Biodiversity Management Plan (BMP)
Ravensworth – Bayswater Ash Line Upgrade

New England Highway, Muswellbrook, NSW 2333

NCA22R139689

05 August 2022

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Ravensworth – Bayswater Ash Line Upgrade

Bayswater Power Station,
New England Highway, Muswellbrook NSW

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Prepared	Reviewed	Endorsed
James Baldry	Emily Fittell	David Martin

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1 INTRODUCTION

1.1 BACKGROUND

Kleinfelder was engaged by AGL Macquarie Pty Ltd to prepare a Biodiversity Management Plan (BMP) for the Ravensworth Ash Line Replacement (Ash Line) component of the approved Bayswater Power Station Water and Other Associated Operational Works Project (WOAOW) located on the New England Highway, Muswellbrook, New South Wales (NSW) (hereafter as the "Study Area") (see

Figure 1). The Study Area contains significant biodiversity values including threatened species habitat, a moderate abundance of mature hollow-bearing trees, and the Commonwealth listed *Central Hunter Valley eucalypt forest and woodland* Critically Endangered Ecological Community (CEEC).

The following terms are used throughout this report to describe geographical areas:

- **Study Area** – extent of Bayswater Power Station associated with the WOAOW Project, plus a buffer area ranging from 25 to 50 metre (m) wide to account for possible indirect impacts, located on the New England Highway, Muswellbrook, NSW (
- **Figure** 1).
- **Subject Site** – extent of the proposed Ash Line, inclusive of land within a 25 metre (m) buffer in each direction from the mid-point of the proposed footprint (50 m total) (
- **Figure** 1).
- **Development Site** – extent of the approved development footprint of the Bayswater WOAOW Project to be directly impacted by the proposed project, i.e. the 'Ash Line' footprint (**Figure 2**).
- **Locality** – land within a 5 km radius of the Study Area.

This BMP provides a summary of biodiversity values within the Subject Site, key threats associated with construction and operational phases of the proposed development, and key strategies for the management of biodiversity values, with an adaptive implementation period based on the length of the construction period.

1.2 SITE DESCRIPTION

The Study Area is located in both the Muswellbrook Shire Council (MSC) and Singleton Shire Council (SC) Local Government Areas (LGAs). The site is zoned 'SP2' – Infrastructure, and 'RU1' – Primary Production under the *Singleton Local Environment Plan 2013* (Singleton LEP) and the *Muswellbrook Local Environmental Plan 2009* (Muswellbrook LEP).

The Study Area is representative of a 46.90 ha stretch of land (50 m wide) associated with an existing Ash Pipeline between Ravensworth Mine and Bayswater Power Station. It is characterised by a mix of native woodland vegetation and derived native grassland (**Figure 2**). Small areas of non-native wetlands and exotic grasslands also occur. The site is intersected by waterways; Ponds Creek (5th order stream) and Pikes Creek (4th order stream).

1.3 PROPOSED DEVELOPMENT

The proposed development forms a part of the larger WOAOW Project to upgrade several water-associated facilities at the Bayswater Power Station.

The WOAOW Project area has been divided into eight works areas based upon their location within the larger Bayswater site (**Figure 1**) being:

- Coal Handling Plant (CHP) and Wastewater infrastructure upgrades.
- Cake Landfill.
- Borrow Pits 1 & 2, Ash Dam augmentation, Ash harvesting and Water management works.
- HP Pipe Clearing (North) and LSP Sludge Line.
- HP Pipe Clearing (South).
- Borrow Pit 3.
- Borrow Pit 4.
- **Ravensworth Ash Line Replacement (subject to BMP).**

The existing Ash Line between Ravensworth Mine and Bayswater Power Station consists of two parallel 9.3 kilometre (km) pipelines which transport fly ash, in slurry form, from the Ravensworth Fly Ash Plant at Bayswater to Ravensworth Void No. 3 for disposal. The lines have reached the end of their operational life and require replacement. The Ash Line will comprise two new pipelines, located parallel to the existing pipelines.

The majority of the new pipelines will be installed above ground on concrete plinths, steel or existing structures. Where the pipelines intersect existing roads or infrastructure (e.g. Pikes Creek, the New England Highway, Liddell Station Road and existing infrastructure corridors), the pipelines will be trenched or under bored below ground.

The new pipelines would connect to the existing, recently extended, ash pipelines which run from Ravensworth Void 3 to Void 5. Access to the new pipeline alignment would be provided via the existing Ravensworth Road and Pikes Gully Road or via internal access roads from the Bayswater Power Station.

During construction, temporary disturbance will comprise of concrete works, crib facilities and laydown areas along the length of the pipeline. Maintenance and/or upgrades to access tracks, drainage works and removal of any redundant infrastructure will be undertaken as required.

The proposed development will require the clearing of native vegetation to facilitate the above works. Areas of retained vegetation (hereafter referred to as the “Subject Site”), will undergo management practices to aid in their long-term remediation. The management of biodiversity values within the Subject Site is detailed within this BMP.

1.4 MANAGEMENT PLAN OBJECTIVES

1.4.1 Objectives

This BMP is a requirement of the conditions of consent (B12) for the WOAOW Project, and has been prepared in accordance with the recommendations detailed within the Environmental Impact Statement (EIS) and Biodiversity Development Assessment Report (BDAR) (Kleinfelder 2020a, 2020b). The key objectives of the BMP are:

1. To minimise impacts to flora and fauna, and their habitats, during the construction phase of the Ash Line development.
2. To maintain the condition of the retained CEEC and EEC vegetation in the Subject Site.
3. To augment and enhance ground habitat (e.g. ground timber and hollow logs) in retained vegetation and to maintain existing habitat features throughout the Subject Site.
4. To outline a strategy for the management of weed species identified as key threats to the retained vegetation within the Subject Site.

1.4.2 Retirement of Biodiversity Offsets

The Biodiversity Offsets for the Ravensworth Ash Line Replacement Development Site have been retired under Biodiversity Conservation Trust Reference BCF356 for State Significant Development 9697 (SSD).

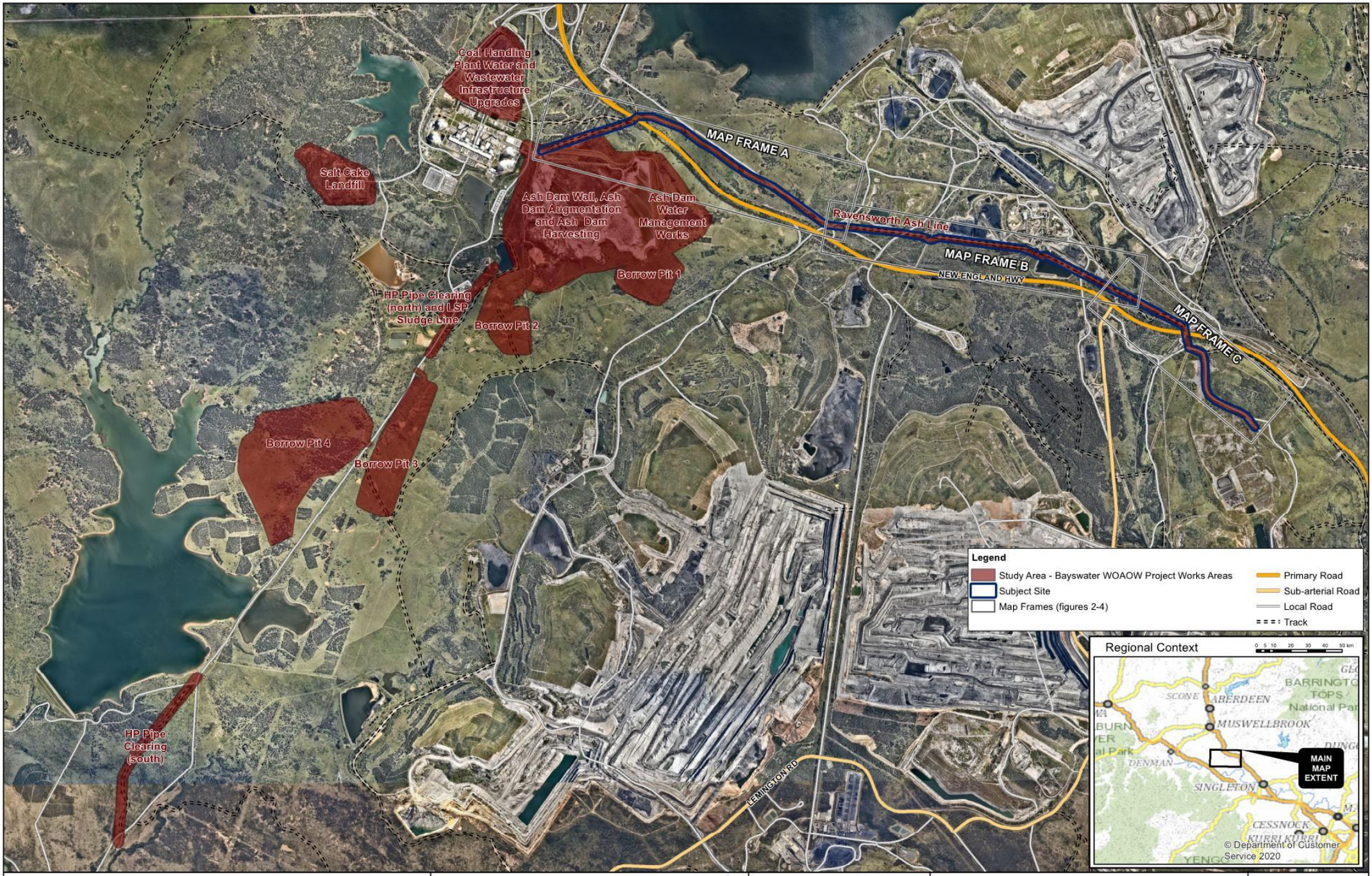
1.4.3 Meeting Conditions of State Significant Development 9697

The SSD conditions relating to biodiversity (B12) requires that Prior to the commencement of construction of the development, the Applicant must prepare a Biodiversity Management Plan (BMP) to the satisfaction of the Planning Secretary. The conditions that the BMP must meet and where they are located in this document are listed in **Table 1**.

Table 1: State Significant Development condition B12

Section	Report
(a) be prepared by a suitably qualified and experienced biodiversity expert/s.	Appendix B.
(b) be prepared in consultation with the BCS.	The BDAR and this BMP have been reviewed by the DPE and comments were incorporated in both documents.
(c) describe how biodiversity offsets required in condition B11 will be retired.	Section 1.4.2.
(d) describe measures to be implemented within the approved disturbance areas to: (i) minimise the amount of vegetation clearing, in particular, by designing surface infrastructure to minimise clearing of EECs and CEECs; (ii) minimise impacts on fauna, including undertaking pre-clearance surveys; (iii) minimise impacts on tree hollows, where reasonable and feasible; (iv) manage potential indirect and prescribed impacts on flora and fauna; and (v) maximise the salvage of resources, including tree hollows, vegetation and soil resources, for beneficial reuse, including fauna habitat enhancement.	Section 3. (i) The construction plan was developed by AGL, with Biodiversity advice from Kleinfelder, to minimise impacts to Biodiversity Values and minimise Biodiversity Offsets - Sections 1.3, 3.1.2, 3.2.2 and 3.3.2. (ii) Sections 3.2.2 and 3.3.2. (iii) Sections 3.2.2 and 3.3.2. (iv) Sections 3.2.2 and 3.3.2. (v) Sections 3.2.2 and 3.3.2.

