and zoning details. [attach map]	Please refer to ECM in Appendix 3. ECM to be read in conjunction with text within ECM table. **Land zoning** – SP2 - Infrastructure – Railway **Local Environmental Plan:** Willoughby City Council LEP 2012; **Ownership:** Sydney Trains **Local Government Area (LGA):** Willoughby
4b	Property description (e.g. drainage, landform, visual characteristics)	Vegetation within the study area is located at the end of Drake St, Artarmon with the trees situated outside of the Sydney Trains rail corridor, North and South of the Sydney Train access gate. The area comprises of concrete driveway and paved road surface. A stormwater drain is present within the vicinity of the proposed vegetation removal sites. The area immediately adjacent to the study area consists of low to medium density residential areas. Vegetation works will be undertaken during standard construction hours to minimise noise impacts to the community.
4c	Current use of property.	Rail Corridor
4d	Current owner of land where vegetation is located. If vegetation is located on land NOT owned by NWRL or RailCorp, attach written consent of the owner for submission of the application.	Sydney Trains, Willoughby city Council

5. Species details		
5a	Has an ecologist been consulted? [attach report]	A detailed site inspection was undertaken by an Arborist (from Get Lopped) on 22 August 2019. Refer to attached Arborist Assessment in Appendix 1.

<table>
<tr><td>5b</td><td>Species to be removed/trimmed</td><td>The removal of three trees is required. Two are non-native to the area (Alnus Jorullensis and Mimosifolia). The third (Callistemon Veminalis) is native and endemic to Australia.

Details of vegetation to be impacted are listed below in Section 5c and identified in Figure 1 in Appendix 1</td></tr>
<tr><td>5c</td><td>Height of tree, diameter of trunk at 1m above ground level and diameter of canopy, or description of shrub/grass (i.e. height, form, etc.).</td><td>
<table>
<tr><th>Tree ID</th><th>Vegetation Species</th><th>Exotic/Native</th><th>Proposed Works</th><th>Height (m)*</th><th>DBH (m)*</th></tr>
<tr><td>T1</td><td>Alnus Jorullensis (Evergreen Alder)</td><td>Non-native</td><td>Removal</td><td>12</td><td>0.4</td></tr>
<tr><td>T2</td><td>Jacaranda Mimosifolia (Jacaranda)</td><td>Non-native</td><td>Removal</td><td>6</td><td>0.2</td></tr>
<tr><td>T3</td><td>Callistemon Veminalis (Bottle Brush)</td><td>Native (endemic)</td><td>Removal</td><td>3</td><td>0.1</td></tr>
</table>
</td></tr>
<tr><td>5d</td><td>Condition of vegetation (i.e. healthy, damaged, dying, etc.).</td><td>T1 – Healthy, T2 – Fair condition, T3 – Dead</td></tr>
<tr><td>5e</td><td>Is the vegetation a threatened species or part of an Endangered Ecological Community, listed under NSW or Commonwealth legislation? [attach ecologist report]</td><td>The vegetation due to be removed is isolate and small in size, and is not listed as a threatened ecological community under the BC Act or EPBC Act.
No threatened flora species were recorded and none are considered likely to occur within the Site due to its degraded nature as a result of previous clearing works.</td></tr>
<tr><td rowspan="2">5f</td><td rowspan="2">If Yes, is the impact significant? [attach ecologist report]</td><td>☒ No. Refer Arborist Assessment in Appendix 1</td></tr>
<tr><td>☐ Yes, If Yes, see P&E Staff. This form cannot be used.</td></tr>
<tr><td>5g</td><td>Is the species subject to a Local Government Tree Preservation Order?
If yes, has the Council been consulted? [Attach response from Council]</td><td>No.</td></tr>
<tr><td>5h</td><td>Does the vegetation provide habitat for any other species?</td><td>No.</td></tr>
<tr><td>5i</td><td>Does the tree have any local aesthetic value, historical significance, or personal value? [Attach response from Council]</td><td>No.</td></tr>
<tr><td colspan="3">6. Details of actions</td></tr>
<tr><td>6a</td><td>Reason for removal</td><td>To allow for the construction and upgrade of the rail corridor access point and gate which includes a new footpath and vehicular crossing.</td></tr>
</table>

