Flora and Fauna Assessment Report

70 Christopher Road Lochinvar NSW

NCA21R132055

04 November 2021

KLEINFELDER
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Flora and Fauna Assessment Report

70 Christopher Road, Lochinvar, NSW

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

Kleinfelder was engaged by Barker Ryan Stewart Pty Ltd to prepare a Flora and Fauna Assessment Report (FFAR) for the proposed residential development at 70 Christopher Road Lochinvar NSW (part Lot 2 and 3, DP 125730). The site will be hereafter referred to as the Study Area (**Figure 1**). The project will be assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The following terms are used throughout this report to describe geographical areas (**Figure 2**):

- Study Area – Lot boundaries that pertain to the development.
- Development Footprint – areas of the Study Area proposed for development, including access tracks.
- Locality – land within a 5-kilometre (km) radius of the Study Area.

An assessment of the likely impacts on identified threatened species, habitat features, wildlife corridors and vegetation communities resulting from the proposed development is also undertaken.

1.2 SITE DESCRIPTION

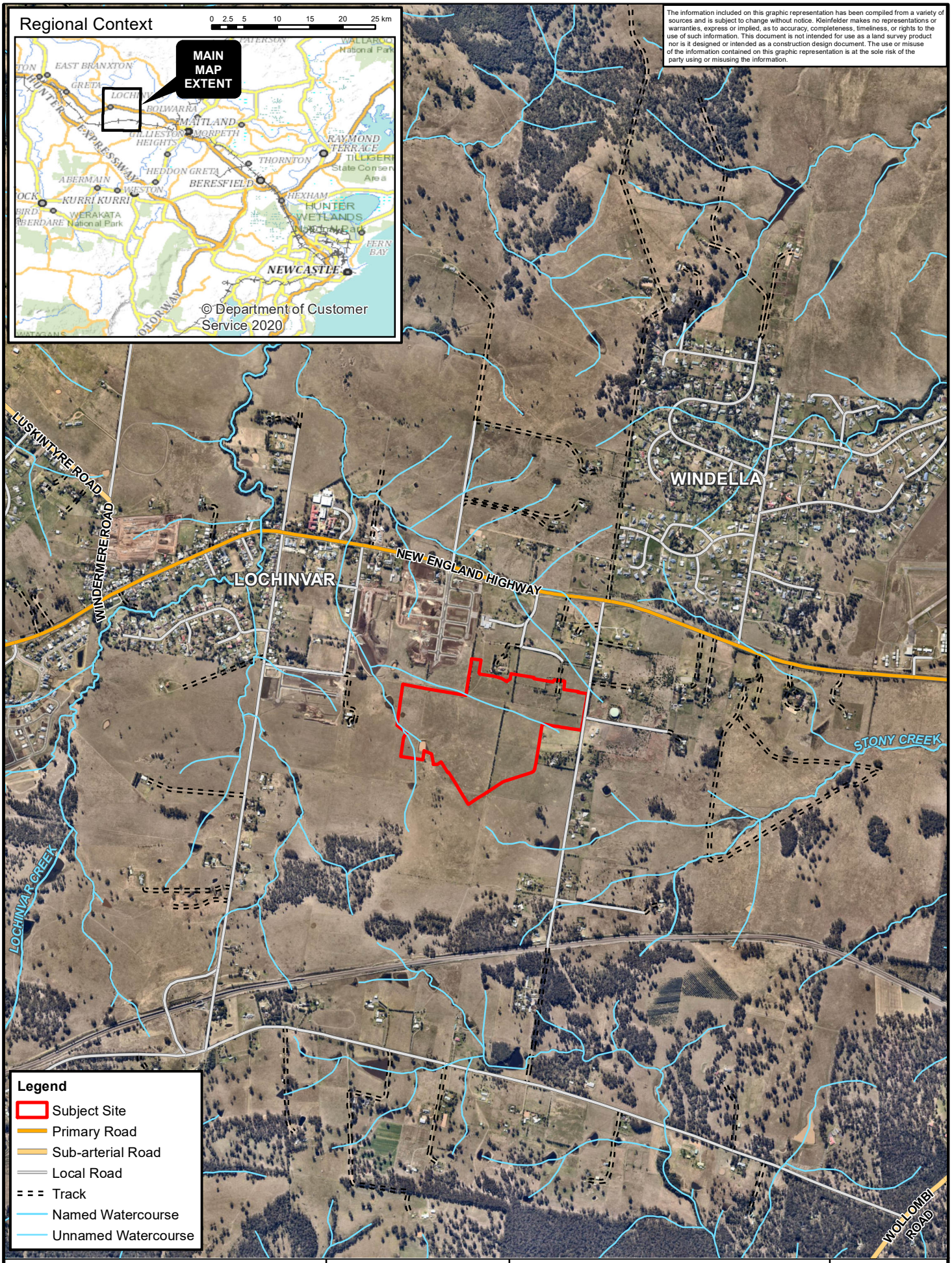
The Study Area is located near the township of Lochinvar, New South Wales, within the Maitland (LGA). The Study Area is zoned as 'General Residential (R1)' land under the *Maitland Local Environmental Plan* (LEP) 2011.

Access to site occurs via the New England Highway from the north or via Winders Land to the east. The site has a relatively flat topography and has been cleared throughout for agricultural purposes. The surrounding land use is also predominantly agricultural.

Site photographs are provided in **Appendix A.**

1.3 PROPOSED DEVELOPMENT

The proposed development will involve the construction of a residential development with associated infrastructure. The proposed development footprint is approximately 38.64 hectares (ha) in size (**Figure 2**)**.**



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NSW DFSI - 2020
NSW OEH - 2020
Nearmap - 2021

Locality

Barker Ryan Stewart
Flora and Fauna Assessment Report
70 Christopher Road, Lochinvar NSW

FIGURE:

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Barker Ryan Stewart - 2021
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Subject Site and Proposed Development

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FIGURE:

2

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1.4 REPORT OBJECTIVES

The objectives of the FFAR are as follows:

- Complete a desktop assessment of relevant threatened biota and regional vegetation mapping.
- Describe flora and fauna (and their habitats) present on or likely to occur on the Study Area.
- Identification of native vegetation, noting the extent and condition of Plant Community Types (PCTs), and the presence, condition and extent of any Threatened Ecological Communities (TECs).
- Assess the relevance and value of the Study Area for threatened species and ecological communities (and their habitats) listed under the NSW *Biodiversity Conservation Act 2016* (BC Act).
- Assess the potential impacts of the proposed development on threatened species and ecological communities, pursuant to Section 7.3 of the BC Act (5-part test).
- Comment on the likely occurrence and relevance of matters of national environmental significance listed under the Commonwealth *Environment Planning and Biodiversity Conservation Act 1999* (EPBC Act).
- Describe steps to avoid and mitigate any identified impacts on flora and fauna and to protect the natural environment of the Study Area.

2 LEGISLATIVE CONTEXT

2.1 COMMONWEALTH LEGISLATION

2.1.1 *Environment Protection & Biodiversity Conservation Act 1999*

The purpose of the EPBC Act is to ensure that actions likely to cause a significant impact on 'matters of national environmental significance' undergo an assessment and approval process. Under the EPBC Act, an action includes a proposal, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. An action that 'has, will have or is likely to have a significant impact on a Matter of National Environmental Significance (MNES) is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Minister for the Environment.

The EPBC Act identifies nine MNES:

- World Heritage properties.
- National heritage places.
- Wetlands of international importance (Ramsar Wetlands).
- Threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mining).
- A water resource, concerning coal seam gas development and large coal mining development.

As part of the current assessment, MNES that are predicted to occur within the locality (applying a 10 km buffer) were obtained from the online Protected Matters Search Tool (DAWE 2021a). These records are discussed in **Section 4**. The EPBC Act has been further addressed in this assessment through:

- Field surveys for EPBC Act listed threatened biota and migratory species.
- Assessment of potential impacts on EPBC Act listed threatened species and migratory biota.
- Identification of suitable impact mitigation and environmental management measures for EPBC Act listed threatened species and migratory biota.

2.2 STATE LEGISLATION

2.2.1 *Environmental Planning and Assessment Act 1979*

The *Environmental Planning and Assessment Act 1979* (EP&A Act) forms the legal policy platform for proposal assessment and approval in NSW and aims to 'encourage the proper management, development and conservation of natural and artificial resources'. All development in NSW is assessed in accordance with the provisions of the EP&A Act and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).