Section	Report
(e) describe the measures to be implemented on the site to: (i) minimise impacts to threatened ecological communities listed under the BC Act and EPBC Act, and contribute to conservation strategies for these communities; (ii) minimise impacts on fauna habitat resources such as habitat trees, fallen timber and hollow-bearing trees; (iii) protect vegetation and fauna habitat outside of the approved disturbance areas; (iv) manage the collection and propagation of seed from the local area; and (v) control weeds and feral pests;	Section 3. (i) The construction plan was developed by AGL, with Biodiversity advice from Kleinfelder, to minimise impacts to Biodiversity Values and minimise Biodiversity Offsets - Sections 1.3, 3.1.2, 3.2.2 and 3.3.2. (ii) Sections 3.2.2 and 3.3.2. (iii) Sections 3.2.2 and 3.3.2. (iv) Section 3.3.4 (v) Section 3.3.4
(f) include a program to monitor, evaluate and report on the effectiveness of the measures.	Section 3.5.2



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DATA SOURCE:
NSW DFSI - 2021
AGL Macquarie - 2020
Nearmap - 2022

Locality

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Ravensworth Ash Line Upgrade

FIGURE:

1

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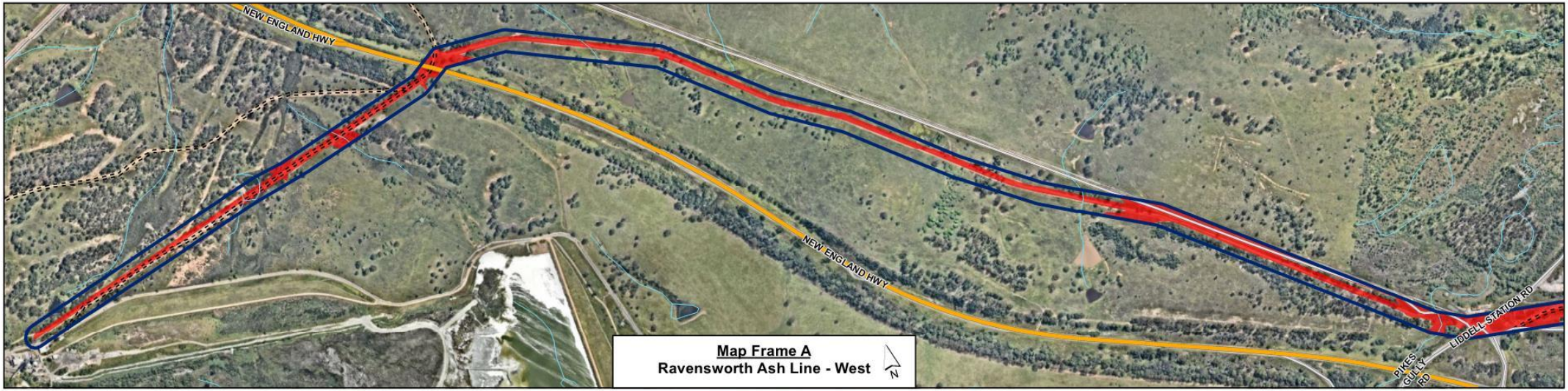

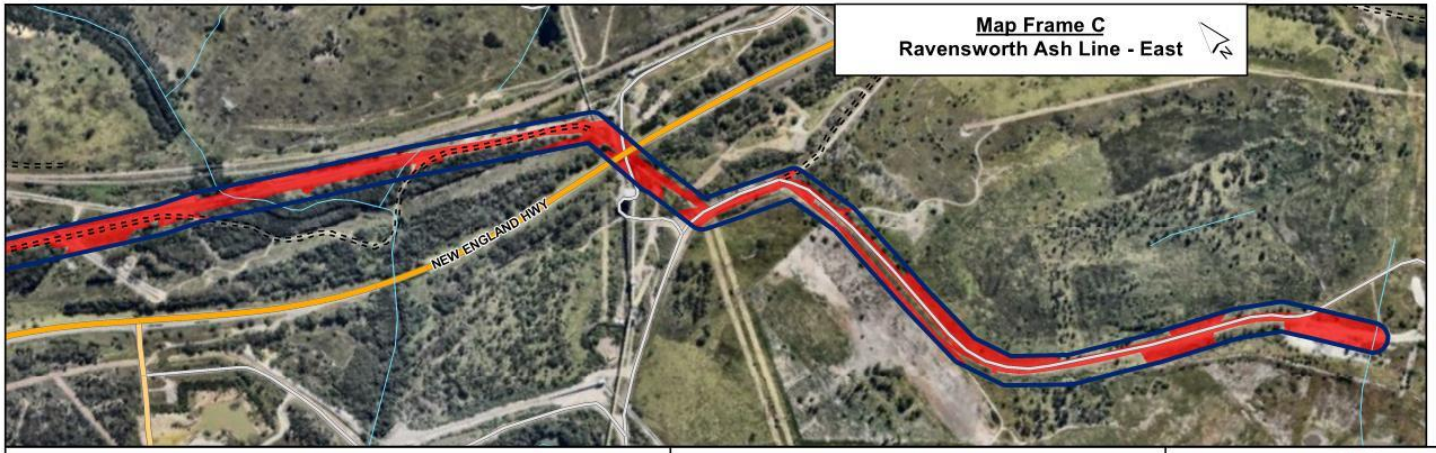

Legend

- Subject Site
- Development Site
- Primary Road
- Local Road
- Track
- Watercourse

0 50 100 200 300 400 500 Metres

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Nearmap - 2022

Subject Site and Development Site

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Biodiversity Management Plan
Ravensworth Ash Line Upgrade

FIGURE:

2

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2 BIODIVERSITY VALUES

2.1 KEY BIODIVERSITY VALUES

A BDAR was completed for the WOAOW Project by Kleinfelder (2020b) following the completion of several site-based assessments between June 2019 to September 2020 (Department of Planning, Industry and Environment [DPIE], 2020). Key results of the BDAR are detailed below.

2.1.1 Flora Species

A total of 194 plant species were identified within the broader Study Area. These were comprised of 62 exotic species and 132 native species, the majority of which were native herbs and grass species (see **Appendix A)**. No threatened flora species were detected within the Study Area.

A total of six (6) Priority Weed species for the Hunter Local Land Services Region (Department of Primary Industries [DPI], 2022) were identified within the Subject Site, four (4) of which are also listed as Weeds of National Significance (WoNS) (DoEE 2022c), these include the following species:

- *Hyparrhenia hirta* (Coolatai Grass) [Priority Weed].
- *Lantana camara* (Lantana) [WoNS and Priority Weed].
- *Olea europaea* subsp*. cuspidata* (African Olive) [Priority Weed].
- *Opuntia stricta* (Common Prickly Pear) [WoNS and Priority Weed].
- *Senecio madagascariensis* (Fireweed) [WoNS and Priority Weed].
- *Lycium ferocissimum* (African Boxthorn) [WoNS and Priority Weed].

Other frequently encountered exotic species include:

- *Chloris gayana* (Rhodes Grass).
- *Galenia pubescens* (Galenia).
- *Megathyrsus maximus* (Guinea Grass).
- *Verbena bonariensis* (Purpletop Vervain).
- *Plantago lanceolata* (Lamb's Tongues).
- *Sida rhombifolia* (Paddy's Lucerne).

A comprehensive list of flora species identified in the Study Area is presented in **Appendix A**. Mitigation measures to prevent the spread of weeds are presented in **Section 3**.

2.1.2 Vegetation Communities

Three (3) native vegetation communities have been mapped within the Subject Site including:

- PCT 1691: *Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter*. This community is represented by five (5) condition classes within the Subject Site (total of 20.69 ha).
- PCT 1692: Bull Oak grassy woodland of the central Hunter Valley (total of 0.71 ha)
- PCT 1731: *Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley*. This community is represented by a single (1) condition class within the Subject Site (1.46 ha).

The vegetation within the Subject Site represents two (2) Threatened Ecological Communities (TECs) (see

Figure 3):

- *Central Hunter Grey Box – Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions* EEC listed under the *Biodiversity Conservation Act 2016* (BC Act).
- *Central Hunter Valley Eucalypt Forest and Woodland* CEEC listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Two (2) non-native vegetation communities exist within the Subject Site including:

- Wetland/dam exotic vegetation (0.67 ha).
- Exotic Grasslands (6.63 ha).

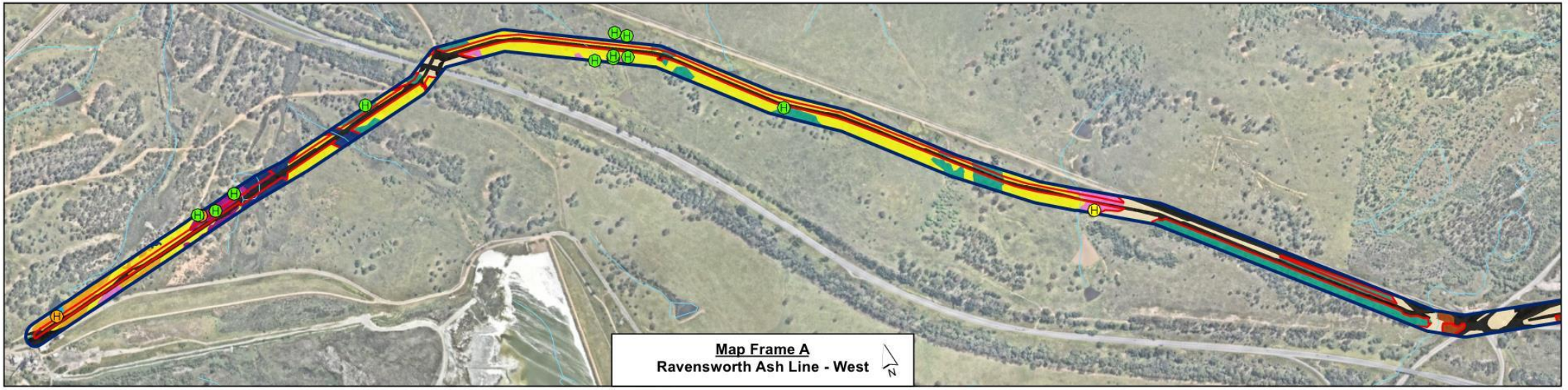
2.1.3 Fauna and Habitat Values

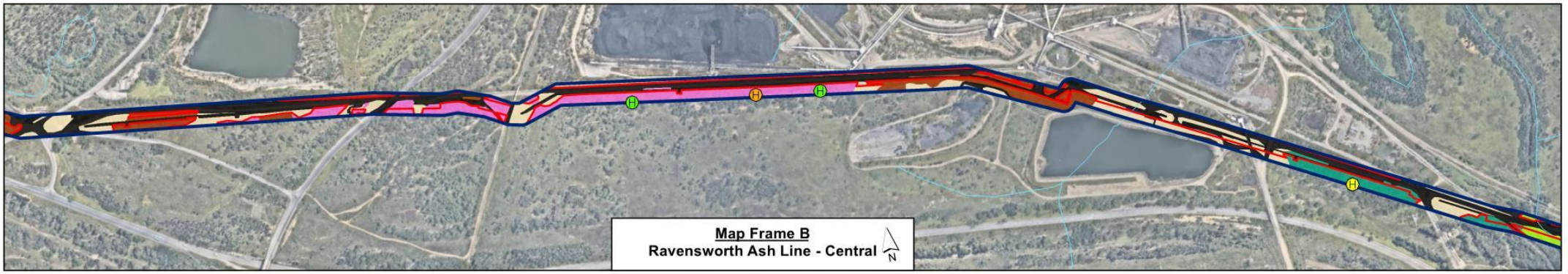
The Subject Site is characterised by open woodland vegetation of varying condition, regrowth vegetation, derived native grassland, exotic wetland vegetation and exotic grassland. The vegetation within the grassland areas is likely to represent minimal foraging habitat for several fauna species. The open woodland community represents potential foraging and denning/roosting habitat for numerous microbat, bird and mammal species. Key fauna habitat features identified within the Subject Site include the following:

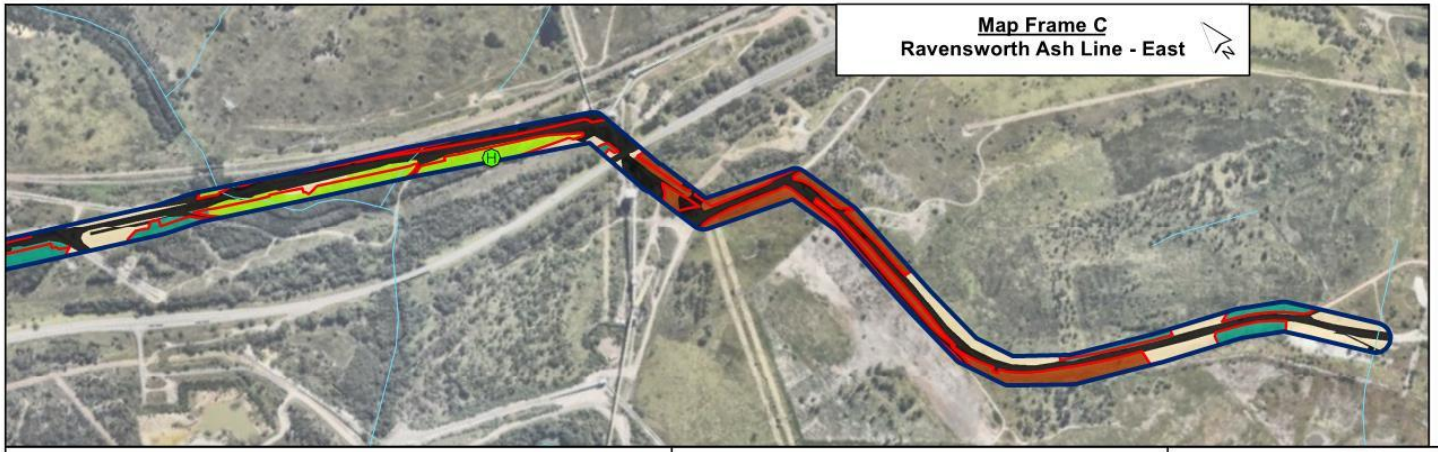
- Hollow-bearing trees (HBTs) and dead stags (**Figure 3**) which provide habitat for a number of bird species, and arboreal reptiles and mammals.
- Coarse woody debris within the woodland areas which provide habitat for reptiles and terrestrial mammals.
- Mature trees which provide foraging and nesting habitat for several common native bird species, microbats and other arboreal mammals.
- Waterbodies may provide habitat for a variety of terrestrial, aquatic and amphibious fauna species.

A total of 64 fauna species were identified during the assessment. This includes eight (8) species listed as Vulnerable under the BC Act, including:

- Large Bent-winged Bat (*Miniopterus orianae oceanensis*),
- Little Lorikeet (*Glossopsitta pusilla*),
- Grey-crowned Babbler (*Pomatostomus temporalis temporalis*),
- Hooded Robin (*Melanodryas cucullata*),
- Southern Myotis (*Myotis macropus*),
- Speckled Warbler (*Chthonicola sagittata*),
- Striped Legless Lizard (*Delma impar*) (also listed as Vulnerable under the EPBC Act),
- Squirrel Glider (*Petaurus norfolcensis*).







Legend

- Subject Site
- Development Site
- Watercourse

Habitat Feature

- Nest
- Dead Stag
- Hollow-bearing Tree

Plant Community Type

- PCT 1691: Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter (Moderate_Good_CEEC)
- PCT 1691: Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter (Moderate_Good)
- PCT 1691: Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter (Regrowth)
- PCT 1691: Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter (Grassland)
- PCT 1691: Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter (Rehabilitation)
- PCT 1692: Bull Oak grassy woodland of the central Hunter Valley (Moderate_Good)
- Non-Native: Wetland/Dam (with Wetland Vegetation)
- Non-Native: Exotic Grasslands
- Dam
- Excluded

0 50 100 200 300 400 500 Metres

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NSW DFSI - 2021
AGL Macquarie - 2020
Nearmap - 2022

Vegetation and Biodiversity Values

AGL Macquarie Ltd
Biodiversity Management Plan
Ravensworth Ash Line Upgrade

FIGURE: **3**

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2.2 KEY THREATS

2.2.1 Weed Incursions

Weeds are known to compete with native flora species, leading to declines in species diversity and regeneration, and changes to fauna habitat values (DE 2015). The *Central Hunter Valley Eucalypt Forest and Woodland* CEEC as a whole has undergone a significant reduction in overall ecological function in response to the establishment of exotic species (DE 2015). A total of six (6) Priority Weed species for the Hunter Local Land Services Region (DPI, 2022) were identified within the Study Area, three of which are also listed as WoNS (Department of Agriculture, Water and Environment [DAWE] 2022). These species included: *Hyparrhenia hirta* (Coolatai Grass), *Lantana camara* (Lantana), *Olea europaea* subsp*. cuspidata* (African Olive)*, Opuntia stricta* (Common Prickly Pear)*, Senecio madagascariensis* (Fireweed) and *Lycium ferocissimum* (African Boxthorn).

A number of weed species present within the Subject Site pose a particular threat to *Central Hunter Valley Eucalypt Forest and Woodland* CEEC, including; *Asparagus asparagoides* (Bridal Creeper) *Lantana camara* (Lantana), *Lycium ferocissimum* (African boxthorn), *Hyparrhenia hirta* (Coolatai grass), *Chloris gayana* (Rhodes Grass, *Galenia pubescens* (Galenia), *Olea europaea* subsp*. cuspidata* (African Olive*), Senecio madagascariensis* (Fireweed) and *Sporobolus africanus* (Giant Parramatta Grass). African Olive is recognised as a serious threat to the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC (DE 2015), owing to the species tendency for shading and competition for space and possibly to allelopathic effects as well as changes to fire ecology. Lantana (*Lantana camara*) was noted by Peake (2006) as having extensively invaded parts of the ecological community (DE 2015). Lantana typically forms dense thickets, similarly suppressing native vegetation and seedlings through shading, nutrient competition, smothering and allelopathy (DE 2015). African Boxthorn is an aggressive invader of pastures, roadsides, reserves, remnant bushland and waterways. It forms an impenetrable, spiny thicket that provides a haven for feral animals. Coolatai grass, like many other invasive grasses, are vigorous invaders of the ecological community; forming dense stands which replace native grasses and wildflowers (for example Coolatai grass threatening terrestrial orchids, such as *Diuris tricolor* (Pine Donkey Orchid) (Peake, 2006; NSW DEC, 2014).

Weed incursions will continue to be a threat to biodiversity values within the Subject Site throughout the following phases of the Ash Line development:

- ***Construction Phase:*** Construction activities occurring on site as part of the proposed development, namely vehicle movements and transport of materials (i.e. soil and mulch) have the potential to facilitate the spread of exotic flora species within the Study Area.
- ***Operational Phase:*** The development, if unmanaged, may further exacerbate local weed incursions or facilitate the introduction of novel weed species through changes to nutrient inputs from increased runoff.

Natural weed dispersion also needs to be recognised, for management purposes, by the various means of dispersal that each species utilises, including (but not limited to) wind, fauna, and slope/gravity. This considers current infestations within the Subject Site and their potential seed bank, and infestations outside/adjacent to it.

2.2.2 Introduced Fauna Species

Introduced fauna species are a significant threat to *Central Hunter Valley Eucalypt Forest and Woodland* CEEC. Key pest species relevant to the Study Area include predators (namely the Red Fox [*Vulpes vulpes*],

Feral Cat [*Felis catus*] and Wild Dogs [*Canis lupus*]) and the European Honeybee (*Apis mellifera*) (DE 2015). Introduced predators pose a key threat to native fauna through predation, especially woodland birds and fauna species that may utilise the hollow-bearing trees on site. The European Honeybee has been recorded within the Study Area inside tree hollows. This species is known to compete with native species for nesting sites and habitat resources. Competition from feral honeybees for tree hollows and floral resources is considered a key threatening process by the NSW Threatened Species Scientific Committee (TSSC 2002). Additionally, the Red Fox was identified within the Study Area, the presence of which is listed as a key threatening process for *Central Hunter Valley Eucalypt Forest and Woodland* CEEC.

2.2.3 Vegetation Clearing and Habitat Loss

The Ash Line will require the clearing of native vegetation, including 1.96 ha of woodland (PCT 1691, PCT 1692 and PCT 1731) and 0.99 ha of derived native grassland (PCT 1691). Vegetation clearing will involve the removal of one hollow-bearing tree which provides potential nesting habitat for a variety of native bird and arboreal mammal species. Incursions into area of native woodland and grassland may exacerbate existing weed management threats and adversely impact threatened species and ecological communities occurring within the Subject Site. Land clearing is recognised as a key threatening process in the management of *Central Hunter Valley Eucalypt Forest and Woodland* CEEC, whereby the associated physical, chemical and biological changes to the system result in a less biodiverse community (DE 2015).

Vegetation clearing and habitat loss represents a threat to biodiversity values throughout the following phases of the Ash Line development:

- ***Construction Phase:*** In addition to the direct impacts to native vegetation and fauna habitat detailed above, construction activities within the Subject Site have the potential to impact retained vegetation through accidental incursions, and the introduction of weed species.
- ***Operational Phase:*** The Ash Line development may further exacerbate habitat loss and degradation of vegetation through inappropriate management of retained vegetation.

2.2.4 Erosion and Sedimentation

Erosion resulting from earthworks such as the operation of machinery during the construction phase may facilitate the movement of water-borne sediments that have the potential to adversely impact important biodiversity values on site. This may include impacts on the condition of native vegetation, threatened ecological communities and threatened species habitat.

3 MANAGEMENT PLAN

3.1 MANAGEMENT ZONES

Two (2) Management Zones have been allocated to the Subject Site based on their location and proposed future land use. The management zones are shown in **Figure 4**, and detailed in **Table 2**.

- **Management Zone 1:** Development Site
- **Management Zone 2:** Retained Vegetation

Table 2: Management Zones within the Study Area

Management Zone	Description
Management Zone 1: Development Site	**Total area within Study Area:** 23.67ha **Communities and Form:** A number of vegetation communities occur within Management Zone 1 including: • PCT 1691*: Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter* (Moderate-Good CEEC). • PCT 1691: *Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter* (Moderate-Good EEC). • PCT 1691: *Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter* (Regrowth). • PCT 1691: *Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter* (Grassland). • PCT 1691: *Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter* (Rehabilitation). • PCT 1731: *Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley* (Moderate-Good). • Non-Native: *Wetland/Dam* (with Wetland Vegetation). • Non-Native: Exotic Grasslands. • *Excluded* (Existing Infrastructure). **Description:** This zone is inclusive of the area to be directly impacted by the proposed development (See **Figure 4**). The extent of this zone is predominantly occupied by areas of existing infrastructure. Native vegetation is represented by grassy woodland communities of varying condition, including vegetation representative of the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC (EPBC Act) and the *Central Hunter Grey Box – Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions* EEC (BC Act). Woodland vegetation is dominated by an open canopy of *Eucalyptus crebra* (*Narrow-leaved Ironbark*) and *Eucalyptus moluccana* (Grey Box) (PCT 1691) or *Casuarina glauca* (Swamp Oak) (PCT 1731). Vegetation towards the western extent of the pipeline is predominantly representative of derivative grassland vegetation (PCT 1691) with few mature trees. Exotic grassland occurs sporadically throughout the zone as well as exotic wetland habitat. Infrastructure associated with the existing pipeline occurs throughout. **Disturbances:** Historic vegetation clearing, significant weed invasion (inclusive of Priority Weeds for the Hunter Local Land Services [LLS] region), on-going management of existing infrastructure. **Management Goals:** The removal of native vegetation will be required within this zone to accommodate the new Ash Line infrastructure. Goals within this zone include the appropriate management of key threats to vegetation cleared and retained within the adjacent Subject Site, particularly in the form of weed control.
Management Zone 2: Retained Areas	**Total area within Study Area:** 23.23 ha **Communities and Form:** A number of vegetation communities occur within Management Zone 2 including:

Management Zone	Description
	• *PCT 1691: Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter* (Moderate-Good CEEC). • *PCT 1691: Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter* (Moderate-Good EEC). • *PCT 1691: Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter* (Regrowth). • *PCT 1691: Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter* (Grassland). • *PCT 1691: Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter* (Rehabilitation). • *PCT 1731: Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley* (Moderate-Good). • Non-Native: Wetland/Dam (with Wetland Vegetation). • Non-Native: Exotic Grasslands. • Excluded (Existing Infrastructure). **Description:** This zone is inclusive of the retained area within the Subject Site (See **Figure 4**). It is dominated by grassy woodland communities of varying condition, including vegetation representative of the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC (EPBC Act) and the *Central Hunter Grey Box – Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions* EEC (BC Act). Woodland vegetation is dominated by an open canopy of *Eucalyptus crebra* (*Narrow-leaved Ironbark*) and *Eucalyptus moluccana* (Grey Box) (PCT 1691) or *Casuarina glauca* (Swamp Oak) (PCT 1731). The western extent of the Subject Site is dominated by derived native grassland vegetation (PCT 1691) with few mature trees. Exotic vegetation within Management Zone 2 exclusively occurs within the western 670 m of the Subject Site and includes exotic grassland and exotic wetland habitat. **Disturbances:** Historic vegetation clearing, significant weed invasion (inclusive of Priority Weeds for the Hunter LLS region), on-going management of adjacent infrastructure. **Management Goals:** This zone will be retained within the Subject Site. Management actions aim to reduce potential indirect impacts of the Ash Line on retained vegetation, particularly in relation to the control of exotic plant species during and following construction works.

3.1.1 Management Stages

The BMP implementation period is inclusive of the pre-construction, construction and operational phases of the development, ending 6-months following the completion of construction. The timing of management tasks and performance criteria are based on Management Stages defined by the progress of the proposed development. The stages are defined as the following:

- **Pre-Construction Phase:** Between development approval and the initiation of construction works on site.
- **Construction Phase:** Between the initiation and completion of construction within the site.
- **Post Construction Phase/Operational Phase:** Between the completion of construction and 6-months after the completion of construction.

3.1.2 Performance Criteria

The overall performance criterion of this BMP following are as follows:

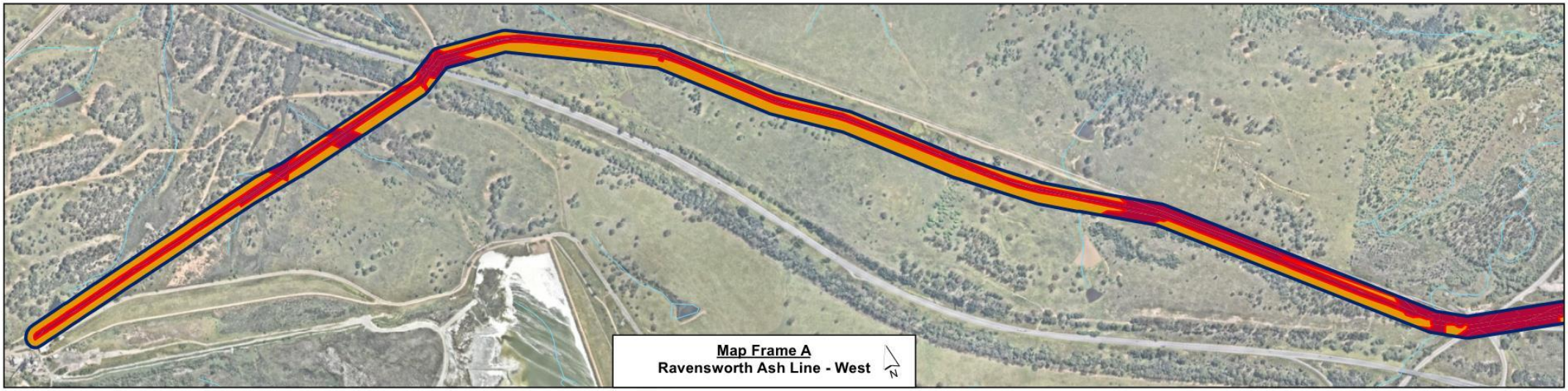
- **Vegetation Exclusion:** The retention of the pre-construction extent of vegetation, particularly EEC and CEEC vegetation, outside of the Development Site following the completion of works (i.e. avoidance of clearing outside of approved footprint).
- **Tree Retention**: The continued presence of all trees demarcated for retention within the Subject Site.
- **Habitat Augmentation:** The presence of salvaged habitat features (e.g. felled trees and bush rock) from the Development Site within retained vegetation.
- **Manageable Weed Extent:** A similar extent or reduction of target weeds (See **Section 3.3**) within retained vegetation of the Subject Site.
- **Feral Animal Control:** The completion of a baiting program targeting feral species within and around the Subject Site.

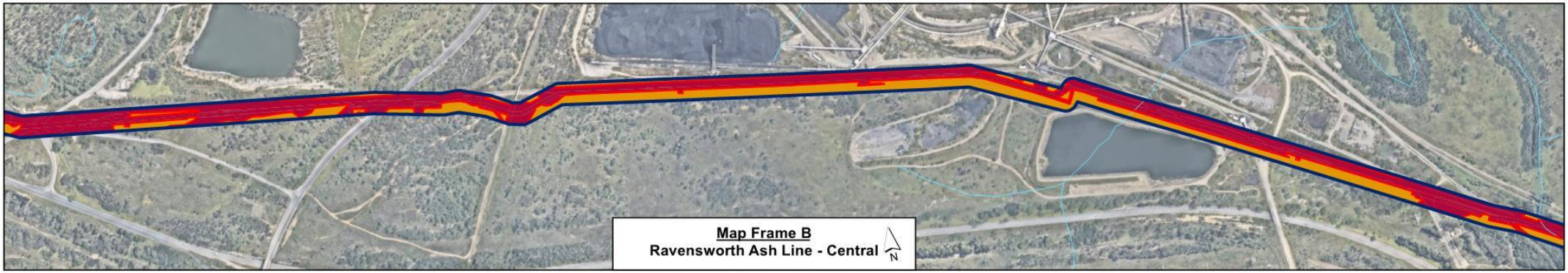
3.1.3 Responsibilities

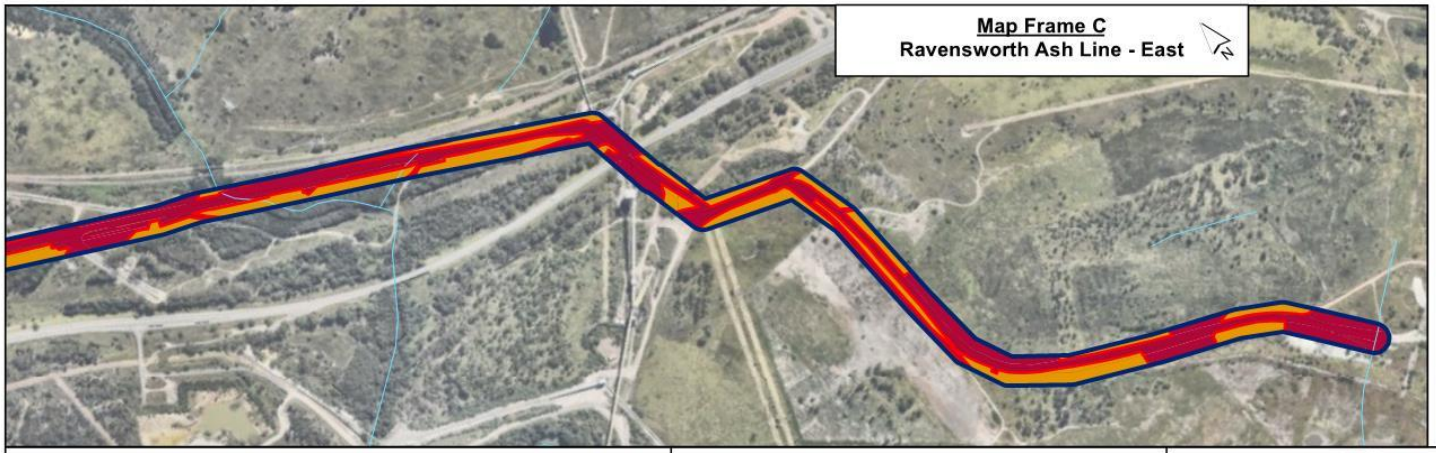
Implementation and funding of this BMP is the responsibility of the proponent who will be the proprietor of the Subject Site throughout the implementation period. The length of monitoring relevant to the BMP will depend on the length of the construction period (implementation period to end 6-months following completion). Management of the Subject Site will adopt an adaptive management process and may be subject to review of monitoring results and recommendations.

The Construction Site has been designed to minimise impacts on native vegetation and to meet construction efficiency and safety requirements. The area of the Development Site has been included in the retirement of the Biodiversity Offset obligation. It is unlikely that opportunities to minimise the impacts to native vegetation could occur and would be limited to car parking and stockpile areas.

Strategies outlined in the BMP will be undertaken by suitably experienced and qualified persons or companies engaged by the proprietor of the Subject Site. Any vegetation restoration works (such as weed management, and landscaping) will be undertaken by a suitably qualified and experienced contractor. Monitoring and reporting will be undertaken by suitably qualified Ecologists.







Legend

- Subject Site
- Development Site
- Watercourse

Management Zones

- Management Zone 1 - Development Site
- Management Zone 2 - Retained Areas

0 50 100 200 300 400 500 Metres

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DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2021
AGL Macquarie - 2020
Nearmap - 2022

Management Zones

AGL Macquarie Ltd
Biodiversity Management Plan
Ravensworth Ash Line Upgrade

FIGURE:
4

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3.2 PRE-CONSTRUCTION PHASE

3.2.1 Construction Environmental Management Plan (CEMP)

A Construction Environmental Management Plan (CEMP) will be established prior to the commencement of construction. The CEMP must include:

- The environmental site management measures must remain in place and be maintained throughout the period of the development.
- The CEMP must address all environmental aspects of the development's construction phases, and include where relevant, but not be limited to, the following:
    - Project Contact Information.
    - Site Security Details.
    - Timing and Sequencing Information.
    - Site Soil and Water Management Plan.
    - Noise and Vibration Control Plan.
    - Air Quality monitoring and management.
    - Health and Safety Plan.
    - Incident Management Contingency.
    - Implementation of mitigation measures specified in Section 5.3 of the BDAR (Kleinfelder 2020).
    - Unexpected Finds Protocol.

3.2.2 Pre-Construction Impact Mitigation

The following measures will be adhered in the pre-construction phase of the project, that being prior to the onset of clearing, earthworks and construction. All contractors, sub-contractors, and personnel must be notified of these measures.

The procedures and mitigation measures detailed below are to be followed/implemented to minimise direct and indirect impacts to biodiversity values within the Subject Site:

- Identify and designate vehicle and equipment parking areas and stockpile areas. Areas containing high ecological value will be avoided.
- Trees to be removed will be identified and demarcated. Distinguishable marking will be used for hollow bearing trees.
- Clearing and construction should be undertaken outside of the breeding and egg maturation periods (November through to February) for the Striped Legless Lizard (*Delma impar*).

3.3 CONSTRUCTION PHASE

The following measures will be adhered in the construction phase of the project, that being immediately prior to, during and immediately after completion of clearing, earthworks and construction. All contractors, sub-contractors, and personnel must be notified of these measures.