6b	Justify why alternatives not used (e.g.; modifying the scope or method of work) to avoid the need to remove/cut/lopped/ringbarked the vegetation.	No alternatives are feasible; vegetation removal is required to facilitate the installation of new wider rail corridor access gates. This includes improvement to the driveway access ramp, incorporating drainage requirements.		
6c	Proposed method of removal. Will an arborist be used or consulted? [if yes attach report]	Chain saw and wood chipping truck will be utilised to trim /remove vegetation and turn it into mulch for offsite disposal. Qualified arborists from Get Lopped Tree Services will be engaged to perform required vegetation removal and trimming.		
6d	Will any other species be affected by the vegetation being removed/cut/ lopped/ringbarked?	No.		
6e	Detail measures proposed to stabilise area after removal/ cut/ lopped/ringbarked	No stabilisation would be required.		
6f	Is the vegetation considered to be remnant vegetation?	☐ Yes, if yes see question 6g		
		☒ No, if no go to question 6h		
6g	If Yes, detail the vegetation replacement/replanting/regeneration activity that will be completed. (see NWRL Sustainability Target P5.2)	N/A		
6h	Will any facilities or services be affected during removal/ cutting/ lopping/ ringbarking of the vegetation? (e.g. underground gas/water mains, overhead communication cables or power lines)	No.		
7. Approval details				
7a	Proposed by – Name:	Charlotte Malone		
	Company:	Laing O'Rourke		
	Signature		Date	Revision 1 – 27 August 2019
	Council Notified by (Name):	Willoughby City Council (Joe Leal)	Date:	16/11/18 & 14/01/19
	Council Comments (attach):	Approval to remove (see Appendix 3)		
		Landowner notified? ☐Yes ☒ No (Council land)		
7b	**Supported by (signature and date):**			

	Nominated Environmental Representative:		Date:	
	Principal Manager, Sustainability, Environment & Planning, Project Delivery Northwest:		Date:	
7c	**If Part V of EP&A Act Approved by (signature & date):**			
	Principal Manager, Sustainability, Environment & Planning:		Date:	
	Conditions of Approval:			
7d	**If Part 5.1 of EP&A Act**			
	Is the vegetation removal/cutting/lopping/ringbarking consistent with the approved project?		☐ Yes ☐ No	
	Approved by (signature & date):			
	Principal Manager, Environment, Sustainability & Planning:		Date:	
	Conditions of Approval:			

Appendix 1 – Tree Assessment

27 August 2019

1800 438 567
info@getlopped.com.au
PO Box 166 Double Bay 1360
CAN: 155 674 650

Report type: Visual Tree Inspection (VTA)

Client: Laing O'Rourke

Location: Drake St, Artarmon

Inspection Conducted By: Angus Mcgregor, AQF Level 3 Arborist on the 22/8/19

1.0 INTRODUCTION

1.1 - Laing O'Rourke have appointed Get Lopped Pty Ltd to make an assessment of three trees: T1 – Evergreen Alder (Alnus Jorullensis), T2 – Jacaranda (Jacaranda Mimosifolia), T3 – Bottle Brush (Callistemon Viminalis)

1.2 - The subject site is located at the end of Drake st, Artarmon with the trees situated outside of the Transport for NSW rail corridor on the north and south of the driveway.

1.3 - The purpose of this report is to assess the overall health and condition of the trees documented above (photos above).

2.0 METHODOLOGY

2.1 - The subject trees were inspected under the visual tree assessment (VTA) criteria.

2.2 - Where possible the height and canopy spread of the trees were estimated.

2.3 - The Diameter at Breast Height (DBH) of the trees was measured at 1400mm above ground level.

2.4 - An iPhone was used for the purpose of collecting photographic evidence. No other alteration of photographic content has been made.