Development activities that require consent are assessed and determined in accordance with Part 4 of the EP&A Act. The determining authority for the project is Maitland City Council (Council).

2.2.2 Biodiversity Conservation Act 2016

The *NSW BC Act*, the NSW *Biodiversity Conservation Regulation 2017* (NSW BC Regulation) and amendments to the NSW *Local Land Services Act 2013* (LLS Act) commenced on 25 August 2017. The legislation aims to deliver "a strategic approach to conservation in NSW whilst supporting improved farm productivity and sustainable development". The *NSW BC Act* repeals several pre-existing Acts, most notably the NSW *Threatened Species Conservation Act 1995*, the NSW *Nature Conservation Trust Act 2001* and the NSW *Native Vegetation Act 2003*.

In accordance with the *NSW BC Act*, entry into the Biodiversity Offsets Scheme (BOS) is not required for the proposed development due to the following:

- The proposed development is not deemed to be 'State Significant' under the NSW EP&A Act.
- The proposed development will not impact an Area of Outstanding Biodiversity Value (AOBV) as listed under Part 3 of the NSW BC Act.
- The proposed development is unlikely to cause a significant impact on a threatened species, population or ecological community, as listed under Schedules 1 and 2 of the NSW BC Act, as determined by the application of a five-part-test of significance under Section 7.3 of the NSW BC Act.
- The proposed development will not impact areas mapped as having 'high biodiversity value' as indicated by the NSW Biodiversity Values Map (BV Map).
- The proposed development does not involve clearing of native vegetation that exceeds the BOS threshold for the site, as determined by the NSW *Biodiversity Conservation Regulation 2017*.

In consideration of the criteria listed above, a Biodiversity Development Assessment Report (BDAR) is not required for the proposed development.

As part of the current assessment, threatened species and ecological communities as listed under the NSW BC Act that have previously been recorded within the locality (applying a 5 km radius buffer) were obtained from the online BioNet Atlas of NSW Wildlife (DPIE, 2021a). These records are discussed in **Section 4** of this report. The NSW BC Act has been further addressed in this assessment through:

- Field surveys to assess the presence of threatened species, populations and ecological communities, as listed under Schedules 1 and 2 of the *NSW BC Act*.
- Assessment of potential impacts threatened species, populations and ecological communities as determined by the application of a five-part-test of significance under Section 7.3 of the *NSW BC Act.*
- Identification of suitable impact mitigation and environmental management measures.

2.2.3 Biosecurity Act 2015

The *NSW Biosecurity Act 2015* provides a streamlined statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds. The primary objective of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by

biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Weed species recorded within the Study Area during the current investigation are discussed in **Section 4.**

2.2.4 National Parks and Wildlife Act 1974

The NSW *National Parks and Wildlife Act 1979* (NPWS Act) aims to conserve nature, objects, places or features (including biological diversity) of cultural value within the landscape. The Act also aims to foster public appreciation, understanding and enjoyment of nature and cultural heritage. It provides for the preservation and management of national parks, historic sites and certain other areas identified under the Act.

No areas of National Park estate occur within or adjacent to the Study Area.

2.2.5 Water Management Act 2000

Controlled activities carried out in, on or under waterfront land are regulated by the NSW *Water Management Act 2000* (WM Act). The NSW Natural Resource Asset Regulator (NRAR) (previously known as the Office of Water) administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to 'waterfront land' as a consequence of carrying out the controlled activity. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 m of the highest bank of the river, lake or estuary (NRAR, 2018).

Two first order streams flow in a north-west direction through the Study Area (**Figure 1**). The site inspection revealed that these streams do not have well defined banks or associated riparian vegetation. Consultation with the NRAR is recommended to determine if a controlled activity approval is required for the proposed development.

An assessment of the indirect impacts of the proposed development on aquatic habitat and downstream aquatic habitats is provided in **Section 5.1.5.**

2.2.6 State Environmental Planning Policy (Koala Habitat Protection) 2021

State Environmental Planning Policy (Koala Habitat Protection) 2021 aims to encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas to support a permanent free-living population over their present range and reverse the current trend of Koala population decline.

The *Koala Habitat Protection SEPP 2021* applies to Part 4 developments within select local government areas (Schedule 1) where no approved Koala Plan of Management (KPoM) applies to the land. A KPoM has not been developed for the Maitland LGA. The Maitland LGA is listed in Schedule 1 of the Koala Protection SEPP 2021, therefore, the SEPP applies to the proposed development.

3 MATERIALS AND METHODS

3.1 DESKTOP ASSESSMENT

Existing information on flora and fauna within the Study Area and the locality, including relevant threatened biota, was obtained from:

- The BioNet Atlas of NSW Wildlife (DPIE, 2021a) for previous records of threatened species, populations and ecological communities (as listed under the BC Act) within a 5 km radius of the Study Area (data retrieved 21/10/2021).
- The Department of the Environment and Energy (DAWE 2021a) Protected Matters Search Tool, which involved a search for matters of national environmental significance within a 10 km radius of the Study Area (conducted on 21/10/2021).
- Relevant published literature on threatened biota (see References).

The results of the database searches were used to compile a list of threatened species, populations and communities, as listed under the BC Act and EPBC Act that could potentially occur on the Study Area and their likelihood of occurrence (**Appendix B**).

3.2 FIELD SURVEY

3.2.1 Vegetation Assessment

A diurnal inspection of the Study Area and surrounds was undertaken on 18 October 2021 to provide specific observations for this report. Native vegetation types were identified based on dominant flora species present within each structural layer (i.e., shrub and ground layers). Exotic or highly modified native vegetation was defined based on structure and species composition. Boundaries of vegetation types and communities were marked with a handheld GPS and mapped using geographical information system (GIS) software.

Vegetation types were assessed against identification criteria for State, and Commonwealth listed threatened ecological communities (DAWE 2021b; DPIE 2021d). Vegetation and habitats were compared with the BioNet Vegetation Classification descriptions to identify Plant Community Types (PCTs).

Plant identification and nomenclature were based on species descriptions presented within The Flora of New South Wales Volumes 1 to 4 (Harden, 1993) and with reference to taxonomic updates in PlantNET - The Plant Information Network System of Botanic Gardens Trust, Sydney, Australia (Botanic Gardens Trust, 2021). Survey tracks are presented in **Figure 3.**

3.2.2 Fauna Habitat Assessment

The locations of any important habitat features, such as microbat roosting habitat, hollow-bearing trees, terrestrial refugia, water bodies and nests/burrows, were captured with a handheld Trimble GPS and photographed where appropriate.

Searches for potential habitat for threatened fauna species included but were not limited to:

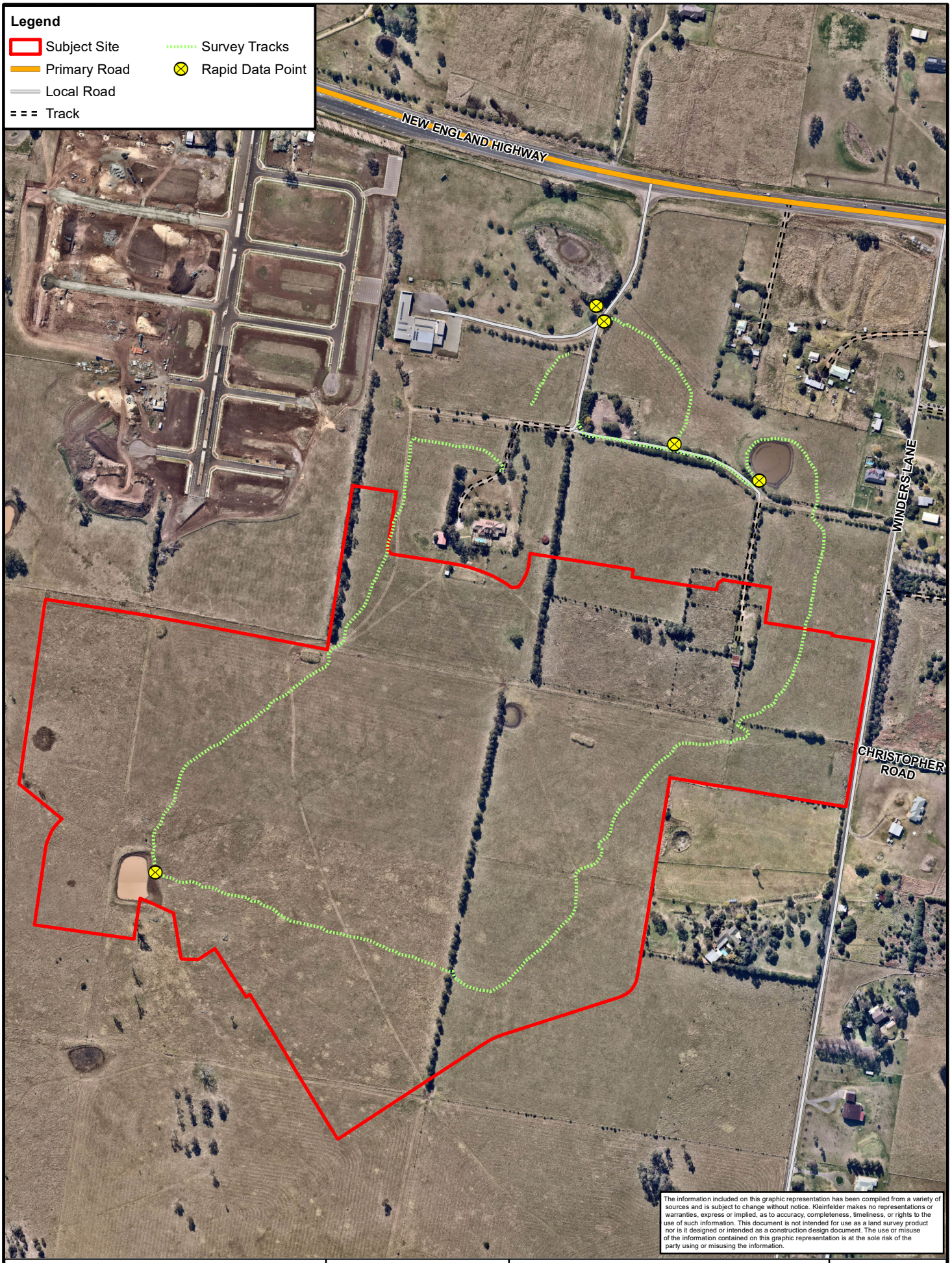
- Foraging trees for threatened birds.
- Hollow-bearing trees.
- Potential roosts for microbats.
- Vegetated ponds, riparian vegetation and drainage lines for frogs and waterbirds.
- Woody debris, leaf litter and bush rock.

Diurnal opportunistic and incidental observations of fauna species were recorded during field surveys. These included opportunistic observations of fauna activity such as scats, tracks, burrows or other traces.

3.2.3 Survey Limitations

The survey techniques and survey effort applied for this study were commensurate with the nature and condition of the site. Due to these limitations, priority was given to habitat assessment for relevant threatened biota. A 'likelihood of occurrence' assessment was applied to all species previously recorded or predicted to occur within the locality based on State and Commonwealth information sources.

A low diversity of native and exotic flora species was recorded. Given the lack of habitat features within the Study Area, an extended survey duration or multiple seasonal surveys may have resulted in the detection of a greater diversity of species. However, it is unlikely that threatened biota would be detected.



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Nearmap - 2021

Survey Effort

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FIGURE:

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4 RESULTS

4.1 PLANT DIVERSITY

The Study Area was found to contain a low diversity of flora species. A total of 50 plant species were identified. Of these, 35 were exotic, and 15 were native. Flora species within the Study Area were comprised of the following growth forms

- One (1) Fern Species
- Twenty-seven (27) Forb Species
- Ten (10) Grass Species
- Two (2) Sedge Species
- Four (4) Shrub Species
- Six (6) Grass Species

A complete list of flora species is presented in **Appendix C.**

4.2 WEEDS

A total of 35 exotic plant species were identified within the Study Area. Three (3) Priority Weed species listed for the Hunter Region were identified (DPI, 2021). These include the following species:

- *Eragrostis curvula* (African Lovegrass)
- *Olea europaea var. cuspidata* (African Olive)
- *Senecio madagascariensis* (Fireweed) – (also a Weed of National Significance – WoNS)

Mitigation measures to prevent the spread of weeds are presented in **Section 5.2.2**.

4.3 PLANT COMMUNITY TYPES

According to the NSW BioNet Vegetation Classification (DPIE 2021), no vegetation within the Study Area is commensurate with a native Plant Community Type (PCT). The vegetation within the site is comprised of Exotic Grassland and Planted Native/Exotic vegetation along windrows. Floristic descriptions of each of these vegetation types is provided below.

4.3.1 Exotic Grassland

The Exotic Grassland was found to be dominated by exotic grass species, including *Cynodon dactylon* (Couch), *Cenchrus clandestinum* (Kikuyu), *Briza subaristata, Phalaris aquaticus, Stenotaphrum secundatum* (Buffalo Grass), *Bromus catharticus* (Prairie Grass) and *Eragrostis curvula* (African Lovegrass). The dominant exotic forbs included, *Conyza bonariensis* (Flax-leaf Fleabane), *Plantago lanceolata* (Lamb's Tongues), *Trifolium dubium* (Yellow-suckling Clover) and others. The coverage of native forbs and grasses was limited to absent throughout the site. Occasional occurrences of *Wahlenbergia gracilis* (Sprawling Bluebell), *Crassula sieberiana* (Australian Stonecrop) and other native forbs was observed few areas such as adjacent to fence lines and windrows. A representative photograph of the vegetation is shown in **Plate 1**

Plate 1 Exotic Grassland

4.3.2 Planted Native/ Exotic Vegetation (Windrows)

The Planted Native/ Exotic Vegetation along windrows was mainly dominated by exotic shrubs such as *Olea europaea* subsp. *cuspidata* (African Olive). Some individuals observed may also represent a cultivated variety of *Olea* sp. Other canopy trees that were observed included *Eucalyptus globulus* (Blue Gum), *Eucalyptus scoparia* (Wallangarra White Gum) and *Casuarina cristata* (Belah). Note that three of these species are native species, but are not native to the Hunter region. Occasional occurrences of *Eucalyptus tereticornis* (Forest Red Gum) and *Casuarina glauca* (Swamp Oak) were observed. These trees were young and represent natural regrowth. Only individual trees were observed, and these areas are considered to be too fragmented to represent native vegetation.

The groundcover beneath the windrows was sparse and generally dominated by exotic grass species, including *Cynodon dactylon* (Couch), *Cenchrus clandestinum* (Kikuyu), *Briza subaristata,* and *Eragrostis curvula* (African Lovegrass).

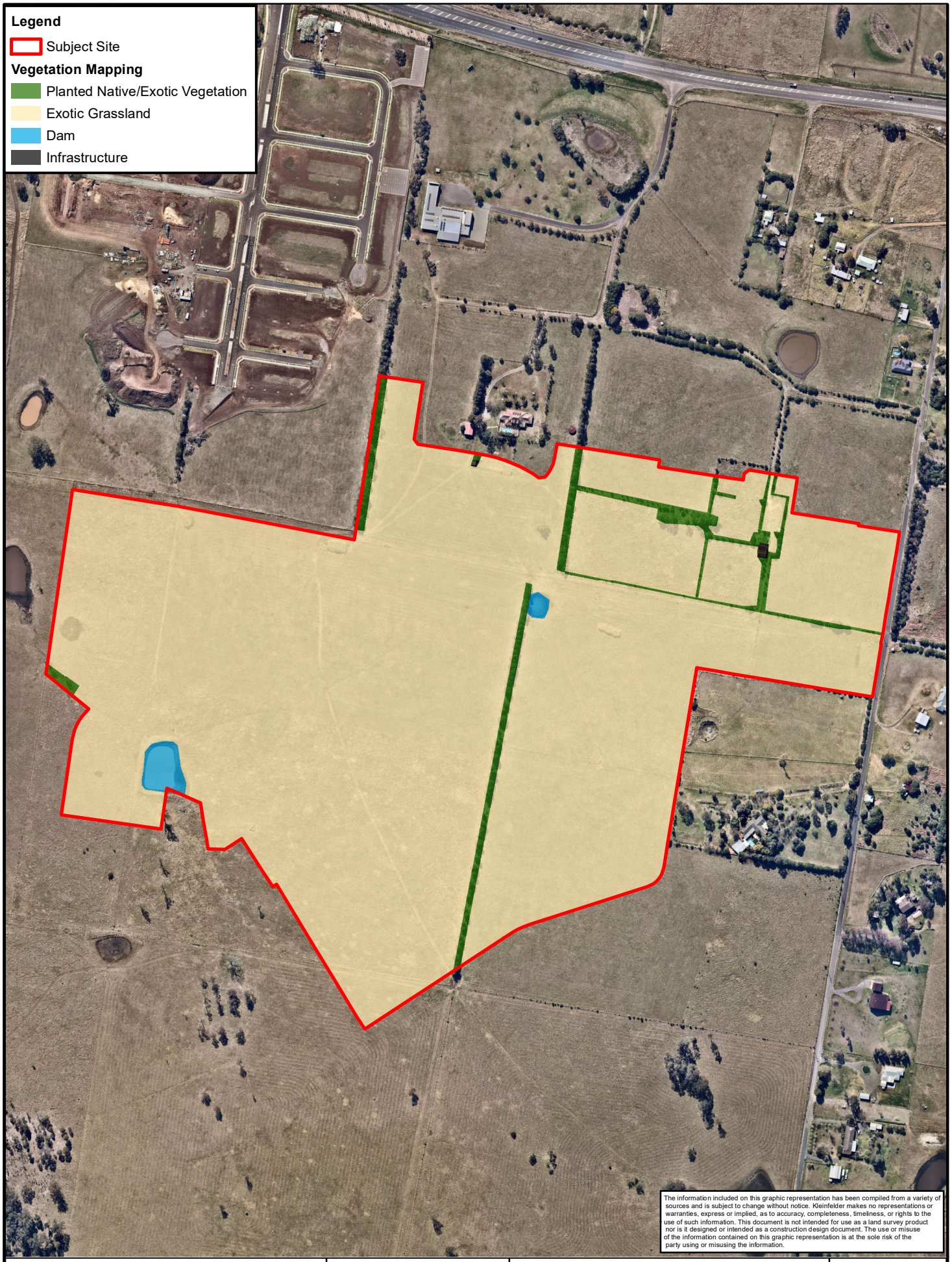
A representative photograph of the vegetation is shown in **Plate 2**.

