thrive ECOLOGY

Proposed changes to stormwater mitigation works at Norman Griffiths Oval

2 Lofberg Rd, West Pymble NSW 2073

Flora and Fauna Impact Assessment Addendum

Prepared for Ku-ring-gai Council

December 2024

Project Details

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Prepared for	Ku-ring-gai Council
Prepared by	E Rogers
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Draft v1	E Rogers	G Teear	03/12/2024	Preparation of draft report.
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Executive Summary

Thrive Ecology has been engaged by Ku-ring-gai Council to prepare this addendum to the Flora and Fauna Impact Assessment (FFIA), as prepared by Total Earth Care (TEC 2023), for the proposed changes to stormwater mitigation work (the Proposal) at Norman Griffiths Oval (Subject Site).

The Proposal requires the removal and realignment of part of an existing footpath to better manage overland stormwater flows. As an addendum to the TEC (2024) FFIA, this report assesses the following as part of design changes:

- Overland flows from stormwater management as per Orion (2024a, 2024b) flood modelling; and
- Removal and realignment of part of the existing footpath as per Ku-ring-gai Council (2024) construction plans.

The Subject Site contains one Plant Community Type; PCT 3262; Sydney Turpentine Ironbark Forest. This PCT does conform to a Critically Endangered Ecological Community under the *Biodiversity Conservation Act 2016* (BC Act) and the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Proposal will result in the removal of approximately 124 m^2 of vegetation from PCT 3262. The Proposal will result in altered surface hydrology due to proposed design changes to overland stormwater flow. Under a 1% AEP storm event (1 in 100-year event) approximately 3387 m^2 of STIF will be inundated with water at varying depths and velocities for approximately 50 minutes (Orion 2024a). The majority of the STIF may experience a maximum velocity of 0.25-0.5 m s^{-1} with small areas potentially experiencing velocities of up to 1-1.25 m s^{-1} and 1.75-2 m s^{-1}. Given the soil type, vegetation cover and flow velocity it is unlikely that erosion of soils will occur within the STIF. Under more regular, lower rainfall conditions the overland flows will be most likely be contained to the turfed batter adjacent to the STIF and may encroach on the edge of the understorey of the STIF at times. According to flood modelling (Orion 2024b), the probable maximum flow (PMF) events are expected to reach velocities of greater than 2.5m/s in some parts of the STIF and surrounding environment. During a PMF event there is potential for erosion or damage to understorey plants to occur within the STIF. However, as PMF events are an extremely rare event, should one occur, the plant community will likely re-establish itself from any damage given its highly resilient condition.

An Assessment of Significance under the BC Act and a Significant Impact Criteria Assessment under the EPBC Act have determined that the Proposal is unlikely to have a significant impact on the CEEC (see Appendix G and H).

Potential indirect impacts of the Proposal include increased risk of weeds, pathogens and erosion. With the application of mitigation measures provided in this report the risk of these indirect impacts can be minimised and managed.

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Acronyms and Abbreviations

Term	Definition
AEP	Annual exceedance Probability
BAM	Biodiversity Assessment Methodology
BC Act	NSW *Biodiversity Conservation Act 2016*
Biosecurity Act	*Biosecurity Act 2015*
BOS	Biodiversity Offset Scheme
BV Map	Biodiversity Values Map
CEEC	Critically Endangered Ecological Community
Commonwealth DCCEEW	Australian Government Department of Climate Change, Energy, the Environment and Water
DPE	NSW Department of Planning and Environment
EP&A Regulation	*Environmental Planning and Assessment Regulation 2021*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPBC PMST	EPBC Protected Matters Search Tool
EP&A Act	*Environmental Planning and Assessment Act 1979z*
ha	Hectares
km	Kilometre(s)
KTP	Key Threatening Processes
LGA	Local Government Area
Locality	A larger area surrounding the site encompassing more distant environmental features (i.e. receiving air and waters, mobile native biodiversity).
m	Metre(s)
mm	Millimetre(s)
MNES	Matters of National Environmental Significance
NSW DCCEEW	NSW Government Department of Climate Change, Energy, the Environment and Water
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
SVTM	State Vegetation Type Map
TEC	Threatened Ecological Community. TECs is an umbrella term that comprises Vulnerable Ecological Communities (VECs), Endangered Ecological Communities (EECs), Critically Endangered Ecological Communities (CEECs).
WoNS	Weeds of National Significance

1 Introduction

1.1 Background and development overview

Thrive Ecology has been engaged by Ku-ring-gai Council to prepare this addendum to the Flora and Fauna Impact Assessment (FFIA), as prepared by Total Earth Care (TEC 2023), for the proposed changes to stormwater mitigation work (the Proposal) at Norman Griffiths Oval (Subject Site).

After consideration of recent flood modelling (Orion 2024a, 2024b), the design of stormwater mitigation infrastructure has been amended. As such, this addendum to the FFIA will address the mandatory ecological impact assessment requirements for activities subject to Division 5.1 of the *Environmental Planning and Assessment Act* (EP & A Act) for the proposed changes.

1.1.1 Report scope

As an addendum to the TEC (2024) FFIA, this report will assess the following as part of design changes to better manage stormwater mitigation:

- Overland flows from stormwater management as per Orion (2024a, 2024b) flood modelling (Appendix B and Appendix C); and
- Demolition and construction of part of the existing footpath as per Ku-ring-gai Council (2024) construction plans.

Consideration of other direct and indirect impacts of the Proposal have been addressed in TEC (2024).

1.2 Subject Site details

The Subject Site is located at 2 Lofberg Rd, West Pymble NSW 2073. See Table 1-1 for Subject Site details and Figure 1-1 for the mapped subject site. See Figure 1-2 and Figure 1-3 for site photos.

Table 1-1 Subject Site details.

Feature	Description
Site address	2 Lofberg Rd, West Pymble NSW 2073
Property identifier (Lot and DP)	Lot 6/-/DP 564939
Local Government Area (LGA)	Ku-ring-gai Council
Zoning	The lot comprises both RE1: Public Recreation and C2: Environmental Conservation zoning.
Subject Site	Refers to the area specified for the ecological assessment as outlined in red in Figure 1-1.
Survey Area	Refers to the area assessed during the site visit as outlined in blue in Figure 1-1.
Study Area	Refers to the broader locality surrounded the Survey Area including the receiving air, wind, and waters.

1.3 Proposal details

The Proposal involves changes to the stormwater mitigation works as outlined in the original FFIA report (TEC 2023). The proposed changes include the demolition of a portion of an existing footpath

and the replanting of this area, construction of a 3 metre (m) wide concrete footpath, construction of a 2 m wide bitumen ramp to join the existing and proposed footpaths, see Appendix A.

The Proposal will involve the removal of approximately 124 m^2 of vegetation. All trees will be retained.