27 August 2019

1800 438 567
info@getlopped.com.au
PO Box 166 Double Bay 1360
CAN: 155 674 650

3.0 Tree Data

3.1 T1 – Evergreen Alder (Alnus Jorullensis),

Height – 12 metres
Canopy width – 4 metres.
DBH – 0.4 metres
Health – Good
Condition – Good

3.2 T2 – Jacaranda (Jacaranda Mimosifolia),

Height – 6 metres
Canopy width – 3 metres.
DBH – 0.2 metres
Health – Fair
Condition – Fair, Tree has cambium scarring as a result of impact from machinery/vehicles entering rail corridor

3.3 T3 – Bottle Brush (Callistemon Viminalis)

Height – 3 metres
Canopy width – 1.5 metres.
DBH – 0.1 metres
Health – Dead Tree
Condition – Dead Tree

4.0 DISCUSSION:

4.1 - T1 is a mature example of its species and presents well with good health and vigor. The tree is a non-native species to the area.
4.2 - T2 is a semi mature example of its species. The species is non-native to the area but is still considered to be significant. The tree is in fair condition but has suffered multiple cambium wounds from vehicles entering/leaving the rail corridor.
4.3 – T3 is dead and should be removed

27 August 2019

1800 438 567
info@getlopped.com.au
PO Box 166 Double Bay 1360
CAN: 155 674 650

Figure 1 – T1

27 August 2019

1800 438 567
info@getlopped.com.au
PO Box 166 Double Bay 1360
CAN: 155 674 650

Figure 2 – T2 and T3

27 August 2019

1800 438 567
info@getlopped.com.au
PO Box 166 Double Bay 1360
CAN: 155 674 650

Yours Sincerely,

Angus McGregor

Director and Level 3 Arborist, Kurri Kurri Tafe

angus@getlopped.com.au

Appendix 2 – Environmental Control Map

Tree Trimming/Removal		
ID	**Aspect**	**Description**
1	**Project**	• This ECM is a supplementary document to MNNSCW CEMP and applies to the tree trimming and removal site identified within this Removal or Trimming of Vegetation Application Form.
2	**Work Stages**	• Activities associated with this application are planned to be undertaken in August/September 2019 once approved by Sydney Metro.
3	**General**	• All staff and contractors will be trained on this ECM, general environmental issues, location of sensitive areas and erosion/sediment controls. • This ECM will be displayed on site sheds and HSE Notice Board.
4	**Contamination**	• In the event of encountering contaminated soil, works will be stopped, hygienist will be engaged and spoil will be classified/disposed of accordingly. • Unexpected contamination finds will be reported to site supervisor, HSE Manager, Sydney Trains and Sydney Metro.
5	**Air Quality**	• No air quality related issues are expected to be encountered. • Weather will be monitored daily on site (BOM).
6	**Waste**	• Mulch containing noxious weed will not be reused onsite or off-site. It will be disposed of off-site to a licenced facility. Waste disposal records will be maintained. • Removal of wastes from site will be undertaken by a licensed contractor as required by the POEP Act and with appropriate approvals, if required, for contaminated materials etc.
7	**Soils and water**	• No soil/water related issue are expected to arise from these trimming works.
8	**Heritage**	• Stop works protocols will be followed in the event of unexpected finds. • Unexpected finds of heritage items must be reported to LOR Environmental Manager, Sydney Trains and Sydney Metro.
9	**Noise and Vibration**	• All works will be completed in compliance with Sydney Metro CEMF, MNNSCW Planning Approval and relevant addendum, Construction Noise Strategy and EPL 12208/EPA requirements. • All plant used onsite will have non-tonal alarms. Plant would be switched off when not in use, regularly maintained, and noisy equipment would be repaired or replaced. • Local council, Sydney Trains and community will be notified regarding these works.
10	**Traffic and Transport**	• Access requirements will be managed by using existing driveways and hardstand roads into the site areas. • All plant operators will be given an induction covering environmental controls relevant to their activities. • No additional traffic control will be required for these works.
11	**Utilities Management**	• Sydney Trains DSS will be referred to for all services present in the area prior to works. Any impacts to utilities will be reported to site HSE Manager, supervisor, Sydney Trains and Sydney Metro.
12	**Biodiversity**	• Limits of clearing will be established on-site prior to vegetation trimming and removal works. • Trees requiring trimming and removal will be identified and marked prior to works commencing. • If vegetation other than that identified in the ecological assessment is affected, further assessment would be undertaken and approval would be sought from Sydney Metro prior to trimming or removal. If trees/shrubs within the areas need to be entirely removed, an ecologist will be present on-site to document the species removed along with their biometric data (e.g. diameter at breast height (DBH), height, canopy cover). • If threatened flora or fauna species are identified on site, work near these species would stop immediately, a spotter/catcher/ecologist would be engaged to survey the site and advise on species management. • Stockpiles, plant, equipment and materials will be located on existing cleared areas, away from the drip zone of other trees and native vegetation. • Soil and vegetation containing weed material (if applicable) will be removed from machinery prior to any movements off site. Mulch would be disposed of at a licenced disposal site and not reused onsite or off-site.
13	**Chemical and fuel storage and use**	• No fuels are required to be stored onsite for these works. • All chemicals (including herbicides) brought onto site must be verified and registered in an SDS. SDS will be kept on site. • Spill kits would be located onsite and portable spill kits would also be available in site vehicles along with fire extinguishers. • All plant will be checked daily to ensure there is no leaking oil, fuel or other liquids.
14	**Imported materials**	• No materials are required to be imported for these works.
15	**No-go zones**	• Tree trimming/removal and removal of weeds/grass will be restricted to the rail corridor. All construction activities outside the MNNSCW site boundary will undergo a review for potential environmental impacts and require approval from Sydney Metro.
Standard Working Hours		
Audible construction works unless otherwise approved by the Environmental Manager will be restricted to: • **7:00AM to 6:00PM - Monday to Friday** • **8:00AM to 1:00PM - Saturdays** No work on Sundays or public holidays • Any works outside of the hours above require OOHW and Sydney Metro and LOR Environmental Manager's Approval		