Plate 2 Planted Native/Exotic vegetation (windrows)

4.3.3 Vegetation Extent

Approximately 37.06 hectares of Exotic Grassland vegetation occurs within the development footprint. Approximately 1.27 hectares of Planted Native/Exotic vegetation occurs within the development footprint.

The extent of each vegetation type is illustrated in **Figure 4**.



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Nearmap - 2021

Vegetation and Habitat

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FIGURE:

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4.4 Fauna Habitat

Fauna habitat is limited within the development footprint due to a general lack of key habitat features. The site is likely to represent marginal foraging habitat for fauna species that commonly occur in agricultural landscapes such as woodland birds and macropods. Two constructed dams occur; however, these lack emergent vegetation and are generally unsuitable as breeding habitat for fauna species.

One hollow-bearing tree was identified during the assessment; however, this tree was located outside the development footprint and will not be impacted.

4.5 Threatened Species

4.5.1 Threatened Flora

One threatened species was identified during the assessment. One individual tree identified as *Eucalyptus glaucina* (Slaty Red Gum) was identified outside the development footprint and will not be impacted. No other threatened flora species were identified within the Study Area during the assessment.

A search of the BioNet Atlas of NSW Wildlife (DPIE, 2021a) returned several threatened fauna species within a 5 km radius of the Study Area. A "likelihood of occurrence' assessment determined that the Study Area does not constitute suitable habitat for threatened flora species, due to a lack of suitable habitat (**Appendix B**).

4.5.2 Threatened Fauna

No threatened fauna species were identified within the Study Area during the assessment.

A search of the BioNet Atlas of NSW Wildlife (DPIE, 2021a) returned several records of threatened fauna species within a 5 km radius of the Study Area. A "likelihood of occurrence' assessment determined that the Study Area is unlikely to constitute suitable habitat for these species due to a lack of suitable habitat (**Appendix B**).

4.6 Threatened Ecological Communities

The vegetation within the Study Area does not represent any TECs listed under either the NSW BC Act or the Commonwealth EPBC Act.

4.7 EPBC Protected Matters

No EPBC listed species were identified within the Study Area during the on-site flora and fauna surveys.

A 'likelihood of occurrence' assessment was conducted for all threatened species and migratory species returned by the EPBC Protected Matters Search (**Appendix B**). The current conditions present within the Study Area were considered unsuitable for all species.

5 DISCUSSION

5.1 IMPACT ASSESSMENT

5.1.1 Impacts to Native Vegetation

The proposed development will not impact any areas of vegetation that are commensurate with a native PCT. Impacts will be limited to the removal of 37.06 ha of Exotic Grassland and 1.27 ha of Planted Native/Exotic vegetation. Mitigation measures relevant to the protection of native vegetation outside the development footprint are presented in **Section 5.2.2**.

5.1.2 Impacts to Fauna

Direct impacts of the proposed development on fauna habitat include the following:

- The disturbance of soil and removal of understorey vegetation during construction potentially displacing ground-dwelling fauna such as amphibians and reptiles.
- The removal of trees within the Study Area that have the potential to provide foraging/nesting habitat for a number of native bird species.

Potential indirect impacts of the proposed development on resident fauna populations include the following:

- Noise and lighting during the construction phase may cause minor disturbance to resident fauna within the locality and disrupt their natural behaviour
- Pollution such as chemical spills from construction machinery may have adverse effects on biota in the adjacent mapped waterway and downstream aquatic environments.
- Ground disturbance by machinery during the construction phase may create dust and facilitate the movement of sediment.

Management measures are presented in **Section 5.2.2** to reduce the potential for these impacts.

5.1.3 Impacts to Threatened Species (AoS)

No threatened species were identified within the Study Area during the assessment. The vegetation within the Study Area is in a low to moderate condition state and is generally unsuitable for sustaining populations of threatened species that are known to occur within the locality.

Assessments of Significance (AoS), pursuant to Section 7.3 of the BC Act were not considered appropriate for individual species; however, the criteria are presented in **Table 1** to provide further justification that impacts of the project are unlikely to cause a “Significant Impact” on any threatened species, populations or endangered ecological communities.

Table 1 Assessment of Significance, pursuant to Section 7.3 of the BC Act.

Factor	Species
(a) in the case of a **threatened species**, whether the proposed development or activity 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 proposed development will not require the removal of any areas of good or moderate quality bushland or key habitat features for threatened species such as hollow-bearing trees. Impacts are highly unlikely to significantly impact the lifecycle of threatened species such that a local population is likely to be put at risk of extinction.
(b) in the case of an **endangered ecological community or critically endangered ecological community**, whether the proposed development or activity: (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	No endangered ecological communities were detected within the Study Area
(c) 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 proposed development or activity, 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 development or activity, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The habitat to be impacted is highly fragmented due to historical agricultural development. Further fragmentation will therefore be negligible. Marginal foraging habitat to be impacted by the project is likely to be used as part of a broader network of habitats by mobile threatened species in the locality. This type of habitat is unlikely to be important to the long-term survival of threatened species.
(d) whether the proposed development or activity is likely to have an adverse effect any declared **area of outstanding biodiversity value** (either directly or indirectly).	No Area of Biodiversity Value occur within the Study Area.
(e) whether the proposed development or activity is or is part of a **key threatening process** or is likely to increase the impact of, a key threatening process.	The proposed development has only minor potential to facilitate the following Key Threatening Processes (KTP): o Invasion, establishment and spread of Lantana (Lantana camara L. sens.lat). o Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.

5.1.4 Impacts to Threatened Ecological Communities

No TECs were identified within the Study Area.

5.1.5 Impacts to Aquatic Habitat

Artificial waterbodies (dams) lack riparian vegetation are unlikely to provide habitat for any threatened species. The mapped waterways within the Study Area are historical and lack a defined channel or associated riparian vegetation. However, the waterways are tributaries of larger river systems to the north, therefore, potential indirect impacts to downstream environments include the following:

- The excavation of soil within the Study Area during the construction phase has the potential to facilitate erosion and sediment movement. Run-off from the Study Area has the potential to introduce nutrients and other contaminants to downstream aquatic habitats.
- The introduction of chemicals such as fuels for vehicles and machinery during the construction phase has the potential to cause pollution to downstream aquatic habitat.
- The potential spread of exotic plant species to the edge of the drainage line from disturbed soil in the Study Area.

Recommendations to reduce the potential for adverse environmental impacts to aquatic habitat are presented in **Section 5.2.2**. Consultation with the NRAR is recommended to determine if a controlled activity approval is required for the project.

5.1.6 Commonwealth Matters

The Study Area does not contain biodiversity values relevant to Commonwealth matters. Potential impacts of the development in accordance with the EPBC Act Significant Impact Guidelines (DOE, 2013) are not considered appropriate and referral to the Commonwealth Minister for the Environment is not recommended.