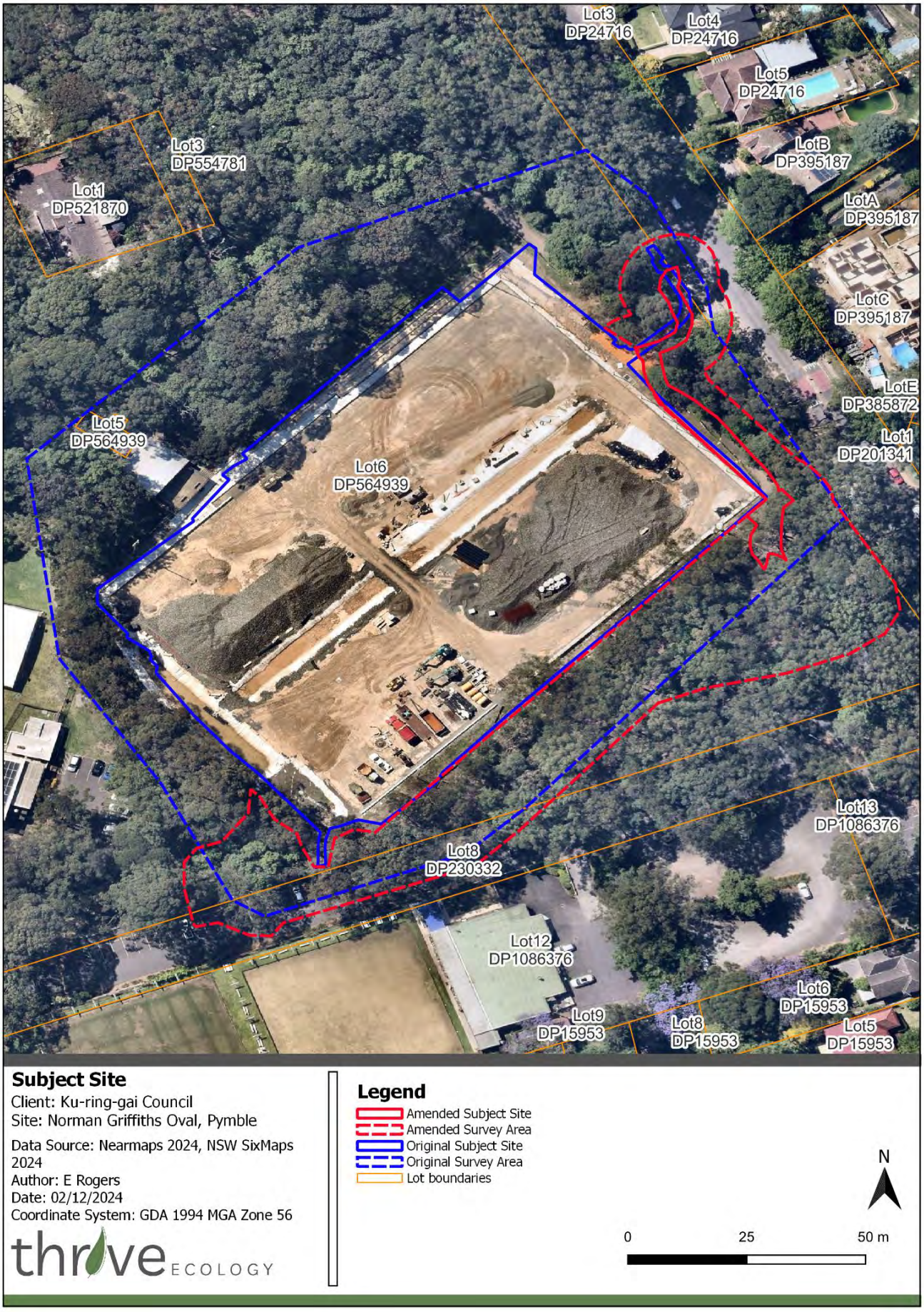

Figure 1-1 Subject Site

Figure 1-2 Eastern edge of the Subject Site facing north, north-east along the existing footpath proposed to be removed.

Figure 1-3 Southern edge of the Subject Site facing south, south-west showing the location where the existing footpath would be rejoined with the proposed footpath.

2 Legislative Context

The following subsections address the relevant ecological components of the legislation applicable to the proposal.

2.1 *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places which are considered Matters of National Environmental Significance (MNES). Under the EPBC Act, approval is required for actions that have, would have, or are likely to have a significant impact on MNES.

The EPBC Act covers nine protected matters of national environmental significance (MNES). These are listed in Table 2-1and their relevance to Subject Site and the Proposal discussed.

Table 2-1 MNES relevant to the Subject Site and Proposal.

MNES	Site relevance	Potential to impact a MNES
World Heritage Areas	None within the Subject Site or within 10km of the Subject Site.	No.
National Heritage Places	None within the Subject Site, two within 10km of the Subject Site.	No.
Wetlands of international importance (listed under the Ramsar Convention)	None within the Subject Site or within 10km of the Subject Site.	No.
Listed threatened species and ecological communities	No threatened flora species or fauna species under the EPBC Act were identified as potentially being impacted by the proposal. One threatened ecological community; Turpentine-Ironbark Forest of the Sydney Basin Bioregion under the EPBC Act was identified as potentially being impacted by the proposal.	Yes, but an assessment has determined the Proposal is unlikely to have a significant impact on the threatened ecology community.
Listed migratory species (protected under international agreements)	None determined as likely to be impacted by the Proposal. See section 4.4.1.	No.
Commonwealth marine areas	None within the Subject Site or within 10km of the Subject Site.	No.
Great Barrier Reef Marine Park	None within the Subject Site or within 10km of the Subject Site.	No.

MNES	Site relevance	Potential to impact a MNES
Nuclear actions (including uranium mines)	Not applicable to the Proposal.	No.
Water resources (that relate to coal seam gas development and large coal mining development).	Not applicable to the Proposal.	No.

No threatened flora or fauna under the EPBC Act were observed within the Subject Site during the site survey. No threatened flora or fauna were identified as potentially being impacted by the Proposal. One threatened ecological community under the EPBC Act was identified as potentially being impacted by the Proposal:

- Turpentine-Ironbark Forest of the Sydney Basin Bioregion – Critically Endangered under the EPBC Act

Due to the limited extent of vegetation clearing (approximately 124 m^2) within an already disturbed edge portion of the community, and the replanting of a small area within the community, the Assessments of Significant Impact Criteria determined the Proposal was unlikely to have a significant impact on the threatened ecological community under the EPBC Act.

2.2 *Environmental Planning and Assessment Act 1979* (EP & A Act)

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation) provide the framework for development and environmental assessment in NSW.

This Proposal is subject to the environmental impact assessment and planning approval requirements of Part 5 of the EP&A Act. Part 5 of the EP&A Act specifies the environmental impact assessment requirements for activities undertaken by public authorities which require development consent. This is an addendum to the FFIA previously prepared by Total Earth Care which informed the Review of Environmental Factors.

2.3 *Biodiversity Conservation Act 2016* (BC Act)

The *Biodiversity Conservation Act 2016* (BC Act) seeks to conserve biological diversity and promote ecologically sustainable development, to prevent extinction and promote recovery of threatened species, populations, and ecological communities and to protect Areas of Outstanding Biodiversity Value.

No threatened flora or fauna species were identified within the Subject Site during the survey. One previous BioNet record for *Thelymitra atronitida* (Black-hooded Sun Orchid) identified in the original FFIA and surveyed for directly adjacent to the Subject Site (see TEC 2023) was not identified during the current BioNet Species Sightings Search. The Black-hooded Sun Orchid is not typically associated with the plant community type or the soil type present within the Subject Site. It is likely this record has since been found to be invalid and removed from BioNet.

One threatened ecological community; Sydney Turpentine Ironbark Forest in the Sydney Basin Bioregion (known as STIF), listed under the BC Act was previously identified within the Subject Site and confirmed to be present during the current survey.

Assessments of Significance (5 Part-test) under s7.3 of BC Act determined that the Proposal is unlikely to have a significant impact on any threatened ecological communities (see Appendix F).

2.3.1 Biodiversity Offset Scheme and the Biodiversity Values Map

Entry to the Biodiversity Offsets Scheme (BOS) is triggered by developments, projects and activities that meet certain thresholds for significant impacts on biodiversity, or on an opt-in basis. Table 2-2 provides the triggers and justification for activities by public authorities assessed under Part 5 of the *Environmental Planning and Assessment Act 1979*.

The Biodiversity Values (BV) Map is one of the Biodiversity Offsets Scheme thresholds. The Biodiversity Values Map identifies land with high biodiversity value, such as native vegetation, threatened species habitat and creek lines, that is particularly sensitive to impacts from development. The Biodiversity Offsets Scheme thresholds do not apply to Part 5 activities. The BV Map can be used as information to support consideration of an area of outstanding biodiversity or the test of significance. The Subject Site is partially mapped on the BV Map and this has been considered when determining if there is a significant impact on a threatened entity.

Table 2-2 BOS threshold triggers and justification for the Proposal.

Criteria for entry into the BOS	Triggered Y/N	Justification
State Significant project or infrastructure	No	Not considered a State Significant project or infrastructure.
Biodiversity certification proposal	No	Not a biodiversity certification proposal.
Carried out on an Area of Outstanding Biodiversity Value (AOBV)	No	The subject site is not an AOBV.
Likely to significantly affect threatened species, ecological communities and their habitats according to the test in section 7.3 of the BC Act	No	See Appendix G for tests of significance in accordance with section 7.3 of the BC Act. The proposal is unlikely to have a significant impact on a threatened entity.