3.3.1 Construction Impact Mitigation

The procedures and mitigation measures detailed below are to be followed/implemented to minimise direct and indirect impacts to biodiversity values within the Subject Site:

- Vegetation may only be removed from the approved development footprint.
- Trees to be retained within the development footprint will demarcated in a way that makes them easily discernible from those to be impacted. E.g., pink marking tape around the tree's trunk.
- Speed limits within the Subject Site would be limited to 40 km/hr to minimise the risk of vehicle collision with fauna.
- Contractors will be informed of **'No-Go' zones** (native vegetation to be retained) to prevent any clearing beyond the approved extent works. Vehicles, construction materials and refuse will be restricted in these areas, where possible. Compaction and the placement of fill within 5 metres of trees and native vegetation will be avoided, at the discretion of the project manager.
- Construction works are only to occur during the day in order to minimise impacts on nocturnal fauna from noise, vibration, waste, and air pollution.

3.3.2 Vegetation Clearing Supervision

The following procedures are to be followed in relation to vegetation clearing, to minimise impacts to biodiversity values within the Study Area.

- Vegetation clearing will not occur inside of the breeding and egg maturation periods (November through to February) for the Striped Legless Lizard (*Delma impar*). Additionally, clearing will be avoided, where possible, during or the months of Spring to avoid the peak breeding period of hollow-dependent fauna.
- Preclearing surveys will be conducted by the project ecologist and will include the following procedures:
    - The project ecologist will inspect vegetation within the Development Site and advise the site manager and tree clearing staff of any habitat potential and precautions necessary during vegetation removal. The ecologist will also inspect ground habitat (e.g. bush rock) for the potential presence of *Delma impar* (Striped Legless Lizard). If detected, individuals will we relocated to similar habitat outside of the Development Site.
    - Select salvageable habitat features (such as large ground logs and bush rocks) will be clearly marked with flagging tape or spray paint, salvaged, and redistributed in the Subject Site, under the supervision of the project ecologist.
- Removal of hollow-bearing trees will be done under the supervision of the project ecologist and will include the following tree felling procedures:
    - Immediately prior to felling, hollow-bearing trees are to be knocked (with an excavator bucket or other machinery) to encourage fauna to evacuate the tree. The hollow-bearing tree will then be "soft-felled". Sectional dismantling will be undertaken where hollows are to be reused (on instruction from the project ecologist).
    - Felled trees will be inspected by the project ecologist or licensed wildlife carer immediately following tree felling. Any displaced fauna will be relocated into adjacent habitat, as close to the development area as possible. Any injured fauna will be placed into the care of a local veterinary hospital or wildlife

rescue group. In circumstances where native fauna species are detected, clearing will cease until the ecologist or wildlife carer has relocated the animal.

- Before being stock-piled, felled trees must be left for at least 48 hours on the ground to allow fauna to escape.
- Any salvaged hollows will then be stockpiled, to be used as ground habitat in the Subject Site (see **Section 3.4.1**).
- Where practical, tree trunks and larger branches to be removed from the development area, are to be cut up into long pieces (i.e. over 4 m where possible) and carefully placed within the Subject Site, in such a way as to look natural, not add to bushfire risks, and to provide benefit to native fauna (on instruction from the project ecologist).
- Cleared vegetation (that is not salvageable as ground habitat) may be mulched, at the discretion of the project manager, and re-used throughout the site as part of any vegetation regeneration or landscaping activities. Mulched material may be disposed of elsewhere within the Study Area, or at the mulch facility at Ravensworth Mine.
- If any injured or displaced fauna are encountered onsite in the absence of an ecologist or licensed wildlife carer, the advice of the ecologist and/or a local wildlife rescue group will be sought immediately.
- During site inductions, all contractors, sub-contractors, and personnel must be notified of these vegetation protection requirements.

3.3.3 Management of Erosion and Sedimentation

A separate Erosion and Sediment Control Plan pertaining to the Ash Line upgrade will be developed to Blue Book (Landcom 2004) standards. This plan will include water quality monitoring and sedimental control measures.

Measures to reduce soil erosion and pollutant run-off during construction as per the Erosion and Sediment Control plan may include:

- Installation of erosion and sediment control measures (including silt fencing) around the boundary of the Development Site prior to any works
- Regular inspection of erosion and sediment control measures, particularly following rainfall events, to ensure their ongoing functionality.
- Management of excavated materials to reduce the movement of sediments during high wind or rainfall events.
- Avoiding stockpiling of materials adjacent to retained vegetation within the Subject Site and within 40 m of watercourses, stockpiling should be undertaken in areas that are already cleared/ disturbed.
- Undertake maintenance of silt fences and other mitigation measures to isolate runoff.

3.3.4 Weed Management During Construction

Appropriate weed control measures must be implemented during the construction phase, including the following:

- All weeds removed from the site must be transported in a sealed container or bag and disposed at a waste management facility licensed to accept green waste.

- Vehicles, machinery and equipment must be free from weed material (including seeds) before entering the construction corridor.

A diverse assemblage of weed species is prevalent throughout the Subject Site. Weed control will prioritise select Priority Weeds of the Hunter (DAWE 2022) as well as other exotic species that are considered manageable within, and adjacent to, the Subject Site. These species are outlined in **Table 3** and their extent mapped on

Figure 5.

Table 3 Exotic species to be targeted for weed control throughout the monitoring program.

Family	Exotic Species	Common Name
Aizoaceae	*Galenia pubescens*	Galenia
Asteraceae	*Tagetes minuta*	Stinking Roger
Asteraceae	*Xaththium spinomum*	Bathurst Burr
Bignoniaceae	*Jacaranda mimosifolia*	Jacaranda
Boraginaceae	*Heliotropium amplexicaule*	Blue Heliotrope
Cactaceae	*Opuntia stricta*	Prickly Pear
Euphorbiaceae	*Ricinus communis*	Castor Oil Plant
Fabaceae	*Acacia saligna*	Golden Wreath Wattle
Oleaceae	*Olea europaea* subsp. *cuspidata*	African Olive
Phytolaccaceae	*Phytolacca octandra*	Inkweed
Poaceae	*Cortaderia selloana*	Pampas Grass
Solanaceae	*Lycium ferocissimum*	African Boxthorn
Verbenaceae	*Lantana camara*	Lantana

Management will adopt the ‘Bradley method’, which involves the progressive removal of weeds from less disturbed areas (outside of mapped weed infestations), followed by removal from more weed infested areas (i.e. mapped weed infestation areas). This method also aims to remove weeds with minimal disturbance and allow native species to re-establish naturally from the existing seed bank and rootstock.

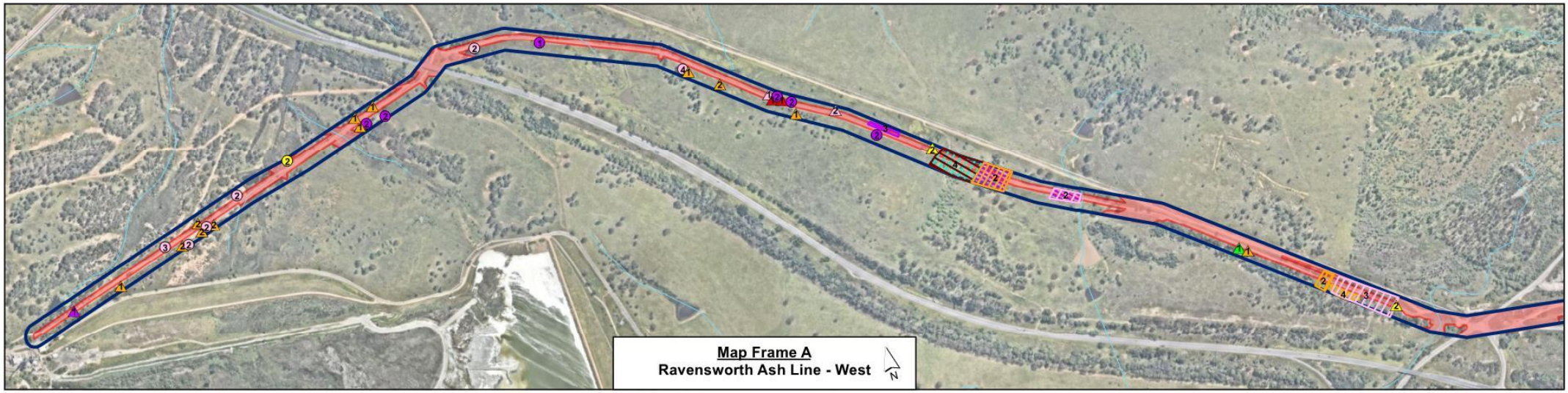
The following steps are to be followed when controlling weeds on the site:

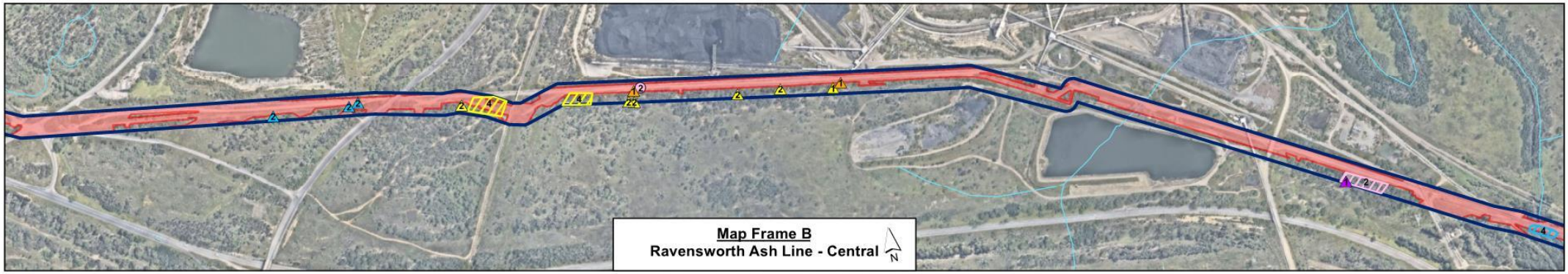
1. The weed removal team will require a site-specific induction, to understand what weeds are to be removed, the process of removal, identification of the native species, and the procedures to be followed.
2. Manual weed removal. Due to the high cover of intact native groundcover within Subject Site the manual removal of weeds will be prioritised where possible.

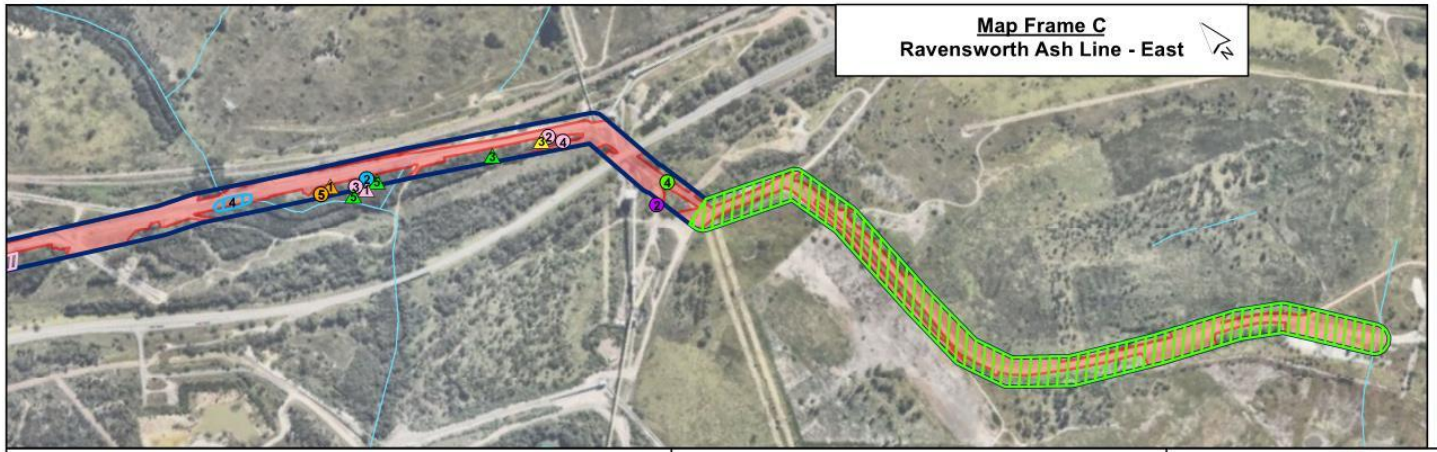
3. Weed propagules collected during weed control activities are to be taken offsite. This will stop weed material smothering native plants and prevent re-establishment. This material is to be taken to an appropriate waste disposal center to prevent further weed spread in the region.