5.1.7 Cumulative Impacts

Cumulative impacts arise from the interaction of individual elements associated with the proposed development and the additive effects of other external projects. No other known projects within the locality are known to have relevance to this project that could exacerbate cumulative impacts.

5.1.8 Koala Habitat Protection State Environmental Planning Policy (SEPP 2021)

The Study Area is located within Maitland LGA (Central Coast Koala Management Area), which is listed under Schedule 1 of the Koala Habitat Protection SEPP 2021, and therefore the SEPP applies. Vegetation was assessed against the criteria for 'Core Koala Habitat' in accordance with the SEPP, defined as the following:

- an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or
- an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.

As such, the presence of 'highly suitable koala habitat' and records of koala habitation within the 'area of land' associated with the proposed development is detailed below.

Presence of Highly Suitable Koala Habitat

Two (2) Koala use tree species listed under Schedule 2 of the Koala SEPP were identified within the Study Area including *Casuarina glauca* (Swamp Oak) and *Eucalyptus tereticornis* (Forest Red Gum). These two species did not constitute over 15% of the total number of trees within the Study Area (land in which the policy applies). As such, the vegetation within the Study Area does not constitute “highly suitable habitat” under the SEPP.

Records of Koala Habitation

No Koalas, or evidence thereof, have been detected throughout the Study Area during the diurnal field survey. No historical records of the Koala (<18 years old) occur within 2.5 km of the external boundary of the ‘site area’ (as specified in the SEPP).

As such, the vegetation within the Study Area does not constitute ‘Core Koala Habitat’ under the Koala SEPP 2021, therefore a Koala Assessment Report is not required for the proposed development.

5.2 IMPACT AMELIORATION

5.2.1 Avoidance Measures

Impacts on biodiversity values have been addressed through an iterative design process to avoid areas of higher biodiversity value within the Study Area. The development has also been positioned to avoid impacting areas of native bushland, threatened species and key habitat features. The mitigation measures detailed below aim to further reduce impacts biodiversity values.

5.2.2 Mitigation Measures

5.2.2.1 Vegetation Protection

The development footprint should be clearly demarcated to prevent incidental clearing of adjacent areas of native vegetation.

5.2.2.2 Vegetation Clearing (Tree Removal)

The following recommendations are to be implemented during vegetation clearing:

- No clearing should occur within the Study Area in the early evening/evening.
- Clearing should be carried out in a manner that allows fauna species residing within areas of dense vegetation to relocate without human intervention.
- Vegetation and soil removed from the Study Area during the construction phase is likely to contain a partially exotic seed bank. Topsoil removed during this period should be stored and disposed of appropriately.

5.2.2.3 Erosion Control

Mitigation measures to reduce soil erosion and pollutant run-off during construction activities should include:

- Installation of erosion and sediment control structures prior to any construction works and in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004).
- Regular inspection of erosion and sediment control measures, particularly following rainfall events, to ensure their ongoing functionality.
- The prompt removal of any excavated material offsite.
- Undertake maintenance of silt fences and other mitigation measures to isolate run-off, particularly on the western boundary of the Study Area.

5.2.2.4 Dust Control

Specific measures to minimise the generation of dust and associated impacts on adjacent natural environments should include:

- Setting maximum speed limits for all traffic within the Study Area to limit dust generation.
- Use of a water tanker to spray unpaved access tracks during the construction phase where required.
- Application of dust suppressants or covers on soil stockpiles.

5.2.2.5 Chemical Spills

Specific measures to minimise the potential for chemical spills and associated impacts on adjacent natural environments should include the following:

- All chemicals must be kept in clearly marked bunded areas.
- Regularly inspect vehicles and mechanical plant for leakage of fuel or oil.
- No re-fuelling, washing or maintenance of vehicles and plant to be undertaken within 20 m of natural drainage lines.

5.2.2.6 Management of Weeds

Weed management should be implemented within the Study Area during and after construction to minimise weed incursions into surrounding intact native vegetation. This should include:

- Prioritising the control of Weeds of National Significance such as *Senecio madagascariensis* (Fireweed), which was detected within the Study Area.
- Carrying out weed removal within the Study Area prior to the construction phase of the development. This will reduce the capacity of exotic plant species to spread into the locality. Organic matter and soil removed during this process should be disposed of appropriately.
- All vehicles and machinery should be cleaned before entering and leaving the Study Area. This is to prevent the introduction of new exotic species, as well as the spread of existing species.

A list of control methods for exotic species listed in NSW can be found on the NSW WeedWise website (DPI, 2021).

6 CONCLUSION

The proposed development will not require the clearing of any areas of good or moderate condition native vegetation that is commensurate with a PCT. Due to a lack of key habitat features, the project is unlikely to cause a significant impact to any threatened species, populations, or ecological communities listed under the NSW BC Act.

No EPBC listed species, ecological communities, migratory species or important habitat for such entities were identified within the Study Area. Impacts to Commonwealth matters are likely to be negligible. An EPBC referral to the Commonwealth Minister for the Environment is not recommended.

Historical mapped waterways occur within the Study Area. Consultation with the NRAR is recommended to determine if a controlled activity approval is required for the project.

Avoidance and mitigation measures have been presented to reduce potential impacts to biodiversity values within the Study Area and the environment.

7 REFERENCES

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APPENDIX A – SITE PHOTOGRAPHS

Plate 3 **Constructed dam (near southern boundary). This dam lacks emergent vegetation or suitable breeding habitat for threatened fauna species.**

Plate 4 ***Casuarina cristata*** **in windrows. This species is not native to the locality. No vegetation in these areas was found to contain hollows.**

Plate 5 **Hollow associated with *Eucalyptus glaucina* (Slatey Red Gum). The individual tree occurs outside the development footprint and will not be impacted by the project.**

Plate 6 **Exotic Grassland and adjacent planted Native/Exotic vegetation within the Study Area.**

APPENDIX B – THREATENED SPECIES' LIKELIHOOD OF OCCURRENCE'

THREATENED SPECIES' LIKELIHOOD OF OCCURRENCE'

A list of threatened species, populations and ecological communities that have been reported or modelled to occur from within a five-kilometre radius of the Study Area was obtained from the following databases:

- NSW Department of Primary Industries (DPIE) BioNet Atlas: (http://www.bionet.nsw.gov.au/); and
- Department of Environment and Energy (DoTEE) Protected Matters search tool: (www.environment.gov.au/erin/ert/epbc/index.html).

An assessment was then made of the likelihood of the threatened species, populations, and ecological communities reported or modelled to occur in the locality occurring within the Study Area or using the habitat within the Study Area as an essential part of a foraging range.

The table below summarises the likelihood of threatened species and EPBC Act listed migratory species occurring within the Study Area based on the habitat requirements of each species. A brief definition of the likelihood of occurrence criteria is provided below:

- Known – species identified within the site during surveys;
- High – species known from the area (OEH Wildlife Atlas records), suitable habitat (such as roosting and foraging habitat) present within the site;
- Moderate – species may be known from the area, potential habitat is present within the site;
- Low – species not known from the area and/or marginal habitat is present within the site; and
- Nil – habitat requirements not met for this species within the site

Note: Wetland and aquatic species identified within the database search have been omitted from this table due to unsuitable habitat conditions within the Study Area.

Table B2 – Likelihood of occurrence assessment

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
Flora								
1.	***Acacia bynoeana*** Bynoe's Wattle	E	V	1	BioNet, PMST	Bynoe's wattle is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches.	Nil	No suitable habitat within the Study Area. Only one record within the locality.
2.	***Callistemon linearifolius*** Netted Bottle Brush	V	-	1	BioNet	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Grows in dry sclerophyll forest on the coast and adjacent ranges.	Nil	No suitable habitat within the Study Area. Only one record within the locality.
3.	***Caladenia tessellata*** Thick-lipped Spider-orchid	E	V	-	PMST	The Thick Lip Spider Orchid is known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil.	Nil	No suitable habitat within the Study Area. No records within the locality.
4.	***Cryptostylis hunteriana*** Leafless Tongue Orchid	V	V	P	PMST	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); appears to prefer open areas in the understorey of this community.	Nil	No suitable habitat within the Study Area. No records within the locality.