"High noise impact works and activities must only be undertaken:

a) between the hours of 8:00am to 6:00pm Monday to Friday;
b) between the hours of 8:00am to 1:00pm Saturday; and

in continuous blocks not exceeding 3 hours each with a minimum respite from those activities and works of not less than 1 hour between each block"

Contact Information		
Position	**Name**	**Phone**
LOR Project Leader	Ken Falano	0437 022 668
LOR Construction Manager	Noel McCarthy	0428 935 784
LOR Environment Manager	Charlotte Malone	0407 061 932
LOR WHS Manager	James Latu	0417 637 135
ER	Peter Hatton	0436 451 153
Sydney Metro Environmental Manager	Andrew Hendy	0475 983 494
Sydney Metro Northwest Info Line		1800 019 989
Sydney Trains Info Line		131 500
Environmental Line / Pollution Incident Response Line		131 555
Office of Environment & Heritage Pollution Line		131 555
Emergency		000 or 112 (mobiles)
WIRES		1300 094 737

Appendix 3 – Council Correspondence

Malone, Charlotte

From: Standing, Christopher
Sent: Wednesday, 14 August 2019 4:07 PM
To: Malone, Charlotte
Subject: FW: Tree removal at Drake Street rail corridor access gate

Follow Up Flag: Follow up
Flag Status: Flagged

From: Leal, Joe <Joe.Leal@Willoughby.nsw.gov.au>
Sent: Monday, 14 January 2019 7:29 AM
To: Standing, Christopher <cstanding@laingorourke.com.au>
Subject: RE: Tree removal at Drake Street rail corridor access gate

Hi Chris,

It's actually an Alnus jorrulensis which is also exempt from council's Tree & Vegetation Clause. You can go ahead & complete the removal.

Regards

Joe Leal - *Streetscapes Team Leader*
WILLOUGHBY CITY COUNCIL
PO Box 57 Chatswood NSW 2057
P +61 2 9777 7793 | M +61417404548
E Joe.Leal@Willoughby.nsw.gov.au
willoughby.nsw.gov.au | visitchatswood.com.au | theconcourse.com.au

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From: Standing, Christopher [mailto:cstanding@laingorourke.com.au]
Sent: Wednesday, 9 January 2019 1:59 PM
To: Leal, Joe
Subject: RE: Tree removal at Drake Street rail corridor access gate

Hi Joe,

Would you be able to please confirm the project is able to remove the subject tree Celtis Australis?