As such the Proposal in its current form does not trigger the requirement to prepare a Species Impact Statement (SIS) or opt into the BOS.

2.4 State Environmental Planning Policies (SEPPs)

2.4.1 State Environmental Planning Policy (Biodiversity and Conservation) 2021

The State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP) aims to preserve, conserve and manage NSW's natural environment and heritage by providing planning rules and controls for clearing of native vegetation for purposes not related to a development application, planning and assessment framework for koala habitat and provisions to support water quality and the environment within specific catchments.

Chapter 4 – Koala Habitat Protection 2021 applies to the Ku-ring-gai LGA, however this chapter does not apply to activities under Part 5 of the EP&A Act.

Chapter 6 – Water Catchments applies to the site as the subject site is located within the Sydney Harbour Catchment. The proposal is to give regard to the controls in Part 6.2 relating to water quality and quantity, aquatic ecology, flooding, recreation and public access, and total catchment management. However, under the *Transport and Infrastructure SEPP 2021* the proposal can be carried out on behalf of Council without consent.

2.4.2 State Environmental Planning Policy (Resilience and Hazards) 2021

Chapter 2 – Coastal Management aims to promote an integrated and co-ordinated approach to land use planning in the coastal zone including the management objectives for each coastal management area.

The subject site is not mapped within or in close proximity (where indirect impacts are possible) to areas mapped within the Coastal Environment Area Map, Coastal Use Area Map, Coastal Vulnerability Area Map or the Coastal Wetlands and Littoral Rainforest Area Map.

3 Methodology

The assessment included desktop research of the locality (10 km radius from the Subject Site) including review of relevant documents and databases, as well as a site investigation to ground-truth the vegetation and determine the plant community type and condition.

3.1 Desktop Research

The desktop study included a review of the following documents and database searches:

- Norman Griffiths Sports field Upgrade – Construction plans, dated 23rd August 2024 (Ku-ring-gai Council 2024);
- Norman Griffiths Oval Flood Effect on EEC zone for 1% AEP Flood event – Orion, dated 24th October 2024 (Orion 2024a) (Appendix B);
- Detailed Flood Impact Assessment - Norman Griffiths Oval Upgrade Works – Orion, dated 29th August 2024 (Orion 2024b);
- Flora and Fauna Impact Assessment for the proposed stormwater mitigation works and synthetic football field at Norman Griffiths Oval – Total Earth Care, dated February 2023 (TEC; 2023);
- State Vegetation Type Mapping (DPE 2022);
- BioNet Wildlife Atlas (NSW DCCEEW 2024a) search date 17th November 2024;
- Protected Matters Search Tool (PMST) (Commonwealth DCCEEW 2024), search date 17th November 2024;
- ePlanning portal (NSW DCCEEW 2024b);
- Soil landscape on eSpade (NSW DCCEEW 2024c);
- Hydroline spatial layers (DCS 2024);
- High resolution aerial imagery (Nearmap 2024 and Sixmaps 2024); and
- Review of BioNet Vegetation Classification database (NSW DCCEEW 2024d).

3.1.1 Threatened species likelihood of occurrence assessment

A preliminary desktop study was conducted to assess the likelihood of the Subject Site to support threatened species, populations or endangered ecological communities, or their habitats. All records of all threatened species and populations within 10 km of the Subject Site were obtained from the NSW Department of Climate Change, Energy, Environment and Water (NSW DCCEEW) BioNet Wildlife Atlas database (NSW DCCEEW, 2024a), and the Commonwealth Department of Climate Change, Energy, Environment and Water (Commonwealth DCCEEW) Protected Matters Search Tool (PMST) (Commonwealth DCCEEW 2024). Recent vegetation mapping was used to determine the likelihood of any nearby areas of endangered ecological communities and included database searches from the State Vegetation Type Map (SVTM) (DPE 2022) and the BioNet Vegetation Classification System (NSW DCCEEW 2024d)

After reviewing the list of threatened species records, additional matters were considered in assessing which threatened species are likely to occur within the Subject Site. This included information such as the number of records within the 10 km of the Subject Site, the dates of these records, the likelihood of detecting the species during a survey, the preferred species habitat requirements and whether the Subject Site contained suitable habitat for the species.

The determination of species for likelihood assessment requires the exclusion of those species that are not relevant to the Subject Site including species that either have not been recorded on the Subject Site during the field investigations and/or are unlikely to be present on the Subject Site due to the absence of suitable habitats (i.e., Extremely Low category). Species excluded from the likelihood assessment included pelagic birds, shoreline birds, marine mammals and marine reptiles.

3.2 Site Investigation

A site visit was undertaken on Wednesday 20th and Monday 25th November 2024 to ground-truth the vegetation and threatened species habitat potential. Due to previous assessment and the narrow shape of the Subject Site a rapid PCT assessment was conducted using the random meander method (Cropper 1993). Transects were used to survey for threatened flora and signs of threatened fauna. The following was also assessed/observed during the site visit:

- Visual assessment of the hydrology and topography of the Survey Area;
- Existing condition of the vegetation including resilience and weed cover;
- Assessment of potential fauna habitat; and
- Opportunistic detections of fauna were recorded.

The identification of native and exotic plant species was in accordance with:

- *Field Guide to the Native Plants of Sydney* (Robinson 2003);
- *Flora of NSW, Volumes 1-4* (Harden 1992, 1993, 2000, 2002);
- *Weeds of the south-east: an identification guide for Australia* (Richardson et al. 2011); and
- PlantNET with reference to recent taxonomic changes (National Herbarium of NSW 2023).

All flora identified were recorded and an inventory of species was compiled, see Appendix B.

3.3 Plant Community Type Classification

The plant community type (PCT) was determined by review of the following documents and databases:

- Flora and Fauna Impact Assessment for the proposed stormwater mitigation works and synthetic football field at Norman Griffiths Oval – Total Earth Care, dated February 2023 (TEC; 2023);
- State Vegetation Type Mapping (SVTM) (DPE 2022);
- NSW Plant Community Type profiles accessed from BioNet Vegetation Classification database (NSW DCCEEW 2024d); and
- Definitions under the relevant final determination under the BC Act or conservation listing advice under the EPBC Act.

3.4 Limitations

The field survey was conducted over two days in November 2024. As the survey was undertaken at a discrete time of the year and during the day, it is possible that some species that may utilise the subject site were not recorded (i.e. migratory species, species present in soil bank, nocturnal species). The likelihood assessment helps to address this limitation.

As stated by the DEC (2004) 'The absence of a species from survey data does not necessarily mean it does not inhabit the survey area. It may simply mean that the species was not detected at that time

with the survey method adopted and the prevailing seasonal or climatic conditions.' Therefore, the relative brevity of the survey and its timing mean that the full spectrum of fauna species and ecological processes likely to occur on the subject site cannot be fully quantified or described in this report.

All spatial data was collected used a hand-held GPS which is accurate to 3 metres.

4 Existing Environment

4.1 Landscape features

Landscape features identified within the Subject Site and Survey Area are shown in Figure 4-1.

A discussion of relevant landscape features is provided below in Table 4-1.

Table 4-1 Landscape features present within the subject site and assessment area.