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
5.	***Cymbidium canaliculatum*** (Tiger Orchid) population in the Hunter Catchment	EP	-	1	BioNet	This large epiphytic orchid has a scattered distribution across northern and eastern Australia, extending from Hunter River in NSW to Cape York and across northern NT and Queensland to the Kimberley region in WA. It typically grows in the hollows, fissures, trunks and forks of trees in dry sclerophyll forest or woodland, where its host trees typically occur on Permian Sediments of the Hunter Valley floor.	Nil	No suitable habitat within the Study Area. No records within the locality.
6.	***Cynanchum elegans*** White-flowered Wax Plant	E	E	P	PMST	Occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree *Leptospermum laevigatum* – Coastal Banksia *Banksia integrifolia* subsp*. integrifolia* coastal scrub; Spotted Gum *Corymbia maculata* aligned open forest and woodland; and Bracelet Honeymyrtle *Melaleuca armillaris* scrub to open scrub.	Nil	No suitable habitat within the Study Area. No records within the locality.
7.	***Dichanthium setosum*** Bluegrass	V	V	-	PMST	Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extending to northern Queensland. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture.	Low	Marginally suitable habitat within the Study Area. No records within the locality.
8.	***Eucalyptus camaldulensis*** (River Gum) population in the Hunter catchment	EP	-	1	BioNet	The Hunter population occurs from the west at Bylong, south of Merriwa, to the east at Hinton, on the bank of the Hunter River, in the Port Stephens local government area. It may occur with *Eucalyptus tereticornis, Eucalyptus melliodora*, *Casuarina cunninghamiana* subsp. *cunninghamiana* and *Angophora floribunda*. Prior to European settlement, it is likely that the species formed extensive stands of woodland and open woodland on the major floodplains of the Hunter and Goulburn rivers, especially in areas where water impoundment occurs after flood.	Low	Marginally suitable habitat within the Study Area. Not detected within the Study Area.

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
9.	***Eucalyptus glaucina*** Slaty Red Gum	V	V	7	BioNet, PMST	Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. It grows in grassy woodland and dry eucalypt forest on deep, moderately fertile and well-watered soils.	Present	One individual was detected outside the development footprint. No impacts.
10.	***Eucalyptus parramattensis* subsp. *decadens*** Earp's Gum	V	V	3	BioNet, PMST	The Kurri Kurri meta-population is bordered by Cessnock—Kurri Kurri in the north and Mulbring—Abedare in the south. Generally occupies deep, low-nutrient sands, often those subject to periodic inundation or where water tables are relatively high.	Nil	No suitable habitat within the Study Area. Few records within the locality.
11.	***Euphrasia arguta***	CE	CE	P	PMST	Euphrasia arguta was rediscovered in the Nundle area of the NSW north western slopes and tablelands in 2008. Could be found in grassy areas near rivers at elevations up to 700 m above sea level, with an annual rainfall of 600 mm.	Nil	No suitable habitat within the Study Area. few records within the locality.
12.	***Grevillea parvifolia subsp. parvifolia*** Small-Flower Grevillea	V	V	1	BioNet. PMST	The species distribution is between Moss Vale/Bargo and the lower Hunter Valley, with most occurrences in Appin, Wedderburn, Picton and Bargo. The habitat for the species is broad including heath, shrubby woodland and open forest on light clay or sandy soils, and often in disturbed areas such as on the fringes of tracks.	Nil	No suitable habitat within the Study Area. One record within the locality.
13.	***Persicaria elatior*** Tall Knotweed	V	V	-	PMST	Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Nil	No suitable habitat within the Study Area. No records within the locality.
14.	***Persoonia hirsuta*** Hairy Geebung	E	E	-	PMST	The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	Nil	No suitable habitat within the Study Area. No records within the locality.

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
15.	***Persoonia pauciflora*** North Rothbury Persoonia	CE	CE	1	BioNet, PMST	Extremely restricted distribution; all but one of the plants which make up the only known population occur within a 2.5 km radius of the original specimen at North Rothbury in the Cessnock local government area. It is found in dry open forest or woodland dominated by Spotted Gum (*Corymbia maculata*), Broad-leaved Ironbark (*Eucalyptus fibrosa*) and/or Narrow-leaved Ironbark (*E. crebra*) and supporting a moderate to sparse shrub layer and grassy groundcover.	Nil	No suitable habitat within the Study Area. One record within the locality.
16.	***Prasophyllum sp. Wybong*** A Leek Orchid	-	CE	-	PMST	The species occurs within the Sydney Basin, New England Tablelands, Brigalow Belt South and NSW South Western Slopes IBRA Bioregions and the Border Rivers–Gwydir, Namoi, Hunter–Central Rivers and Central West Natural Resource Management Regions. The distribution of this species overlaps with the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland EPBC Act-listed threatened ecological community.	Nil	Habitat is considered too degraded for this species. No records within the locality.
17.	***Prostanthera cineolifera*** Singleton Mint Bush	V	V	-	PMST	This species is restricted to only a few localities near Scone, Cessnock and St Albans. It grows in in open woodlands on exposed sandstone ridges. It is usually found in association with shallow or skeletal sands.	Nil	No suitable habitat within the Study Area. No records within the locality.
18.	***Pterostylis gibbosa*** Illawarra Greenhood	E	E	1	BioNet, PMST	Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage.	Nil	No suitable habitat within the Study Area. No records within the locality.

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
19.	***Rhizanthella slateri*** Eastern Australian Underground Orchid	V	E	-	PMST	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore usually located only when the soil is disturbed. Flowers September to November.	Nil	No suitable habitat within the Study Area. No records within the locality.
20.	***Rhodamnia rubescens*** Scrub Turpentine	CE	-	P	PMST	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	Nil	No suitable habitat within the Study Area. No records within the locality.
21.	***Rhodomyrtus psidioides*** Native Guava	CE	-	-	PMST	Occurs from Broken Bay, approximately 90 km north of Sydney, New South Wales, to Maryborough in Queensland. Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines.	Nil	No suitable habitat within the Study Area. No records within the locality.
22.	***Rutidosis heterogama*** Heath Wrinklewort	V	V	1	BioNet, PMST	On the Central Coast it is located north from Wyong to Newcastle. Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.	Nil	No suitable habitat within the Study Area. One record within the locality.
23.	***Syzygium paniculatum*** Magenta Lilly Pilly	CE	-	2	BioNet, PMST	Occurs from Broken Bay, approximately 90 km north of Sydney, New South Wales, to Maryborough in Queensland. Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines	Nil	No suitable habitat within the Study Area. Two records within the locality.
24.	***Thesium austral*** Austral Toadflax	V	V	-	PMST	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	Nil	No suitable habitat within the Study Area. No records within the locality.
Birds								

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
1.	***Anthochaera phrygia*** Regent Honeyeater	CE	CE	2	BioNet, PMST	Mostly recorded in box-ironbark eucalypt associations. At times of food shortage, the species also uses other woodland types and wet lowland coastal forest dominated by Swamp Mahogany or Spotted Gum.	Low	Marginally suitable foraging habitat present. Two records in the locality.
2.	***Botaurus poiciloptilus*** Australasian Bittern	E	E	-	PMST	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha spp*.) and spikerushes (*Eleocharis spp*.).	Nil	No suitable habitat within the Study Area. No records within the locality.
3.	***Chthonicola sagittata*** Speckled Warbler	V	-	3	BioNet	Prefers in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area.	Low	No suitable habitat within the Study Area. Few records within the locality.
4.	***Circus assimilis*** Spotted Harrier	V	-	1	BioNet	The Spotted Harrier occurs throughout the Australian mainland, except in densly forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. It predominantly occurs in grassy open woodland including *Acacia* and mallee remnants, inland riparian woodland, grassland and shrub steppe.	Nil	No suitable habitat within the Study Area. One record within the locality.
5.	***Daphoenositta chrysoptera*** Varied Sittella	V	-	1	BioNet	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Nil	No suitable habitat within the Study Area. One record within the locality.

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
6.	***Ephippiorhynchus asiaticus*** Black-necked Stork	E	-	1	BioNet	Primarily inhabits permanent freshwater wetlands and surrounding vegetation including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters. Will also forage in inter-tidal shorelines, mangrove margins and estuaries. Feeds in shallow, still water. This species breeds during summer, nesting in or near a freshwater swamp. Black-necked Storks build large nests high in tall trees close to water. Trees usually provide clear observation of the surroundings and are at low elevation (reflecting the floodplain habitat). They feed on a wide variety of animals, including fish, frogs and invertebrates (such as beetles, grasshoppers, crickets and crayfish).	Nil	No suitable habitat within the Study Area. No records within the locality.
7.	***Erythrotriorchis radiatus*** Red Goshawk	CE	V	P	PMST	Occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia, and frequently riverine forests. Such habitats typically support high bird numbers and biodiversity, especially medium to large species which the goshawk requires for prey. Nests in large trees, frequently the tallest in a tall stand, and nest trees are invariably within one km of permanent water. The breeding behaviour of Red Goshawks is not well known. Breeding is likely to be in spring and summer in southern Queensland and NSW. The birds lay clutches of 1-2 eggs between July and September, in a stick nest in a tall tree (>20 m tall) within 1 km of a watercourse or wetland.	Nil	No suitable habitat within the Study Area. No records within the locality.
8.	***Falco hypoleucos*** Grey Falcon	E	V	P	PMST	Medium-sized, compact, pale falcon with a heavy, thick-set, deep-chested appearance. The species is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	Nil	No suitable habitat within the Study Area. No records within the locality.