4. Chemical weed control. Chemical should be applied only where application to larger weeds can be isolated (i.e. no broad application).

For concentrations and dosage rates on targeted chemical control, refer to the Department of Primary Industries New South Wales 'WeedWise' webpage (DPI, 2022). Any weed spraying should be conducted by an authorised person, having a Chemical Application Certificate or similar qualification. This would ensure that best practice is adhered to in consideration of the sensitive nature of the surrounding ecosystems.







Legend

- Subject Site
- Development Site
- Watercourse

Weed Locations & Areas

(Labelled with density - see table)

- *Acacia saligna* (Golden Wreath Wattle)
- *Cortaderia selloana* (Pampas Grass)
- *Galenia pubescens* (Galenia)
- *Heliotropium amplexicaule* (Blue Heliotrope)
- *Jacaranda mimosifolia* (Jacaranda)
- *Lantana camara* (Lantana)
- *Lycium ferocissimum* (African Boxthorn)
- *Olea europaea subsp. cuspidata* (African Olive)
- *Opuntia stricta* (Prickly Pear)
- *Phytolacca octandra* (Inkweed)
- *Ricinus communis* (Castor Oil Plant)
- *Tagetes minuta* (Stinking Roger)
- *Xaththium spinomum* (Bathurst Burr)

- *Acacia saligna* (Golden Wreath Wattle)
- *Galenia pubescens* (Galenia)
- *Grevillea robusta* (Silky Oak)
- *Heliotropium amplexicaule* (Blue Heliotrope)
- *Jacaranda mimosifolia* (Jacaranda)
- *Olea europaea subsp. cuspidata* (African Olive)
- *Opuntia stricta* (Prickly Pear)
- *Ricinus communis* (Castor Oil Plant)

Label	Weed Density
1	Negligible (<1%)
2	Sparse (1-5%)
3	Scattered (5-10%)
4	Light (10-30%)
5	Moderate (30-60%)

0 50 100 200 300 400 500 Metres

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PROJECT REFERENCE: 20230172

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DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2021
AGL Macquarie - 2020
Nearmap - 2022

Weed Mapping

AGL Macquarie Ltd
Biodiversity Management Plan
Ravensworth Ash Line Upgrade

FIGURE:

5

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3.4 POST CONSTRUCTION PHASE

3.4.1 Maintenance of Retained Vegetation

Continued actions will be required within the Subject Site following construction, with the aim of maintaining biodiversity values within Management Zone 2. Additional management actions may be provided in the Final Summary Report (See **Section 3.5**).

Weed Management

Weed management will be undertaken within Management Zones 1 and 2 in accordance with **Section 3.3.4.** Weed management following construction will continue prioritise the control of weeds identified within and adjacent to the site that are considered manageable (**Table 3**). Additional target species may be included in future monitoring reports.

The removal of exotic species following construction will be based on the recommendations provided in Final Summary Report.

Habitat Augmentation

Fallen and standing timber (coarse woody debris and dead branches, snags, stumps etc.) provides essential or important breeding, foraging or shelter habitat for many threatened species. Tree trunks and larger branches will to be removed from the development area during vegetation clearing. Suitable logs and branches may be cut up into long pieces (i.e. over 4 m where possible) and carefully placed into woodland and grassland areas within Management Zone 2, where practical. Placement of logs and branches are to be in such a way as to look natural, not add to bushfire risks, and to provide benefit to native fauna (on instruction from the project ecologist).

Feral Pest Baiting

A number of feral pests have been observed within the Study Area that have the potential to reduce the biodiversity value of the communities on site. Predation of native fauna by feral pest species such as the Red Fox (*Vulpes vulpes*), Feral Cat (*Felis catus*) and Pig (*Sus scrofa*) are considered to be a key threat for Central Hunter Valley Eucalypt Forest and Woodland CEEC (DAWE, 2016).

A feral animal baiting program is to be carried out following the completion of construction, targeting predatory animals such as the Red Fox (*Vulpes vulpes)* and Feral Cat (*Felis catus*). This program is to utilise ground baiting as per the PestSmart Guidelines (PestSmart, 2019). This will involve the installation of sodium fluoroacetate (1080) poison across Management Zone 2, following the completion of construction, by a suitably trained individual.

3.5 Adaptive Management/Operational Phase

Adaptive management will be undertaken within the Subject Site, throughout the implementation period, with monitoring and report recommendations used to continually inform management strategies. Monitoring and reporting requirements under this BMP are detailed below.

3.5.1 Monitoring Program

A monitoring program will be implemented to ensure that the measures detailed within this BMP are implemented and successful. The program will be completed throughout the implementation period, a summary of key monitoring events and deliverables are shown in **Table 4**. Monitoring program methods are detailed below. Reporting requirements are detailed in **Section 3.5.2**.

Table 4: Monitoring and Reporting Summary

Monitoring Event	Timing	Scope	Deliverable
Initial Monitoring Survey	Completed 6-months following the onset of construction. Report to be delivered within 1-month following site visit.	Assessment of compliance and performance criteria as per **Section 3.1.2.** Reassessment of weed mapping*.	Initial Monitoring Report
Ongoing Monitoring Surveys	Completed annually, for each year that construction remains active. The first ongoing survey is to occur 1-year after the completion of the initial monitoring survey. To be completed within 1-month following site visit.	Assessment of compliance and performance criteria as per **Section 3.1.2** An adaptive management plan based on findings of surveys.	Monitoring Report
Post-Construction Summary Report	Completed 1-year following the completion of construction. Report to be delivered within 1-month following site visit.	Completion of the Monitoring Programme. Assessment of compliance and performance criteria as per **Section 3.1.2.** Advice on future monitoring/ required works.	Final Summary Report

*Includes priority weed infestations adjacent to the site.

3.5.2 Reporting

Reporting requirements and timing of deliverables are summarised within **Table 4**, all monitoring and reporting will be completed by a suitably qualified person (i.e. project ecologist), content of reporting deliverables will are detailed below:

Initial Monitoring Survey Report: This report will detail an adaptive management plan, providing an assessment of compliance with mitigation methods and performance criteria (**Section 3.1.2**). Management actions may be provided based off the findings of the site visit. Weed mapping will be updated.

On-going Monitoring Survey Report: Similarly**,** this report will detail an adaptive management plan, providing an assessment of compliance with mitigation methods and performance criteria (**Section 3.1.2**). Management actions may be provided based off the findings of the site visit and previous the monitoring report(s).

Final Summary Report: Summary of the Monitoring Programme throughout, assessing the implementation of adaptive management actions. An assessment of the overall effectiveness and implementation of actions relevant to the performance criteria (**Section 3.1.2**). A final update of weed mapping will be completed. Future management actions may be provided, if necessary.

The Monitoring Program will be completed within the Subject Site as per the schedule detailed in **Section 3.5.1**. Monitoring methods address key performance criterion listed in **Section 3.1.2**. It is comprised of two (2) key components: *Vegetation Extent* and *Biodiversity Value Retention*. These are detailed below.

Vegetation Extent

The mapped extent of exotic plants presented in **Table 3** are to be updated during the monitoring event using a hand-held GPS. Additional exotic species deemed manageable may be included throughout the construction phase.

Biodiversity Value Retention

The compliance with, and effectiveness of, the management methods will be assessed including:

- An assessment of overall EEC and CEEC vegetation condition within the Subject Site including habitat values and weed infiltration.
- The continued presence of all trees demarcated for retention within the Subject Site.
- The placement salvaged habitat features (e.g. felled trees and bush rock) from the Development Site within retained vegetation of the Subject Site.
- An assessment of overall exotic plant abundance within the Subject Site.
- The implementation of a feral pest baiting program following the completion of construction.

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APPENDIX A FLORA AND FAUNA SPECIES LIST

Table A1: Study Area Flora Species List (Kleinfelder 2020)

No.	Family	Scientific Name	BAM Growth Form	Biosecurity Act 2015 Status
Introduced Species				
1	Aizoaceae	*Galenia pubescens*	High Threat	
2	Asteraceae	*Bidens pilosa*	High Threat	
3	Asteraceae	*Carthamus lanatus*	High Threat	
4	Asteraceae	*Senecio madagascariensis*	High Threat	Priority Weed in Hunter, Weed of National Significance
5	Cactaceae	*Opuntia stricta*	High Threat	Priority Weed in Hunter, Weed of National Significance
6	Iridaceae	*Romulea rosea*	High Threat	
7	Juncaceae	*Juncus acutus*	High Threat	
8	Oleaceae	*Olea europaea subsp. cuspidata*	High Threat	Priority Weed in Hunter
9	Poaceae	*Axonopus fissifolius*	High Threat	
10	Poaceae	*Bromus diandrus*	High Threat	
11	Poaceae	*Chloris gayana*	High Threat	
12	Poaceae	*Ehrharta erecta*	High Threat	
13	Poaceae	*Eragrostis curvula*	High Threat	
14	Poaceae	*Hyparrhenia hirta*	High Threat	Priority Weed in Hunter
15	Poaceae	*Megathyrsus maximus*	High Threat	
16	Solanaceae	*Lycium ferocissimum*	High Threat	Priority Weed in Hunter, Weed of National Significance
17	Apiaceae	*Cyclospermum leptophyllum*	Exotic	
18	Apocynaceae	*Gomphocarpus fruticosus*	Exotic	
19	Asphodelaceae	*Asphodelus fistulosus*	Exotic	
20	Asteraceae	*Aster subulatus*	Exotic	
21	Asteraceae	*Cirsium vulgare*	Exotic	
22	Asteraceae	*Conyza bonariensis*	Exotic	
23	Asteraceae	*Gamochaeta calviceps*	Exotic	
24	Asteraceae	*Hypochaeris radicata*	Exotic	
25	Asteraceae	*Leontodon rhagadioloides*	Exotic	
26	Asteraceae	*Soliva sessilis*	Exotic	
27	Asteraceae	*Sonchus asper*	Exotic	
28	Asteraceae	*Sonchus oleraceus*	Exotic	
29	Asteraceae	*Taraxacum officinale*	Exotic	
30	Brassicaceae	*Brassica spp.*	Exotic	
31	Brassicaceae	*Lepidium africanum*	Exotic	
32	Brassicaceae	*Rorippa microphylla*	Exotic	
33	Brassicaceae	*Sisymbrium spp.*	Exotic	
34	Caryophyllaceae	*Paronychia brasiliana*	Exotic	
35	Caryophyllaceae	*Petrorhagia nanteuilii*	Exotic	