Landscape feature	Description
IBRA bioregion	Sydney Basin
IBRA subregion	Pittwater
Topography	The Subject Site is positioned in a depression in the landscape surrounded by vegetation gently sloping upward away from the existing oval. There is a gradual slope moving from north-east to south-west.
Elevation	68 – 74 m above sea level (asl)
NSW (Mitchell) landscape	Port Jackson Basin
Geology	The Subject Site is mapped as containing both the **Glenorie** (eastern edge) and **Lucas Heights** (western and southern portions) soil landscapes. The **Glenorie** soil landscape is described as undulating to rolling hills on Wianamatta Group Shales. The local relief is 50-80 m with narrow ridges, valleys, and hillcrests part of the landscape. The soils are shallow to moderately deep (< 100 cm) and are highly impermeable. The vegetation has been extensively cleared but the landscape used to support tall open-forest typically wet sclerophyll. The **Lucas Heights** soil landscape is comprised of gently undulating crests and ridges on plateau surfaces of the Mittagong formation. The local relief is to 30 m with slopes approximately 10%. The soils are moderately deep (50 – 150 cm) and are considered stony. The vegetation has been extensively cleared but the landscape used to support dry sclerophyll low forest and woodland.
Soil hazard features	The Subject Site is not mapped as having any acid sulfate soil risk or within close proximity to acid sulfate soils. The **Glenorie** soil landscape has a high erosion hazard and the **Lucas Heights** soil landscape has a low soil fertility and low available water capacity.
Rivers, streams, estuaries and wetlands	No waterways or waterbodies exist within the Subject Site. The closest mapped waterways include Quarry Creek approximately 300 m downslope from the Subject Site, a 1st order stream. Quarry Creek is a tributary of Lane Cove River which is approximately 1.3 km downslope, see Figure 4-1. There is a drainage outlet at the south-west corner of the Norman Griffith Oval that runs into Quarry Creek. A modified channel exists upstream to the north of the subject site which runs under the road and oval and into Quarry Creek via the drainage outlet.

Landscape feature	Description
Habitat connectivity	The vegetation surrounding the existing oval is connected in the south-west to a broader patch of in-tact vegetation that eventually connects to Lane Cove River and Lane Cove National Park. The eastern and southern edges of the Subject Site abut roads including Ryde Road in the east, see Figure 4-1.
Karst, caves, crevices, cliffs, rocks or other geological features of significance	The Subject Site does not contain any karst, caves, crevices, cliffs, rocks or other geological features of significance nor were any observed near the Subject Site.
Areas of outstanding biodiversity value	No Areas of Outstanding Biodiversity Value are located within the Subject Site or within the locality.

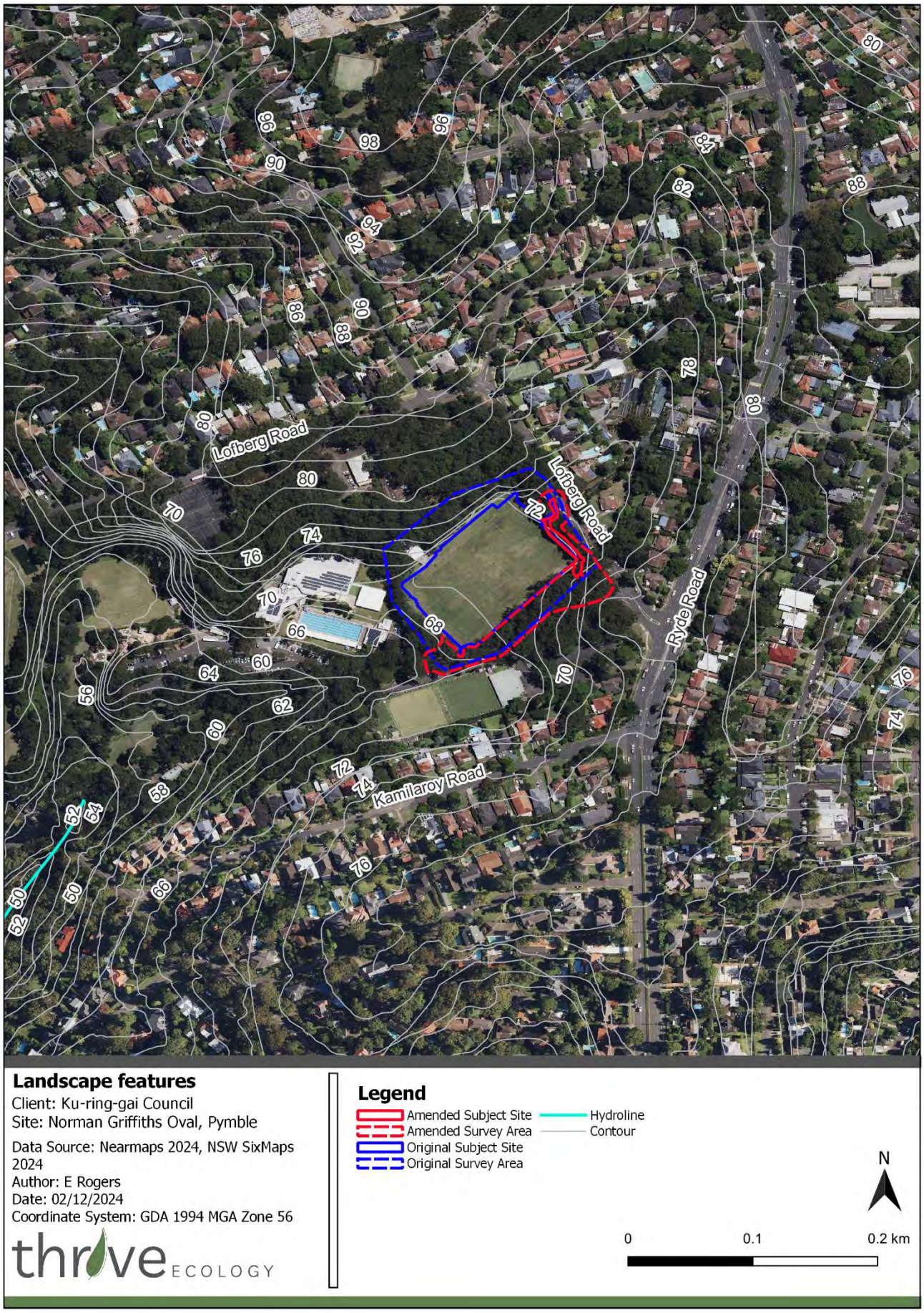

Figure 4-1 Landscape context and connectivity.

4.2 Flora species

Thirty-four (34) flora species were recorded during the site investigation. Of these, three are exotic weed species and 31 are native species of which most are associated with the plant community type.

The flora species inventory is provided in Appendix B.

4.2.1 Threatened flora species

No threatened flora or fauna species were identified within the Subject Site during the survey. One previous record for *Thelymitra atronitida* (Black-hooded Sun Orchid) identified in the original FFIA and surveyed for directly adjacent to the Subject Site (see TEC 2023) was not identified during the BioNet Species Sightings Search. The Black-hooded Sun Orchid is not typically associated with the plant community type or the soil type present within the Subject Site. It is likely this record has since been found to be invalid and removed from BioNet.

The NSW BioNet Atlas of NSW Wildlife database and the EPBC PMST identified 60 threatened flora species within a 10 km radius (see Figure 4-2 for records within 1-1.5 km). Of these, two were deemed likely to occur on the Subject Site based on recorded sightings and habitat suitability (see Appendix D). These are listed in Table 4-2.

Following the site assessment and review of species characteristics (see Appendix E) and survey requirements all species were ruled out of requiring assessments of significance under the EPBC Act 1999 and NSW BC Act 2016. This was based on the current survey being conducted during appropriate survey periods in accordance with the targeted survey requirements of the BAM and/or the ability of the species to be detected during the surveys (Table 4-2):

Table 4-2 Threatened species requiring an assessment of significance and justification.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Assessment of significance required
Callistemon linearifolius	Netted Bottle Brush	V	V	No – Can be surveyed year-round. Not observed during the site visit within the Subject Site following thorough survey.
Epacris purpurascens var. *purpurascens*		V		No – Not surveyed for during flowing period. Associated PCT within the Subject Site. High number of records within the locality. However, no *Epacris* spp were observed within the Survey Area. Therefore, it has been ruled out as being present within the Survey Area.

BC Act Status – V – Vulnerable, E1 Endangered, E4A - Critically Endangered, P – Protected, 2 – Category 2 sensitive species, 3 - Category 3 sensitive species.
EPBC Act Status - CE - Critically Endangered, E – Endangered, V – Vulnerable.

4.2.2 Weed species

Three weed species were identified within the Survey Area including one Weed of National Significance (WoNS), *Asparagus aethiopicus* (Asparagus Fern) which is also a listed State Priority Weed under the *Biosecurity Act 2015* and *Greater Sydney Regional Strategic Management Plan 2023-2027*.

This weed species must be managed in accordance with the requirements of the *Greater Sydney Regional Strategic Management Plan 2023-2027* to demonstrate compliance with the General Biosecurity Duty under the *Biosecurity Act 2015*.