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
9.	***Glossopsitta pusilla*** Little Lorikeet	V	-	4	BioNet	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in *Angophora*, *Melaleuca* and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity.	Low	No suitable habitat within the Study Area. Few records within the locality.
10.	***Grantiella picta*** Painted Honeyeater	V	V	P	PMST	Inhabits *Acacia pendula*, *Acacia harpophylla*, Box-Gum Woodlands and Box-Ironbark Forests. Feeds on the fruits of mistletoes growing on woodland eucalyptus and acacia.	Nil	No suitable habitat within the Study Area. No records within the locality.
11.	***Haliaeetus leucogaster*** White-bellied Sea-Eagle	V	M	4	BioNet	Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest).	Nil	No suitable habitat within the Study Area. Few records within the locality.
12.	***Hirundapas caudacutus*** White-throated Needletail	-	M	1	BioNet, PMST	Most often seen in eastern Australia before storms, low pressure troughs and approaching cold fronts and occasionally bushfire. These conditions are often used by insects to swarm (eg termites and ants) or tend to lift insects away from the surface which favours sighting of White-throated Needletails as they feed.	Low	Marginally suitable aerial foraging habitat within the Study Area. One record within the locality.
13.	***Lathamus discolor*** Swift Parrot	E	CE, M	-	PMST	This migratory species has been recorded on the mainland from a variety of habitat types including dry and wet sclerophyll forest, forested wetlands, coastal swamp forests and heathlands. This species does not breed within mainland Australia. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	Low	Marginally suitable foraging habitat within the Study Area. No records within the locality.

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
14.	***Pomatostomus temporalis temporalis*** Grey-crowned Babbler (eastern subspecies)	V	-	18	BioNet	Inhabits Box-Gum woodlands on slopes, and Box-Cypress pine and Open-Box woodlands when on Alluvial plains. Distribution along most of the eastern side of Australia, particularly the western slopes of the Great Dividing Range.	Low	Marginally suitable foraging habitat within the Study Area. Few records within the locality.
15.	***Rostratula australis*** Australian Painted Snipe	E	E	P	BioNet	The Australian Painted Snipe is restricted to Australia. Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. It prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.	Nil	No suitable habitat within the Study Area. Few records within the locality.
16.	***Tyto novaehollandiae*** Masked Owl	V	-	2	BioNet	Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	Nil	No suitable habitat within the Study Area. Few records within the locality.
Mammals								
1.	***Chalinolobus dwyeri*** Large-eared Pied Bat	V	V	-	PMST	Found in well-timbered areas containing gullies. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features.	Low	Potential foraging habitat, but no suitable breeding habitat within the Study Area. No records within the locality.

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
2.	***Dasyurus maculatus*** Spotted-tailed Quoll	V	E	4	BioNet, PMST	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.	Nil	No suitable habitat within the Study Area. Few records within the locality.
3.	***Falsistrellus tasmaniensis*** Eastern False Pipistrelle	V	-	4	BioNet	Prefers moist habitats, with trees taller than 20 m. Generally, roosts in tree hollows but has also been found under loose bark on trees or in buildings.	Low	Potential foraging habitat, but no suitable breeding habitat within the Study Area. Few records within the locality.
4.	***Micronomus norfolkensis*** Eastern Coastal Free-tailed Bat	V	-	9	BioNet	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	Low	Potential foraging habitat, but no suitable breeding habitat within the Study Area. Few records within the locality.
5.	***Miniopterus australis*** Little Bentwing-bat	V	-	5	BioNet	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings.	Low	Potential foraging habitat, but no suitable breeding habitat within the Study Area. Few records within the locality.
6.	***Miniopterus orianae oceanensis*** Large Bent-winged Bat	V	-	13	BioNet	Forages in forested habitats. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings, and other man-made structures.	Low	Potential foraging habitat, but no suitable breeding habitat within the Study Area. Few records within the locality.
7.	***Myotis Macropus*** Southern Myotis	V	-	5	BioNet	Mainly coastal but may occur inland along large river systems. Usually associated with permanent waterways at low elevations in flat/undulating country, usually in vegetated areas. Forages over streams and watercourses feeding on fish and insects from the water surface. Roosts in a variety of habitats including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage, typically in close proximity to water. The breeding period for this species is November or December.	Low	Potential foraging habitat, but no suitable breeding habitat within the Study Area. Few records within the locality.

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
8.	***Petauroides volans*** Greater Glider	-	V	-	PMST	Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Shelters during the day in tree hollows.	Nil	No suitable nesting habitat within the Study Area. No records within the locality.
9.	***Petaurus norfolcensis*** Squirrel Glider	V	-	17	BioNet	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.	Low	No suitable nesting habitat within the Study Area. No records within the locality.
10.	***Petrogale penicillata*** Brush-tailed Rock-wallaby	E	V	-	PMST	Occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north.	Nil	No suitable nesting habitat within the Study Area. No records within the locality.
11.	***Phascogale tapoatafa*** Brush-tailed Phascogale	V	-	5	BioNet	Prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. It also inhabits heath, swamps, rainforest and wet sclerophyll forest. The Brush-tailed Phascogale primarily feeds on arthropods but will also eat other invertebrates, nectar and sometimes small vertebrates. They Nest and shelter in tree hollows with entrances 2.5 - 4 cm wide and use many different hollows over a short time span.	Nil	No suitable nesting habitat within the Study Area. No records within the locality.
12.	***Phascolarctos cinereus*** Koala	V	V	-	PMST	In New South Wales, Koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	Nil	No suitable habitat within the Study Area. No records within the locality.
13.	***Potorous tridactylus tridactylus*** Long-nosed Potoroo	V	V	P	PMST	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	Nil	No suitable habitat within the Study Area. No records within the locality.

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
14.	***Pseudomys novaehollandiae*** New Holland Mouse	-	V	-	PMST	Inhabits open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	Nil	No suitable habitat within the Study Area. No records within the locality.
15.	***Pteropus poliocephalus*** Grey-headed Flying-fox	V	V	122	BioNet, PMST	Occurs across a wide range of habitat types along the eastern seaboard of Australia, depending on food availability. Fruit from myrtaceous trees and rainforest trees form the major components of their diet.	Low	Suitable foraging habitat within the Study Area. No evidence of a roost site.
16.	***Saccolaimus flaviventris*** Yellow-bellied Sheathtail-bat	V		2	BioNet	Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Roosts in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.	Low	Potential foraging habitat, but no suitable breeding habitat within the Study Area. Few records within the locality.
17.	***Scoteanax rueppellii*** Greater Broad- nosed Bat	V	-	8	BioNet	This species occurs in a variety of habitats including rainforest, dry and wet sclerophyll forest and eucalypt woodland.	Low	Potential foraging habitat, but no suitable breeding habitat within the Study Area. Few records within the locality.
18.	***Vespadelus troughtoni*** Eastern Cave Bat	V	-	2	BioNet	A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest.	Low	Potential foraging habitat, but no suitable breeding habitat within the Study Area. Few records within the locality.
Amphibians								
1.	***Heleioporus australiacus*** Giant Burrowing Frog	V	V	-	PMST	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water.	Nil	No suitable habitat within the Study Area. No records within the locality.