No.	Family	Scientific Name	BAM Growth Form	Biosecurity Act 2015 Status
36	Caryophyllaceae	*Silene gallica*	Exotic	
37	Fabaceae (Faboideae)	*Medicago minima*	Exotic	
38	Fabaceae (Faboideae)	*Medicago spp.*	Exotic	
39	Fabaceae (Faboideae)	*Trifolium campestre*	Exotic	
40	Fabaceae (Faboideae)	*Trifolium repens*	Exotic	
41	Fabaceae (Faboideae)	*Trifolium subterraneum*	Exotic	
42	Lamiaceae	*Stachys arvensis*	Exotic	
43	Linaceae	*Linum trigynum*	Exotic	
44	Malvaceae	*Modiola caroliniana*	Exotic	
45	Malvaceae	*Pavonia hastata*	Exotic	
46	Malvaceae	*Sida rhombifolia*	Exotic	
47	Myrsinaceae	*Lysimachia arvensis*	Exotic	
48	Phyllanthaceae	*Phyllanthus tenellus*	Exotic	
49	Plantaginaceae	*Plantago lanceolata*	Exotic	
50	Poaceae	*Briza minor*	Exotic	
51	Poaceae	*Bromus catharticus*	Exotic	
52	Poaceae	*Lolium perenne*	Exotic	
53	Poaceae	*Lolium rigidum*	Exotic	
54	Poaceae	*Melinis repens*	Exotic	
55	Rubiaceae	*Richardia brasiliensis*	Exotic	
56	Rubiaceae	*Richardia stellaris*	Exotic	
57	Rutaceae	*Murraya paniculata*	Exotic	
58	Solanaceae	*Solanum nigrum*	Exotic	
59	Verbenaceae	*Lantana camara*	Exotic	Priority Weed in Hunter, Weed of National Significance
60	Verbenaceae	*Verbena bonariensis*	Exotic	
61	Verbenaceae	*Verbena hispida*	Exotic	
62	Verbenaceae	*Verbena rigida*	Exotic	
Endangered Population (BC Act)				
62	Fabaceae (Mimosoideae)	*Acacia pendula*	Tree (TG)	
Native Species				
63	Acanthaceae	*Brunoniella australis*	Forb (FG)	
64	Anthericaceae	*Arthropodium milleflorum*	Forb (FG)	
65	Apiaceae	*Daucus glochidiatus*	Forb (FG)	
66	Asteraceae	*Brachyscome dentata*	Forb (FG)	
67	Asteraceae	*Calotis cuneifolia*	Forb (FG)	
68	Asteraceae	*Calotis lappulacea*	Forb (FG)	
69	Asteraceae	*Chrysocephalum apiculatum*	Forb (FG)	
70	Asteraceae	*Chrysocephalum semipapposum*	Forb (FG)	
71	Asteraceae	*Cotula australis*	Forb (FG)	

No.	Family	Scientific Name	BAM Growth Form	Biosecurity Act 2015 Status
72	Asteraceae	*Cyanthillium cinereum*	Forb (FG)	
73	Asteraceae	*Cymbonotus lawsonianus*	Forb (FG)	
74	Asteraceae	*Euchiton sphaericus*	Forb (FG)	
75	Asteraceae	*Glossocardia bidens*	Forb (FG)	
76	Asteraceae	*Lagenophora stipitata*	Forb (FG)	
77	Asteraceae	*Vittadinia cuneata*	Forb (FG)	
78	Asteraceae	*Vittadinia muelleri*	Forb (FG)	
79	Campanulaceae	*Wahlenbergia communis*	Forb (FG)	
80	Campanulaceae	*Wahlenbergia gracilis*	Forb (FG)	
81	Campanulaceae	*Wahlenbergia spp.*	Forb (FG)	
82	Caryophyllaceae	*Spergularia marina*	Forb (FG)	
83	Casuarinaceae	*Allocasuarina luehmannii*	Tree (TG)	
84	Casuarinaceae	*Casuarina cristata*	Tree (TG)	
85	Casuarinaceae	*Casuarina glauca*	Tree (TG)	
86	Chenopodiaceae	*Atriplex semibaccata*	Shrub (SG)	
87	Chenopodiaceae	*Atriplex spp.*	Shrub (SG)	
88	Chenopodiaceae	*Einadia nutans subsp. linifolia*	Forb (FG)	
89	Chenopodiaceae	*Einadia nutans subsp. nutans*	Forb (FG)	
90	Chenopodiaceae	*Enchylaena tomentosa*	Shrub (SG)	
91	Chenopodiaceae	*Maireana enchylaenoides*	Forb (FG)	
92	Chenopodiaceae	*Maireana microphylla*	Shrub (SG)	
93	Chenopodiaceae	*Sclerolaena muricata*	Shrub (SG)	
94	Clusiaceae	*Hypericum gramineum*	Forb (FG)	
95	Commelinaceae	*Commelina cyanea*	Forb (FG)	
96	Convolvulaceae	*Convolvulus erubescens*	Other (OG)	
97	Convolvulaceae	*Dichondra repens*	Forb (FG)	
98	Crassulaceae	*Crassula sieberiana*	Forb (FG)	
99	Cyperaceae	*Carex inversa*	Grass & grasslike (GG)	
100	Cyperaceae	*Cyperus gracilis*	Grass & grasslike (GG)	
101	Cyperaceae	*Cyperus spp.*	Grass & grasslike (GG)	
102	Cyperaceae	*Fimbristylis dichotoma*	Grass & grasslike (GG)	
103	Euphorbiaceae	*Chamaesyce drummondii*	Forb (FG)	
104	Fabaceae (Caesalpinioideae)	*Senna barclayana*	Forb (FG)	
105	Fabaceae (Faboideae)	*Desmodium brachypodum*	Forb (FG)	
106	Fabaceae (Faboideae)	*Desmodium gunnii*	Forb (FG)	
107	Fabaceae (Faboideae)	*Desmodium spp.*	Other (OG)	
108	Fabaceae (Faboideae)	*Desmodium varians*	Other (OG)	
109	Fabaceae (Faboideae)	*Glycine clandestina*	Other (OG)	
110	Fabaceae (Faboideae)	*Glycine microphylla*	Other (OG)	
111	Fabaceae (Faboideae)	*Glycine tabacina*	Other (OG)	
112	Fabaceae (Faboideae)	*Templetonia stenophylla*	Forb (FG)	

No.	Family	Scientific Name	BAM Growth Form	Biosecurity Act 2015 Status
113	Fabaceae (Mimosoideae)	*Acacia implexa*	Shrub (SG)	
114	Fabaceae (Mimosoideae)	*Acacia salicina*	Tree (TG)	
115	Geraniaceae	*Erodium crinitum*	Forb (FG)	
116	Geraniaceae	*Geranium homeanum*	Forb (FG)	
117	Goodeniaceae	*Goodenia hederacea*	Forb (FG)	
118	Goodeniaceae	*Goodenia heterophylla*	Forb (FG)	
119	Lamiaceae	*Ajuga australis*	Forb (FG)	
120	Lamiaceae	*Scutellaria humilis*	Forb (FG)	
121	Lamiaceae	*Spartothamnella juncea*	Shrub (SG)	
122	Linaceae	*Linum marginale*	Forb (FG)	
123	Lobeliaceae	*Pratia purpurascens*	Forb (FG)	
124	Lomandraceae	*Lomandra filiformis*	Grass & grasslike (GG)	
125	Lomandraceae	*Lomandra multiflora subsp. multiflora*	Grass & grasslike (GG)	
126	Loranthaceae	*Amyema cambagei*	Other (OG)	
127	Malvaceae	*Abutilon oxycarpum*	Shrub (SG)	
128	Malvaceae	*Brachychiton populneus*	Tree (TG)	
129	Malvaceae	*Sida corrugata*	Forb (FG)	
130	Malvaceae	*Sida hackettiana*	Forb (FG)	
131	Myrtaceae	*Angophora floribunda*	Tree (TG)	
132	Myrtaceae	*Corymbia maculata*	Tree (TG)	
133	Myrtaceae	*Eucalyptus crebra*	Tree (TG)	
134	Myrtaceae	*Eucalyptus melliodora*	Tree (TG)	
135	Myrtaceae	*Eucalyptus moluccana*	Tree (TG)	
136	Myrtaceae	*Eucalyptus punctata*	Tree (TG)	
137	Myrtaceae	*Eucalyptus spp.*	Tree (TG)	
138	Myrtaceae	*Eucalyptus tereticornis*	Tree (TG)	
139	Oleaceae	*Jasminum suavissimum*	Other (OG)	
140	Oleaceae	*Notelaea microcarpa*	Tree (TG)	
141	Other	*Unknown herb*	Forb (FG)	
142	Other	*Unknown herb - Succulent*	Forb (FG)	
143	Other	*Unknown herb #2*	Forb (FG)	
144	Oxalidaceae	*Oxalis perennans*	Forb (FG)	
145	Phormiaceae	*Dianella revoluta*	Forb (FG)	
146	Phyllanthaceae	*Phyllanthus virgatus*	Forb (FG)	
147	Pittosporaceae	*Bursaria spinosa*	Shrub (SG)	
148	Pittosporaceae	*Rhytidosporum spp.*	Shrub (SG)	
149	Plantaginaceae	*Plantago debilis*	Forb (FG)	
150	Plantaginaceae	*Plantago hispida*	Forb (FG)	
151	Poaceae	*Anthosachne scabra*	Grass & grasslike (GG)	
152	Poaceae	*Aristida echinata*	Grass & grasslike (GG)	
153	Poaceae	*Aristida ramosa*	Grass & grasslike (GG)	

No.	Family	Scientific Name	BAM Growth Form	Biosecurity Act 2015 Status
154	Poaceae	*Austrostipa scabra*	Grass & grasslike (GG)	
155	Poaceae	*Austrostipa spp.*	Grass & grasslike (GG)	
156	Poaceae	*Austrostipa verticillata*	Grass & grasslike (GG)	
157	Poaceae	*Bothriochloa macra*	Grass & grasslike (GG)	
158	Poaceae	*Chloris spp.*	Grass & grasslike (GG)	
159	Poaceae	*Chloris truncata*	Grass & grasslike (GG)	
160	Poaceae	*Chloris ventricosa*	Grass & grasslike (GG)	
161	Poaceae	*Cymbopogon refractus*	Grass & grasslike (GG)	
162	Poaceae	*Cynodon dactylon*	Grass & grasslike (GG)	
163	Poaceae	*Dichelachne micrantha*	Grass & grasslike (GG)	
164	Poaceae	*Digitaria diffusa*	Grass & grasslike (GG)	
165	Poaceae	*Echinopogon caespitosus*	Grass & grasslike (GG)	
166	Poaceae	*Eragrostis brownii*	Grass & grasslike (GG)	
167	Poaceae	*Eragrostis leptostachya*	Grass & grasslike (GG)	
168	Poaceae	*Microlaena stipoides var. stipoides*	Grass & grasslike (GG)	
169	Poaceae	*Panicum effusum*	Grass & grasslike (GG)	
170	Poaceae	*Panicum simile*	Grass & grasslike (GG)	
171	Poaceae	*Panicum spp.*	Grass & grasslike (GG)	
172	Poaceae	*Phragmites australis*	Grass & grasslike (GG)	
173	Poaceae	*Poa sieberiana*	Grass & grasslike (GG)	
174	Poaceae	*Poa spp.*	Grass & grasslike (GG)	
175	Poaceae	*Rytidosperma fulvum*	Grass & grasslike (GG)	
176	Poaceae	*Sporobolus creber*	Grass & grasslike (GG)	
177	Poaceae	*Themeda triandra*	Grass & grasslike (GG)	
178	Polygonaceae	*Persicaria spp.*	Forb (FG)	
179	Polygonaceae	*Rumex brownii*	Forb (FG)	
180	Pteridaceae	*Cheilanthes distans*	Fern (EG)	
181	Pteridaceae	*Cheilanthes sieberi subsp. sieberi*	Fern (EG)	
182	Rubiaceae	*Asperula conferta*	Forb (FG)	
183	Rubiaceae	*Opercularia diphylla*	Forb (FG)	
184	Rubiaceae	*Psydrax odorata*	Shrub (SG)	
185	Scrophulariaceae	*Eremophila debilis*	Shrub (SG)	
186	Scrophulariaceae	*Myoporum montanum*	Shrub (SG)	
187	Scrophulariaceae	*Veronica plebeia*	Forb (FG)	
188	Solanaceae	*Solanum cinereum*	Shrub (SG)	
189	Solanaceae	*Solanum prinophyllum*	Forb (FG)	
190	Solanaceae	*Solanum spp.*	Forb (FG)	
191	Stackhousiaceae	*Stackhousia viminea*	Forb (FG)	
192	Typhaceae	*Typha domingensis*	Grass & grasslike (GG)	
193	Vitaceae	*Cayratia clematidea*	Other (OG)	