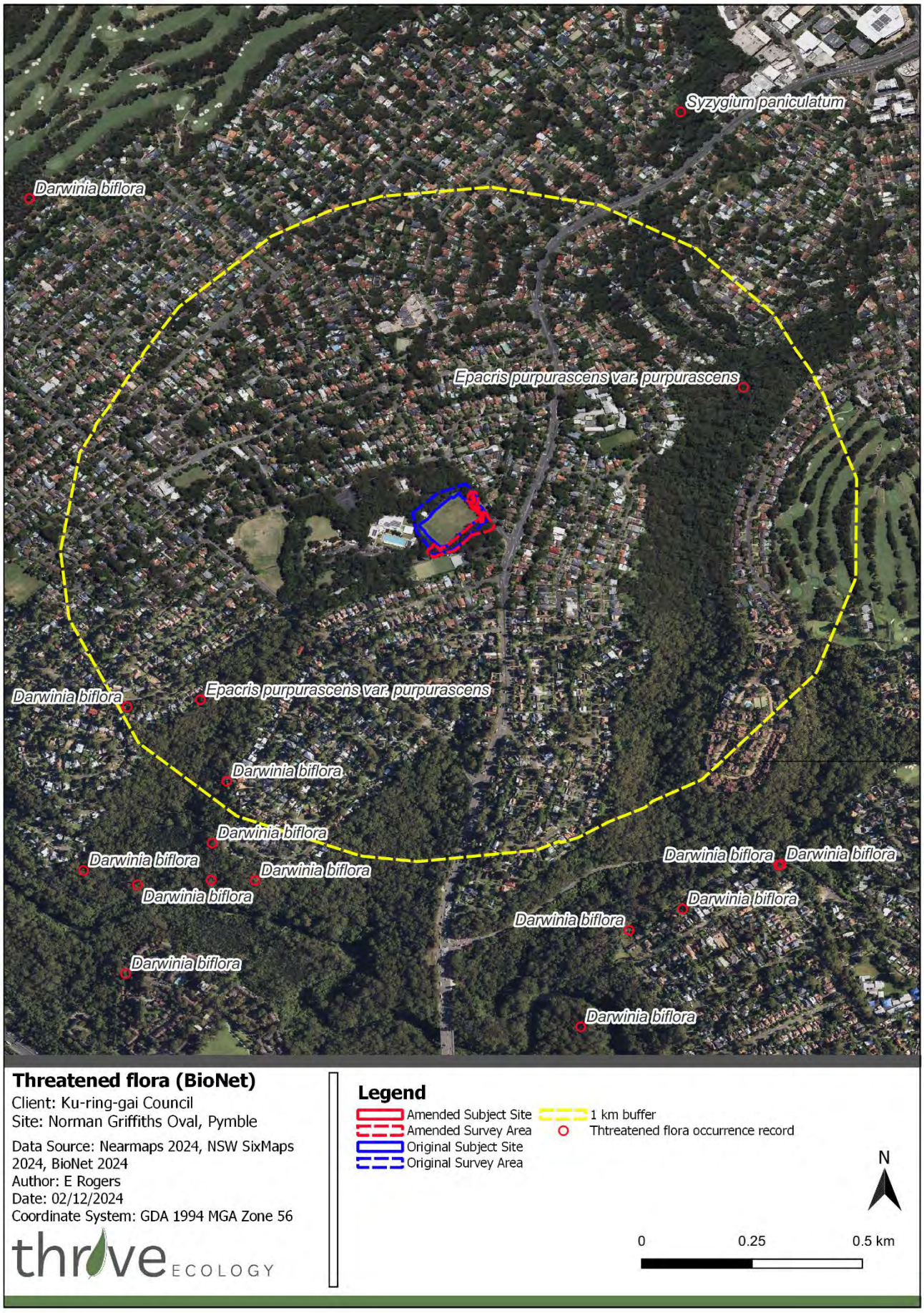

Figure 4-2 Threatened flora records (NSW DCCEEW 2024a)

4.3 Plant Community Types

NSW State Vegetation Type Mapping (DPE 2022) maps the subject site as containing PCT 3262 – Sydney Turpentine Ironbark Forest.

The current and previous field surveys determined the vegetation within the Survey Area best aligns with PCT 3262. It varies in condition from poor to good due to current land use including the existing oval and footpath that transects the patch of vegetation to the south.

The condition of the PCT across the Subject Site is shown in Figure 4-4 and detailed in Table 4-3. The area of good condition contains all three strata of the PCT and has low occurrence of weeds in the ground strata. The area of moderate condition contains all three strata of the PCT and has a moderate occurrence of weeds in the ground strata. The area of poor condition contains the upper strata species only with no understorey and little ground storey species associated with the PCT.

4.3.1 PCT 3262 – Sydney Turpentine Ironbark Forest

Table 4-3 PCT 3262 description and justification.

Vegetation Formation / Class	Wet Sclerophyll Forests (Grassy sub-formation) / Northern Hinterland Wet Sclerophyll Forests
Condition of PCT	Poor (see Figure 4-3) and good (above example)

Description from NSW DCCEEW (2024d)

A tall to very tall sclerophyll open forest with mid-stratum of mixed sclerophyll and mesophyll shrubs and a ground layer of grasses and forbs, found on shale or sheltered shale-sandstone soils mainly in the northern suburbs of Sydney and lower Blue Mountains. The tree canopy very frequently includes *Syncarpia glomulifera* either as a canopy dominant or as a smaller tree or both. Other species which are localised and occasionally dominant or co-dominant occasionally include *Eucalyptus pilularis*, *Angophora costata* and *Eucalyptus punctata*, rarely with one of several species from the ironbark, stringybark or mahogany eucalypt groups of which Eucalyptus paniculata, *Eucalyptus globoidea* and *Eucalyptus resinifera* are the most frequent of each group. The mid-stratum is layered, with a sparse cover of small trees that includes eucalypts, occasionally *Acacia parramattensis* and *Allocasuarina torulosa*, rarely with *Allocasuarina littoralis*. The lower shrub layer very frequently includes *Pittosporum undulatum* and *Leucopogon juniperinus*, commonly with *Breynia oblongifolia*, *Polyscias sambucifolia*, *Ozothamnus diosmifolius* and *Notelaea longifolia*. The ground layer includes a diverse cover of grasses that very frequently includes *Microlaena stipoides* and *Entolasia stricta*, commonly with *Imperata cylindrica*, *Entolasia marginata* and *Themeda triandra*. Small forbs including *Lobelia purpurascens* are also very frequent, together with *Lomandra longifolia*. This PCT occurs as small remnants in mosaics of urban

land use in the shale-dominated landscapes in higher rainfall zones of the Sydney Metropolitan area. The northern suburbs between Baulkham Hills and Ku-ring-gai include the highest number of remnants, however small areas remain in Sutherland, Heathcote, Menai, lower Blue Mountains and Oakdale plateau west of Picton. Only a small number of remnants remain on the Wianamatta Group shales of the eastern Cumberland Plain between Villawood and Bankstown.	
Justification for Assignment	**Characteristic Flora Species** The vegetation within the Subject Site contains a number of key characteristic species with a high recorded frequency of occurrence for PCT 3262 as per the Bionet Vegetation Classification. These include *Syncarpia glomulifera*, *Angophora costata*, and *Eucalyptus pilularis* in the canopy, *Breynia oblongifolia*, *Allocasuarina torulosa*, and *Ozothamnus diosmifolius* in the mid-storey, and *Lomandra longifolia*, *Lobelia purpurascens*, and *Imperata cylindrica* in the ground-storey.
	Geology and Landscape Position This PCT is known to occur in shale dominated landscapes or at the interface between shale-sandstone soils. The Subject Site contains both a shale and a sandstone associated soil, conforming to the PCT description. The Subject Site is also within the Sydney Basin Bioregion.
BC Act Status	Does conform to threatened ecological community listed under the BC Act.
EPBC Act Status	Does conform to threatened ecological community listed under the EPBC Act.

Figure 4-3 Example of poor condition PCT 3262 within the Subject Site.