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
2.	***Litoria aurea*** Green and Golden Bell Frog	E	V	3	BioNet, PMST	This species prefers open water bodies, fringed by reeds and other aquatic vegetation for breeding and foraging purposes. Needs fallen logs and debris for shelter and over-wintering purposes.	Nil	No suitable habitat within the Study Area. Few records within the locality.
Reptiles								
1.	***Delma impar*** Striped Legless Lizard	V	V	-	PMST	The Striped Legless Lizard occurs in the Southern Tablelands, the South West Slopes, the Upper Hunter and possibly on the Riverina. Populations are known in the Goulburn, Yass, Queanbeyan, Cooma, Muswellbrook and Tumut areas. Also occurs in the ACT, Victoria and south-eastern South Australia.	Nil	No suitable habitat within the Study Area. No records within the locality.
Migratory Species								
1.	***Calidris ferruginea*** Curlew Sandpiper	E	CE, M	-	PMST	Occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast.	Nil	No suitable habitat within the Study Area. No records within the locality.
2.	***Cuculus optatus*** Oriental Cuckoo	-	M	-	PMST	Inhabits rainforest margins, monsoon forest, vine scrub, riverine thickets, wet densely canopied Eucalypt forests, paperbark swamp and mangroves.	Nil	No suitable habitat within the Study Area. No records within the locality.
3.	***Gallinago hardwickii*** Latham's Snipe	-	M	1	BioNet	In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level.	Nil	No suitable habitat within the Study Area. No records within the locality.
4.	***Hirundapus caudacutus*** White-throated Needletail	-	M, V	1	PMST	Forages in high open spaces over varied habitat types.	Nil	No suitable habitat within the Study Area. No records within the locality.
5.	***Monarcha melanopsis*** Black-faced Monarch	-	M	-	PMST	Found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	Nil	No suitable habitat within the Study Area. No records within the locality.

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
6.	***Monarcha trivirgatus*** Spectacled Monarch	-	M	-	PMST	Prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	Nil	No suitable habitat within the Study Area. No records within the locality.
7.	***Motacilla flava*** Yellow Wagtail	-	M	-	PMST	Typically inhabits inundated fields, saltmarsh and wetlands and occasionally coastal areas.	Nil	No suitable habitat within the Study Area. No records within the locality.
8.	***Myiagra cyanoleuca*** Satin Flycatcher	-	M	-	PMST	Found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	Nil	No suitable habitat within the Study Area. No records within the locality.
9.	***Numenius madagascariensis*** Eastern Curlew	-	CE, M	-	PMST	Prefers intertidal mud and sandflats.	Nil	No suitable habitat within the Study Area. No records within the locality.
10.	***Rhipidura rufifrons*** Rufous Fantail	-	M	-	PMST	Found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground.	Nil	No suitable habitat within the Study Area. No records within the locality.
Threatened Ecological Communities								
1.	Central Hunter Valley eucalypt forest and woodland	-	CE	-	PMST	This ecological community occurs in the Hunter Valley region (primarily in the Central Hunter). generally occurs on soils derived from the Permian sedimentary bedrock found on the valley floors and on lower hillslopes and low ridges.	Nil	Not detected within the Study Area.
2.	Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community.	-	E	P	PMST	The ecological community is found within the South Eastern Queensland (SEQ), NSW North Coast (NNC), Sydney Basin (SYB) and part of the South East Corner (SEC) IBRA7 bioregions. The canopy layer is dominated2 by Casuarina glauca (swamp oak, swamp she-oak).	Nil	Not detected within the Study Area.

	Species	Status		Records	Source	Habitat	LoO	Summary
		BC	EPBC					
3.	Hunter Valley Weeping Myall Woodland	CE	CE	P	PMST	Hunter Valley Weeping Myall Woodland of the Sydney Basin bioregion is currently known from parts of the Muswellbrook and Singleton Local Government Areas but may occur elsewhere in the bioregion. This community is associated with heavy clay soils on depositional landforms in the south-western part of the Hunter River valley floor.	Nil	Not detected within the Study Area.
4.	Lowland Rainforest of Subtropical Australia	E	CE	P	PMST	The Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions is known to be associated with forested wetlands, wet sclerophyll forests, and dry, temperate and subtropical rainforests.	Nil	Not detected within the Study Area.
5.	River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	-	CE	P	PMST	Known from parts of the Local Government Areas of Port Stephens, Maitland, Singleton, Cessnock, Lake Macquarie, Wyong, Gosford, Hawkesbury, Baulkham Hills, Blacktown, Parramatta, Penrith, Blue Mountains, Fairfield, Holroyd, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Sutherland, Wollongong, Shellharbour, Kiama, Shoalhaven, Palerang, Eurobodalla and Bega Valley but may occur elsewhere in these bioregions.		
6.	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	-	CE	P	PMST	Box-Gum Woodland is found from the Queensland border in the north, to the Victorian border in the south. It occurs in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions		

Note: Marine species were omitted from this appendix.

APPENDIX C – FLORA AND FAUNA SPECIES LIST

Table C1 - Flora Species List

Species	Growth Form	Native/ Exotic/ Priority Weed
Ambrosia tenuifolia	Forb	Exotic
Asperula conferta	Forb	Native
Bothriochloa macra	Grass	Native
Briza minor	Grass	Exotic
Briza subaristata	Grass	Exotic
Bromus catharticus	Grass	Exotic
Callistemon sp. (Planted)	Shrub	Native (Planted)
Carthamus lanatus	Forb	Exotic
Casuarina cristata (Planted)	Tree	Native (Planted)
Casuarina glauca	Tree	Native
Cenchrus clandestinum	Grass	Exotic
Chenopodium murale	Forb	Exotic
Cirsium vulgare	Forb	Exotic
Conyza bonariensis	Forb	Exotic
Crassula sieberiana	Forb	Native
Cynondon dactylon	Grass	Exotic
Cyperus eragrostis	Sedge	Exotic
Dicondra repens	Forb	Native
Echium plantagineum	Forb	Exotic
Eragrostis curvula	Grass	Exotic (Priority Weed)
Eucalyptus globulus	Tree	Native (Planted)
Eucalyptus scoparia	Tree	Native (Planted)
Eucalyptus tereticornis	Tree	Native
Ficus superba	Tree	Native (Planted)
Gamochaeta americana	Forb	Exotic
Hydrocotyle bonariensis	Forb	Exotic

Species	Growth Form	Native/ Exotic/ Priority Weed
Hypochaeris radicata	Forb	Exotic
Juncus cognatus	Sedge	Exotic
Ligustrum sinense	Shrub	Exotic
Linum trigynum	Forb	Exotic
Ludwigia peploides	Forb	Native
Lysimachia arvensis	Forb	Exotic
Microlaena stipoides var. stipoides	Grass	Native
Modiola caroliniana	Forb	Exotic
Olea europea var. cuspidata	Shrub	Exotic (Priority Weed)
Persicaria decipiens	Forb	Native
Phalaris aquaticus	Grass	Exotic
Plantago Lanceolata	Forb	Exotic
Pteridium esculentum	Fern	Native
Richardia humistrata	Forb	Exotic
Romulea rosea	Forb	Exotic
Rumex conglomeratus	Forb	Exotic
Senecio madagascariensis	Forb	Exotic (Priority Weed)
Senna pendula	Shrub	Exotic
Sonchus oleraceus	Forb	Exotic
Stachys arvensis	Forb	Exotic
Stenotaphrum secundatum	Grass	Exotic
Trifolium dubium	Forb	Exotic
Trifolium repens	Forb	Exotic
Verbena rigida	Forb	Exotic

Table C2 Fauna Species List

No.	Scientific Name	Common Name
1.	*Corvus coronoides*	Australian Raven
2.	*Cracticus nigrogularis*	Pied Butcherbird
3.	*Dacelo novaeguineae*	Laughing Kookaburra
4.	*Grallina cyanoleuca*	Magpie Lark
5.	*Macropus giganteus*	Eastern Grey Kangaroo
6.	*Manorina melanocephala*	Noisy Miner
7.	*Rhipidura leucophyrs*	Willie Wagtail
8.	*Strepera graculina*	Pied Currawong
9.	*Trichoglossus moluccanus*	Rainbow Lorikeet

APPENDIX D – STAFF CONTRIBUTIONS

The following staff were involved in the compilation of this report.

Name	Qualification	Title/Experience	Contribution
Dr. Gilbert Whyte	BSc (Hons) PhD	Senior Ecologist	Field surveys, Reporting
Dr. Daniel O'Brien	BEnvSc&Mgt (PhD)	Senior Ecologist	Report Review
James Baldry	MConsBio	Ecologist	Report Assistance
Gayle Joyce	BSc Forestry (Hons)	GIS Specialist	GIS Data Management and Figure Preparation

APPENDIX E – LICENSING

Kleinfelder employees involved in the current study are licensed or approved under the *Biodiversity Conservation Act 2016* (License Number: SL100730, Expiry: the 31st of March 2022) and the *Animal Research Act 1985* to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.