Table A2: Study Area Fauna List (Kleinfelder 2020)

No.	Scientific Name	Common Name	Legal Status
Amphibians			
1.	*Crinia signifera*	Common Eastern Froglet	
2.	*Limnodynastes tasmaniensis*	Spotted Grass Frog	
3.	*Litoria fallax*	Eastern Dwarf Tree Frog	
4.	*Litoria latopalmata*	Broad-palmed Frog	
5.	*Litoria peronii*	Peron's Tree Frog	
Birds			
6.	*Aegotheles cristatus*	Owlet Nightjar	
7.	*Aquila audax*	Wedge-tailed Eagle	
8.	*Chthonicola sagittata*	Speckled Warbler	Vulnerable (BC Act)
9.	*Corcorax melanorhamphos*	White Winged Chough	
10.	*Corvus coronoides*	Australian Raven	
11.	*Cracticus nigrogularis*	Butcher Bird	
12.	*Cracticus torquatus*	Grey Butcherbird	
13.	*Elanus axillaris*	Black-shouldered Kite	
14.	*Eolophus roseicapilla*	Gallah	
15.	*Glossopsitta pusilla*	Little Lorikeet	Vulnerable (BC Act)
16.	*Glossopsitta concinna*	Musk Lorikeet	
17.	*Trichoglossus moluccanus*	Rainbow Lorikeet	
18.	*Chenonetta jubata*	Australian Wood Duck	
19.	*Grallina cyanoleuca*	Magpie Lark	
20.	*Manorina melanocephala*	Noisy Miner	
21.	*Megalurus mathewsi*	Rufous Songlark	
22.	*Melanodryas cucullata*	Hooded Robin	Vulnerable (BC Act)
23.	*Podargus strigoides*	Tawny Frogmouth	
24.	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler	Vulnerable (BC Act)
25.	*Rhipidura leucophrys*	Willy Wagtail	
Fish			
26.	*Gambusia holbrooki**	Mosquito Fish	Feral
Mammals			
27.	*Antechinus stuartii*	Brown Antechinus	
28.	*Canis familiaris**	Wild Dog	
29.	*Chalinolobus gouldii*	Gould's Wattled Bat	
30.	*Chalinolobus morio*	Chocolate Wattled Bat	
31.	*Isoodon macrourus*	Northern Brown Bandicoot	
32.	*Lepus europaeus**	European Hare	
33.	*Macropus giganteus*	Eastern Grey Kangaroo	
34.	*Macropus robustus*	Wallaroo	
35.	*Macropus rufogriseus*	Red-necked Wallaby	

No.	Scientific Name	Common Name	Legal Status
36.	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	Vulnerable (BC Act)
37.	*Mormopterus* Sp. 2	Undescribed Freetail-bat	
38.	*Mormopterus* Sp. 4	Southern Free-tailed Bat	
39.	*Mus musculus**	House Mouse	Feral
40.	*Myotis macropus*	Southern Myotis	Vulnerable (BC Act)
41.	*Nyctophilus* sp.	Long-eared Bat	
42.	*Oryctolagus cuniculus**	European Rabbit	
43.	*Petaurus breviceps*	Sugar Glider	
44.	*Petaurus norfolcensis*	Squirrel Glider	Vulnerable (BC Act)
45.	*Pteropus poliocephalus*	Grey Headed Flying Fox	
46.	*Rattus rattus**	Black Rat	Feral
47.	*Sminthopsis murina*	Common Dunnart	
48.	*Tachyglossus aculeatus*	Echidna	
49.	*Trichosurus vulpecula*	Brush-tailed Possum	
50.	*Vespadelus pumilus*	Eastern Forest Bat	
51.	*Vulpes vulpes**	Red Fox	Feral
Reptiles			
52.	*Anomalopus leuckartii*	Two-clawed Worm-skink	
53.	*Chelodina longicollis*	Snake-necked Turtle	
54.	*Ctenotus robustus*	Eastern Stripped Skink	
55.	*Delma impar*	Stripped Legless Lizard	Vulnerable (BC Act and EPBC Act)
56.	*Delma plebeia*	Leaden Delma	
57.	*Diplodactylus vittatus*	Eastern Stone Gecko	
58.	*Egernia striolata*	Tree Skink	
59.	*Intellagama lesueurii*	Eastern Water Dragon	
60.	*Parasuta dwyeri*	Dwyer's Snake	
61.	*Pogona barbata*	Eastern Bearded Dragon	
62.	*Pseudonaja textilis*	Brown Snake	
63.	*Underwoodisaurus milii*	Thick-tailed Gecko	
64.	*Varanus varius*	Lace Monitor	

* Denotes exotic species.

APPENDIX B STAFF CONTRIBUTIONS

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

Name	Qualification	Title/Experience	Contribution
David Martin	MSc	Ecologist (Botanist)	Report review
James Baldry	MBioCons	Ecologist	Report author, field surveys
Ben Stewart	MMSc&Mgt	Field Assistant / Ecologist	Field surveys
Emily Fittell	BSc (Hons)	Ecologist	Report review
Gayle Joyce	BSc (Forestry) (Hons)	GIS Specialist	GIS and figure preparation

APPENDIX C LICENSE AND PERMITS

Kleinfelder employees involved in the current study are licensed or approved under the *Biodiversity Conservation Act 2016* (License Number: SL100730, Expiry: 31 March 2023) 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.

APPENDIX D REGULATORY CONSULTATION ADDRESSED

Robert Gibson

From: Robert Gibson
Sent: Thursday, 7 July 2022 6:30 PM
To: matthew.parkinson@agl.com.au
Cc: Steven Crick
Subject: RE: Major Projects – Proponent Request for Advice - Bayswater Power Station Upgrade - Biodiversity Management Plan: Ash Line Upgrade (SSD-9697-PA-4) (Muswellbrook Shire,Singleton Shire)

Dear Matthew,
On 10 June 2022 Planning and Assessment Division of the Department of Planning and Environment (the Department) provided Biodiversity and Conservation Division (BCD) of the Department with a copy of the Biodiversity Management Plan for the Ravensworth – Bayswater Ash Line Upgrade. This is part of the Bayswater Power Station Upgrade Project (SSD-9697). Schedule 2, Condition B12(b) requires that the Biodiversity Management Plan is prepared 'in consultation with' the NSW Biodiversity and Conservation Science Directorate, of which BCD is a part, hence our involvement in the process.

BCD has reviewed the Biodiversity Management Plan and recommends that weed management for the project area (Section 2.2.1 'Weed Incursions') includes the identification adjacent areas that are most likely to be a source of weeds to the project area and ensures that they are monitored (Section 3.5.1 'Monitoring Program'). This is particularly so where the adjacent area is upslope of the project area. The project area is linear and so is more susceptible to weed incursions from adjacent areas than a project with a rectangular shape.

If you have any questions about this advice, please do not hesitate to contact Robert Gibson, Senior Regional Biodiversity Conservation Officer, via huntercentralcoast@environment.nsw.gov.au or 02 4927 3154.

Yours sincerely
Robert

Robert Gibson
Senior Regional Biodiversity Conservation Officer, Hunter Central Coast Branch

Biodiversity and Conservation Division| Department of Planning and Environment
T 02 4927 3154 | **E** robert.gibson@environment.nsw.gov.au
6 Stewart Avenue NEWCASTLE NSW 2300
Locked Bag 1002 DANGAR NSW 2309
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Our Vision: Together, we create thriving environments, communities and economies.

The Department of Planning and Environment acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

Please note our branch email address has changed. Please send all new planning requests to huntercentralcoast@environment.nsw.gov.au where they will be entered into our document management system and be forwarded to our Senior Team Leader.

From: no-reply@majorprojects.planning.nsw.gov.au <no-reply@majorprojects.planning.nsw.gov.au>
Sent: Friday, 10 June 2022 3:35 PM
To: Bernadette Hughes <Bernadette.Hughes@environment.nsw.gov.au>; OEH ROD Hunter Central Coast Mailbox <huntercentralcoast@environment.nsw.gov.au>; OEH Planning Matters Mailbox <PlanningMatters@environment.nsw.gov.au>
Subject: Major Projects – Proponent Request for Advice - Bayswater Power Station Upgrade - Biodiversity Management Plan: Ash Line Upgrade (SSD-9697-PA-4) (Muswellbrook Shire,Singleton Shire)

A proponent is requesting advice in relation to a post approval matter for the Bayswater Power Station Upgrade.

Please sign in to your account to view the details of this request and to upload your advice.

If you have any enquiries about this request, you can contact Matthew Parkinson at matthew.parkinson@agl.com.au.

To sign in to your account click here or visit the Major Projects Website.
Please do not reply to this email.

Kind regards

The Department of Planning and Environment

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Bayswater Power Station Upgrade
Post Approval Review

Biodiversity Management Plan, Condition B12, Schedule 2	Sufficient (Yes/No/Partial)	Document reference and comment	Action Required	Company Response
Prior to the commencement of construction of the development, the Applicant must prepare a Biodiversity Management Plan (BMP) to the satisfaction of the Planning Secretary. The BMP must: (a) be prepared by a suitably qualified and experienced biodiversity expert/s;	Yes	Qualifications provided in Appendix B		
(b) be prepared in consultation with the BCS;	Yes	BCS comments have been addressed		
(c) describe how biodiversity offsets required in condition B11 will be retired;	No	Not provided	Note how credits have been retired	Included – Sec 1.4.2
(d) describe measures to be implemented within the approved disturbance areas to: (i) minimise the amount of vegetation clearing, in particular, by designing surface infrastructure to minimise clearing of EECs and CEECs;	Partial	Generally provided throughout Section 3 Plan should more explicitly note how opportunities to further minimise clearing have been identified or ruled out It is noted Section 3.2.2 identifies that parking and stockpiling areas should avoid areas containing high quality vegetation.	Update the plan to more explicitly identify opportunities to further minimise clearing have/will be identified or ruled out. If opportunities are limited to locations for car parking and stockpiling then this should be noted.	Updated and noted
(ii) minimise impacts on fauna, including undertaking pre-clearance surveys;	Yes	Provided in Section 3.2 and 3.3		
(iii) minimise impacts on tree hollows, where reasonable and feasible;	Yes	Provided in Section 3.2 and 3.3		
(iv) manage potential indirect and prescribed impacts on flora and fauna; and	Yes	Provided in Section 3.2 and 3.3		
(v) maximise the salvage of resources, including tree hollows, vegetation and soil resources, for beneficial reuse, including fauna habitat enhancement; and	Yes	Provided in Section 3.3.2		
describe the measures to be implemented on the site to:	Partial	It should be clearer how this requirement has been addressed	Refer to comments on (d) above which will address this comment	Updated and noted

(i) minimise impacts to threatened ecological communities listed under the BC Act and EPBC Act, and contribute to conservation strategies for these communities;				
(ii) minimise impacts on fauna habitat resources such as habitat trees, fallen timber and hollow-bearing trees;	Yes	Provided in Section 3.2 and 3.3		
(iii) protect vegetation and fauna habitat outside of the approved disturbance areas;	Yes	Provided in Section 3.2 and 3.3		
(iv) manage the collection and propagation of seed from the local area; and	n/a	n/a		
(v) control weeds and feral pests; and	Yes	Provided in Section 3.3.4 - BCS requested updates on this matter which have been addressed		
include a program to monitor, evaluate and report on the effectiveness of the measures	No	Not provided	Update the plan to include this	Sec 3.5.2
General Comments			**Action Required**	**Company Response**
Conditions of consent			Include table for all plans that includes the relevant conditions and where they are addressed in the management plan	Included – Sec 1.4.3