4.3.2 Threatened Ecological Communities

4.3.2.1 BC Act

Plant Community Type 3262 is associated with the BC Act listed Critically Endangered Ecological Community (CEEC); Sydney Turpentine Ironbark Forest in the Sydney Basin Bioregion, known as STIF. The vegetation comprises characteristic species and is found on the appropriate geology and soil type as outlined in the final determination for STIF (NSW Threatened Species Scientific Committee, 2019). This was previously confirmed by TEC (2023).

4.3.2.2 EPBC Act

This PCT is also associated with the EPBC Act listed CEEC; Turpentine-Ironbark Forest of the Sydney Basin Bioregion. The vegetation that conforms to PCT 3262, and is classed as 'moderate' and 'good' condition, within the Subject Site and Survey Area conforms to this EPBC Act listing because it aligns with the 'good condition' condition class outlined in the Approved Conservation Advice (ACA; Threatened Species Scientific Committee, 2005):

- *the vegetation has some characteristic components from all structural layers (tree canopy, small tree/shrub midstorey, and understorey); and*
- *the tree canopy cover is greater than 10%; and*
- *the patch size is greater than one hectare.*

The vegetation within the Subject Site contained components of STIF in all vegetation strata, had a canopy cover greater than 10% and connects with a larger patch of PCT 3262 (greater than 1 ha), therefore it meets the listing requirements under the EPBC Act listing.

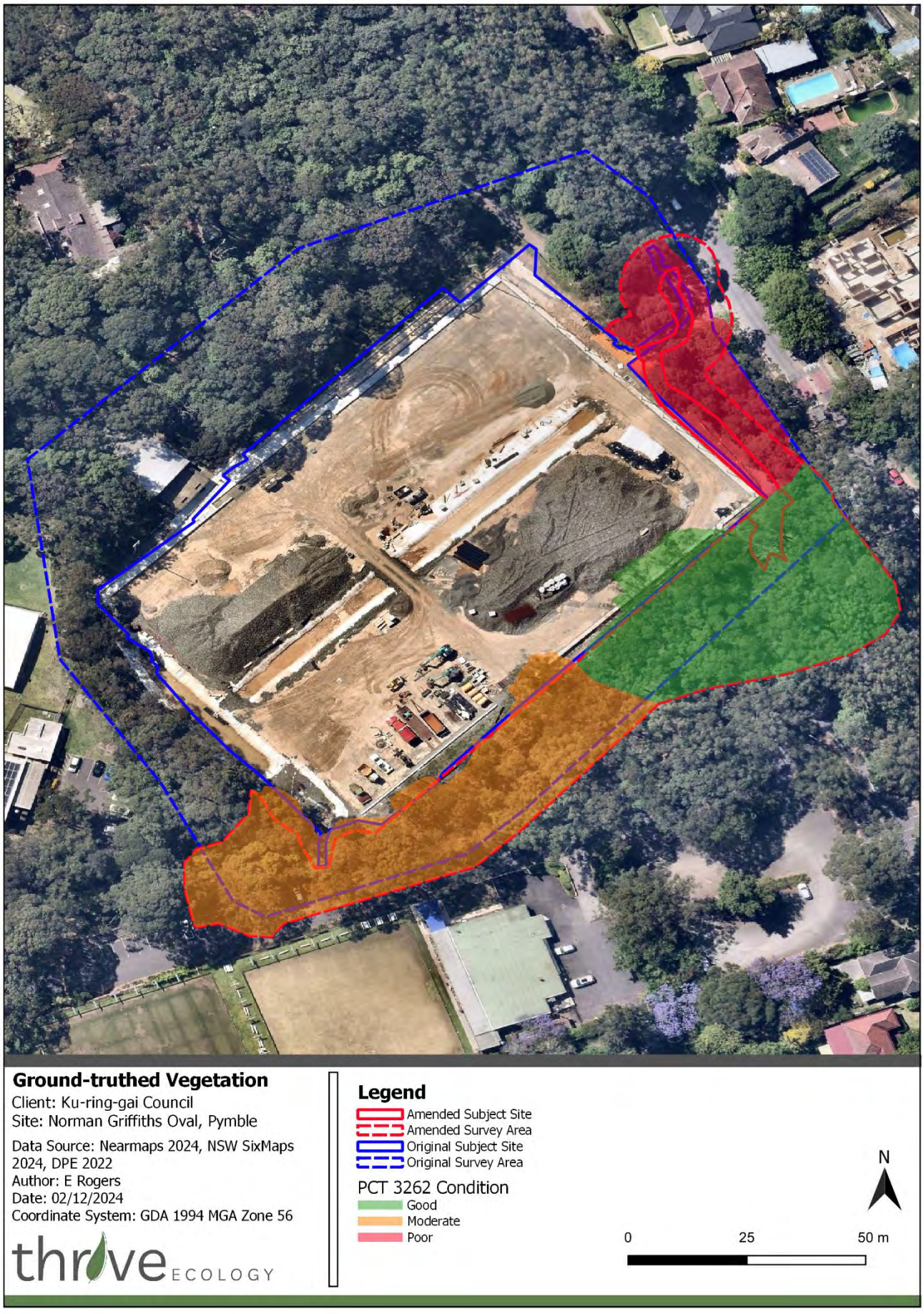

Figure 4-4 Ground-truthed PCT and condition.

4.4 Fauna species and their habitat

No fauna species were recorded during the site visit. However, the vegetation within the Survey Area is likely providing habitat and foraging resources for local fauna.

4.4.1 Threatened fauna species

No threatened fauna were observed within the Subject Site at the time of survey. The NSW BioNet Atlas of NSW Wildlife database and the EPBC PMST identified 77 threatened fauna species within a 10 km radius (see Figure 4-5). Of these, 16 threatened fauna species were determined to have a high likelihood of occurring on the Subject Site (see Appendix F). The potential impacts on these species have been assessed in Table 4-4 to determine if an assessment of significance is required. Species to which impacts on are considered extremely low or negligible have not had assessments of significance conducted.

Table 4-4 Threatened species requiring an assessment of significance and justification. Assessments of significance have been prepared for species in bold.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Assessment of significance required
Callocephalon fimbriatum	Gang-gang Cockatoo	E1,P,3	E	No – as the Proposal will not remove any canopy species the species is unlikely to impacted.
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	V,P,2	V	No – as the Proposal will not remove any *Allocasuarina littoralis* the species is unlikely to impacted.
Chalinolobus dwyeri	Large-eared Pied Bat	E1, P	E	No – as the Proposal will not remove any canopy species the species is unlikely to be impacted.
Glossopsitta pusilla	Little Lorikeet	V,P		No – as the Proposal will only remove 124 m^2 of PCT 3262 and no canopy species will be removed, the species is unlikely to be impacted.
Lathamus discolor	Swift Parrot	E1,P	CE	No – as the Proposal will not remove any canopy species the species is unlikely to be impacted.
Lophoictinia isura	Square-tailed Kite	V,P,3		No – likely to only forage above the canopy. Almost exclusively aerial. Unlikely to be impacted by the proposal.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V,P		No – as the Proposal will not remove any canopy species the species is unlikely to be impacted.
Miniopterus australis	Little Bent-winged Bat	V,P		No – as the Proposal will not remove any canopy species the species is unlikely to be impacted.
Miniopterus orianae oceanensis	Large Bent-winged Bat	V,P		No – as the Proposal will not remove any canopy species the species is unlikely to be impacted.
Myotis macropus	Southern Myotis	V,P		No – as the Proposal will not remove any canopy species the species is unlikely to be impacted.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Assessment of significance required
Ninox strenua	Powerful Owl	V,P,3		No – as the Proposal will not remove any canopy species the species is unlikely to be impacted.
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V	No – as the Proposal will not remove any canopy species the species is unlikely to be impacted.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P		No – as the Proposal will not remove any canopy species the species is unlikely to be impacted.

BC Act Status – V – Vulnerable, E1 Endangered, E4A - Critically Endangered, P – Protected, 2 – Category 2 sensitive species, 3 - Category 3 sensitive species.
EPBC Act Status - CE - Critically Endangered, E – Endangered, V – Vulnerable.

4.4.2 Fauna habitat

The presence and absence of key fauna habitat features is summarised in the Table 4-5.

Table 4-5 Habitat features on site.