As I understand it is on the exempt list, however would like to confirm.

Regards,
Chris

Chris Standing
Senior Environment and Sustainability Manager

Laing O'Rourke Australia
Level 8, 100 Christie Street
St Leonards NSW 2065
www.laingorourke.com.au

mobile: +61 431 338 578

From: Standing, Christopher
Sent: Thursday, 20 December 2018 1:55 PM
To: 'Leal, Joe' <Joe.Leal@Willoughby.nsw.gov.au>
Subject: Tree removal at Drake Street rail corridor access gate

Morning Joe,

Laing O'Rourke is undertaking works for Sydney Metro within Artarmon. Part of these works includes the upgrade of the rail corridor access point and gate at the end of Drake Street.

A new wider rail corridor access double gate will be installed , including improvements to the driveway access ramp, incorporating drainage requirements.

While we have been consulting with council's infrastructure team on the specification for the access point, there is a Celtis australis that has grown within the access alignment at the end of Drake Street.

Please refer to yellow line in the attached image and the agree design drawing with the council's infrastructure team.

We would be unable to accommodate the Celtis australis within this design and therefore request approval to have it removed.

We request council consider our application to remove the said tree to facilitate the works, upgrading rail corridor access point at Drake Street.

Could you please indicate of any additional requirements, approvals to remove the Celtis australis.

We would intend on undertaking the works in the coming weeks.

Regards,
Chris

Chris Standing
Senior Environment and Sustainability Manager

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St Leonards NSW 2065
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mobile: +61 431 338 578

Malone, Charlotte

From: Standing, Christopher
Sent: Wednesday, 14 August 2019 4:07 PM
To: Malone, Charlotte
Subject: FW: Tree removal at Drake Street rail corridor access gate

Follow Up Flag: Follow up
Flag Status: Flagged

From: Leal, Joe <Joe.Leal@Willoughby.nsw.gov.au>
Sent: Tuesday, 16 October 2018 12:14 PM
To: Standing, Christopher <cstanding@laingorourke.com.au>
Subject: RE: Tree removal at Drake Street rail corridor access gate

Hello Chris,

I'm sure this Jacaranda was shown for removal in previous correspondence that you have sent us. We did not have a problem with its removal on the original documents that we have seen & that still stands now. While you have your tree crew there you could also remove the small poor specimen (if not dead) Callistemon (Bottlebrush) right beside the Jacaranda shown in your photo if your happy to do use a favour.

Regards

Joe Leal - *Streetscapes Team Leader*
WILLOUGHBY CITY COUNCIL
PO Box 57 Chatswood NSW 2057
P +61 2 9777 7793 | M +61417404548
E Joe.Leal@Willoughby.nsw.gov.au
willoughby.nsw.gov.au | visitchatswood.com.au | theconcourse.com.au

From: Standing, Christopher [mailto:cstanding@laingorourke.com.au]
Sent: Wednesday, 10 October 2018 7:40 AM
To: Leal, Joe
Cc: McCarthy, Noel
Subject: Tree removal at Drake Street rail corridor access gate

Morning Joe,

Laing O'Rourke is undertaking works for Sydney Metro within Artarmon. Part of these works includes the upgrade of the rail corridor access point and gate at the end of Drake Street.

A new wider rail corridor access double gate will be installed , including improvements to the driveway access ramp, incorporating drainage requirements.

While we have been consulting with council's infrastructure team on the specification for the access point, there is a Jacaranda mimosifolia that has grown within the access alignment at the end of Drake Street.

Please refer to yellow line in the attached image and the agree design drawing with the council's infrastructure team.

We would be unable to accommodate the Jacaranda within this design and therefore request approval to have it removed.

We request council consider our application to remove the said tree to facilitate the works, upgrading rail corridor access point at Drake Street.

Could you please indicate of any additional requirements, approvals to remove the Jacaranda mimosifolia.

We would intend on undertaking the works in the coming weeks.

Regards,
Chris

Chris Standing
Senior Environment and Sustainability Manager

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Appendix 4 – Traffic/Pedestrian Management

No additional Traffic Control is required for these works.