Habitat Feature	Presence or absence and further details
Hollows	Small hollows most suitable for small arboreal mammals or microbats present in the canopy.
Decorticating bark and microbat habitat	Some decorticating bark is present on rough-barked Eucalypts such as the *Eucalyptus pilularis* (Blackbutt) species present within the Subject Site.
Rocky outcrops, crevices, caves and overhangs	Absent.
Drainage areas, waterbodies or wet areas suitable for frogs	No waterways of waterbodies exist within the Subject Site.
Feed trees	*Allocasuarina littoralis* present as Glossy Black-Cockatoo feed trees.

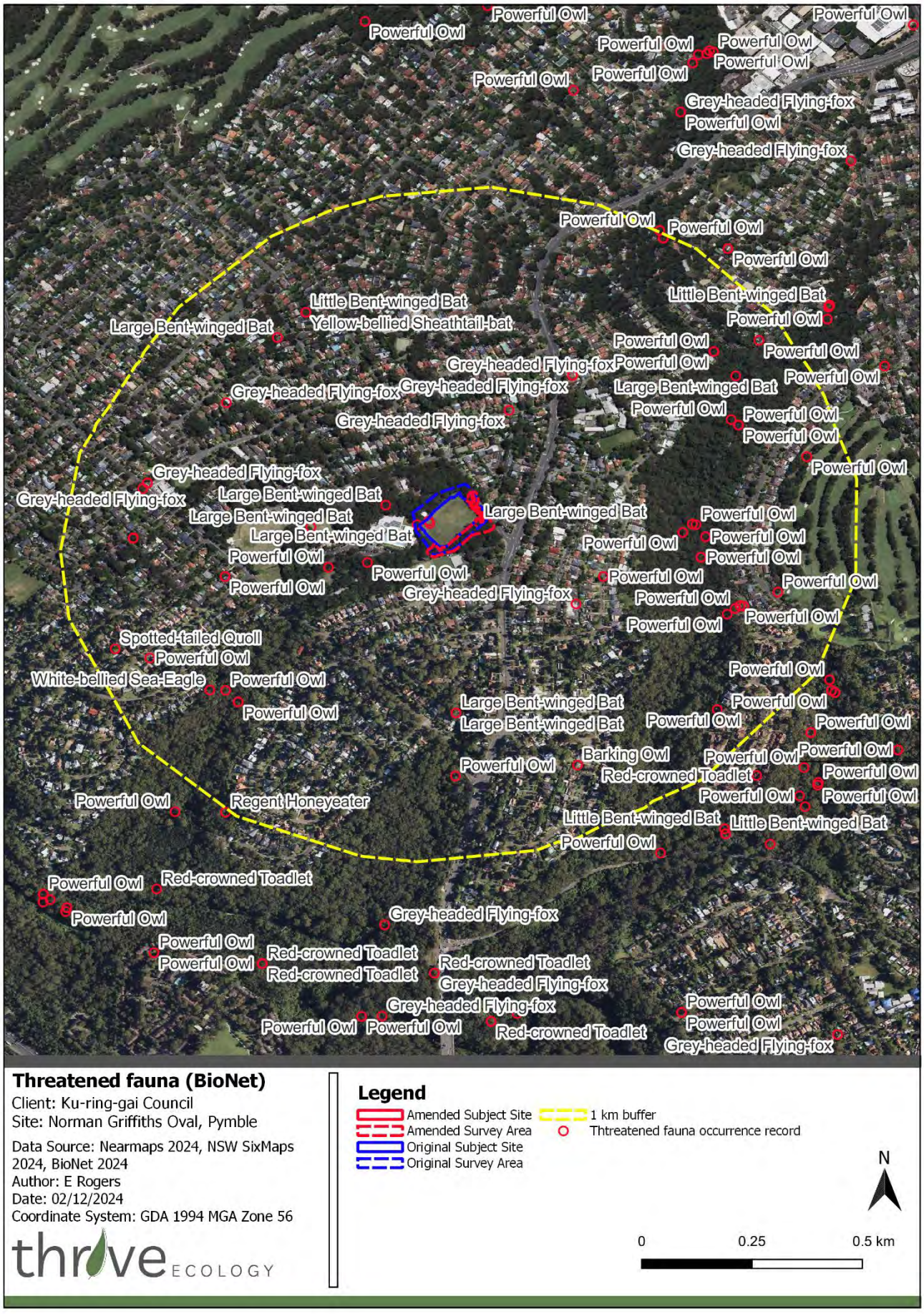

Figure 4-5 Threatened fauna records (NSW DCCEEW 2024a)

5 Impact assessment

5.1 Avoid and minimise impacts

The Proposal has been amended following consideration of recent flood modelling (Orion 2024a, 2024b). The design amendments have been made to minimise potential flood and overland flow impacts to the adjacent Critically Endangered Ecological Community (STIF). The amended footpath has been positioned to reduce the erosive nature of surface stormwater runoff during flooding events (Orion 2024a, 2024b) on the surrounding STIF. Areas where the footpath will be removed will be replanted with suitable species for the PCT.

5.2 Direct Impacts

5.2.1 Vegetation Removal

The Proposal will result in the removal of approximately 124 m^2 of ground-storey and shrub layer vegetation that conforms to PCT 3262. The ground-storey to be removed includes *Cenchrus clandestinus* (Kikuyu), *Lomandra longifolia* (Spiny-head Mat-rush), and *Imperata cylindrica* (Blady Grass). Two *Acacia linifolia* (Flax-leaved Wattle), one *Breynia oblongifolia* (Coffee Bush) and one *Ozothamnus diosmifolius* (Rice Flower) will be removed. No canopy species will be removed.

5.2.2 Threatened ecological communities (TECs)

The Proposal will result in the removal of approximately 124 m^2 of vegetation that conforms to PCT 3262 and the CEEC Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion under the BC Act and Turpentine-Ironbark Forest in the Sydney Basin Bioregion under the EPBC Act.

As outlined above, no canopy species will be removed with the vegetation clearing restricted to mostly exotic grasses, native groundcovers and three native shrub species. The clearing is also restricted to the edge of the CEEC at the ecotone between 'good' and 'poor' patches of PCT 3262.

An Assessment of Significance under the BC Act and a Significant Impact Criteria Assessment under the EPBC Act have determined that the Proposal is unlikely to have a significant impact on the CEEC (see Appendix G and H).

5.2.3 Threatened flora

No threatened flora or fauna species were identified within the Subject Site during the survey. One previous record for *Thelymitra atronitida* (Black-hooded Sun Orchid) identified in the original FFIA and surveyed for directly adjacent to the Subject Site (see TEC 2023) was not identified during the BioNet Species Sightings Search. The Black-hooded Sun Orchid is not typically associated with the plant community type or the soil type present within the Subject Site. It is likely this record has since been found to be invalid and removed from BioNet.

Two threatened flora were deemed likely to occur on the Subject Site based on recorded sightings and habitat suitability (see Appendix D). These are listed in Table 4-2.

Following the site assessment and review of species characteristics (see Appendix E) and survey requirements all species were ruled out of requiring assessments of significance under the EPBC Act 1999 and NSW BC Act 2016. This was based on the current survey being conducted during appropriate survey periods in accordance with the targeted survey requirements of the BAM and/or the ability of the species to be detected during the surveys (Table 4-2).

5.2.4 Threatened fauna

No threatened fauna were observed within the Subject Site at the time of survey. The vegetation proposed to be removed is unlikely to provide habitat for threatened fauna. Seventeen threatened fauna were determined to have a high likelihood of occurring on the Subject Site (see Appendix F). The potential impacts on these species were assessed in Table 4-4 to determine if an assessment of significance was required. All species were ruled out of requiring assessments of significance under the EPBC Act 1999 and NSW BC Act 2016 as they are mostly dependant on the canopy species which are being retained.

5.3 Indirect impacts

5.3.1 Hydrology and overland stormwater flow

The Proposal will result in altered surface hydrology due to proposed design changes to overland stormwater flow. Under a 1% AEP storm event (1 in 100-year event) approximately 3387 m^2 of STIF will be inundated with water at varying depths and velocities for approximately 50 minutes (Orion 2024a). The full extent of the area inundated under a 1% AEP will be inundated for less than 50 minutes. The majority of the STIF may experience a maximum velocity of 0.25-0.5 m s^{-1} with small areas potentially experiencing velocities of up to 1-1.25 m s^{-1}. There is one small patch in the south-west that may experience a velocity of 1.75-2 m s^{-1}.

The soils within the Subject Site are comprised of sandy loams and sandy clay loams. Based on the overland flow velocity modelling under a 1% AEP storm event (Orion 2024a) and the recommended maximum overland flow velocities for sandy loam soils outlined by WA DRIRD (2021) it is unlikely that erosion of soils will occur within the STIF. However, the small area that may experience a velocity of 1.75-2 m s^{-1} is located at an existing stormwater pit. With the predicted velocity of the stormwater in this area there is potentially for some erosion and sediment removal under the 1% AEP storm event modelling (Orion 2024a). Despite this, it is unlikely that the Proposal has significantly increased the risk of this occurring. No erosion or sediment removal was observed in this area during the site visit.

According to flood modelling (Orion 2024b), the probable maximum flow (PMF) events are expected to reach velocities of greater than 2.5m/s in some parts of the STIF and surrounding environment. During a PMF event there is potential for erosion or damage to understorey plants to occur within the STIF. However, as PMF events are an extremely rare event, should one occur, the plant community will likely re-establish itself from any damage given its highly resilient condition.

Under more regular, lower rainfall conditions the overland flows will be most likely be contained to the turfed batter adjacent to the STIF and may encroach on the edge of the understorey of the STIF at times. With the turf batter and existing understorey vegetation of the STIF in this area there is good protection from erosion. The Proposal is unlikely to significantly change the local hydrology under regular rainfall events due to the permeable soils that will be retained within the Survey Area and the natural south-west sloping aspect of the Subject Site that drains into Quarry Creek.

Due to the topography and the existing stormwater pit water is unlikely to be pooling in the overland flow path for long periods of time. As such it is unlikely to negatively impact the vegetation in this area.

An Assessment of Significance under the BC Act and a Significant Impact Criteria Assessment under the EPBC Act have determined that the Proposal is unlikely to have a significant impact on the CEEC (see Appendix G and H).

5.3.2 Erosion and sediment

During construction there is a risk of increased erosion and sediment entering the retained bushland. However, this is unlikely as the vegetation is mostly upslope from the construction footprint. There is also a risk during construction of increased erosion and sediment entering Quarry Creek. During construction risks can be managed using appropriate sediment and erosion controls.

5.3.3 Spread of weeds and pathogens

During construction there is a risk that weeds and pathogens may be introduced to the site or spread throughout the site considering the current weed presence. However, this can be reduced by the implementation of hygiene protocols.

5.3.4 Edge effects

The Subject Site is situated among multiple roads and recreational centres. Therefore, the vegetation is already subject to edge effects. The construction phase of the Proposal may increase the risk of weed recruitment due to soil disturbance, however, it is not expected to significantly increase the existing edge effects in the long term or create significant additional edges to the vegetation.

5.3.5 Connectivity

The vegetation surrounding the Proposal has an intact canopy cover that connects to Quarry Creek and then Lane Cove River in the south-west. The Proposal will remove a very minimal amount of understorey vegetation and all native canopy species will be retained, therefore, the broader connectivity of the vegetation is unlikely to be impacted by the Proposal.

6 Recommendations

The following mitigation measures are to be implemented as part of the planning, preconstruction and construction process. Taking into consideration the results from the desktop research and surveys, site-specific mitigation measures are made to either reduce the impacts of the Proposal on the Subject Site's biodiversity values and/or to ensure potential impacts to the retained vegetation and biodiversity on the Subject Site are minimised. The mitigation measures are provided in Table 6-1. The mitigation measures provided in the FFIA by Total Earth Care still apply.

Table 6-1 Recommended safeguards and mitigation measures.

Safeguards	Responsibility	Timing
Following removal of the existing footpath, the disturbed area within the 'good' condition STIF is to be replanted to include species as listed in Appendix K. These species are to be sourced from local provenance seed, be planted at densities as outlined in Appendix K, and the replanting works are to be conducted by qualified Bush Regenerators.	Construction contractor/Bush Regenerators	Construction
During clearing works or construction works, if any threatened flora or fauna are identified, works will stop immediately and a qualified Ecologist will be contacted.	All personnel on site	Pre-construction and construction
Areas of retained vegetation are to be marked out and flagged/fenced off to prevent trampling. This should be marked out by the construction contractor under the guidance of the ecologist to allow for practical access to the site while retaining areas of vegetation in high condition.	Construction contractor and Ecologist	Pre-construction and construction
Tree protection is to be installed in accordance with the Australian Standard AS 4970-2009 'Protection of Trees on Development Sites' (SA, 2009) for all trees to be retained in close proximity to the works. Arborist supervision is required for all works within the Tree Protection Zone	Construction contractor/ Arborist	Pre-Construction
The natural soil levels around the trees to be retained must not be altered without consultation with a qualified arborist.	Construction contractor	Pre-construction and construction

Safeguards	Responsibility	Timing
If any fauna are identified during works and require rescue, a qualified Ecologist, or fauna rescue volunteer, must be notified. Works will not continue until the animal has been rescued. Call either Wildlife Animal Rescue and Care Society (ARC) on (02) 4325 0666 or WIRES on 1300 094 737.	All personnel on site	Pre-construction and construction
Erosion and sediment control are to be detailed in the existing Construction and Environmental Management Plan (CEMP), including types of control, method of installation, locations, maintenance regime, responsibilities, and stockpile storage. All sedimentation and erosion control measures are to be designed, installed, and maintained using procedures outlined in the *Standards of the Soil Conservation Service of NSW, WR Volume 4* and *Managing Urban Stormwater: Soils and Construction 2004 4th edition* (Landcom, 2004). Controls are to be maintained daily and installed prior to any construction activity.	Construction contractor	Pre-construction and construction
No rubbish, spoil, debris, or vegetation waste is to be dumped in the retained bushland or the road verge. All waste must be stored in ancillary areas and removed from site to a suitably licenced waste facility.	Construction contractor	Pre-construction and construction
Best practice hygiene is to be implemented to prevent the spread of invasive weeds and pathogens in accordance with the "Arrive Clean, Leave Clean" guidelines included in Appendix J. Vehicles and plant will be inspected for mud and soils before entering and leaving site. Stockpiles of materials containing invasive weed plant matter will be covered and bunded to prevent spread.	All personnel on site	Pre-construction and construction
Stockpiling or refuelling is to be undertaken in allocated areas such as existing asphalt and/or hard standing. Stockpiles and refuelling areas will be clearly marked and have appropriate bunding and erosion and sediment controls in place.	Construction contractor/Project Manager	Pre-construction and construction
Heavy machinery, plant or equipment are to be stored in designated areas. These must be on hardstand areas.	Construction contractor	Pre-construction and construction

Safeguards	Responsibility	Timing
Waste and excess spoil is to be managed in accordance with the *NSW EPA Waste Classification Guidelines* (EPA, 2014). Waste (including weed materials) will be disposed of at an appropriately licenced waste facility.	Construction contractor/Project Manager	Pre-construction and construction

7 Conclusion

The Proposal requires the removal of approximately 124 m^2 of the BC Act and EPBC Act listed CEEC Sydney Turpentine Ironbark Forest in the Sydney Basin Bioregion (PCT 3626). No trees will be removed, with the clearing confined within an already disturbed edge portion of the community. The Proposal will also involve the replanting of approximately 40 m^2 within the community following the removal/realignment of an existing footpath.

With consideration of the 1% AEP flood modelling (Orion 2024a) and the PMF flood modelling (Orion 2024b), the Proposal is unlikely to significantly impact the CEEC or any threatened flora or fauna in the Survey Area.

The Proposal is unlikely to have a significant impact on any threatened flora, fauna, or ecological communities based on the limited extent of the proposed impacts and the low frequency of flood events with potential to inundate areas of the STIF. As such, a SIS or BDAR is not required and referral to the Commonwealth Minister is not required. Mitigation measures have been provided to minimise, mitigate and offset impacts of the proposal

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