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Boral Dunmore Operations

Dunmore Lakes Sand Project
Flora and Fauna Management Plan

October 2023

Document control

Rev No.	Date	Prepared By	Approved By	Comments
1	15/4/16	Laura Hoffman (Arcadis)	Brad Searle (Arcadis)	Draft Flora and Fauna Management Plan
2	29/7/16	Laura Hoffman (Arcadis)	Brad Searle (Arcadis)	Final Flora and Fauna Management Plan
3	16/12/16	Laura Hoffman (Arcadis)	Brad Searle (Arcadis)	Final Flora and Fauna Management Plan
4	6/2/17	Laura Hoffman (Arcadis)	Brad Searle (Arcadis)	Final Flora and Fauna Management Plan
5	1/6/2021	Emilie Mascarenhas (Cambium Group)	Mark Nolan (Cambium Group)	Updated to Modification 2 Conditions of Approval
6	10/07/2021	Emilie Mascarenhas (Cambium Group)	Mark Nolan (Cambium Group)	Updated to incorporate Shellharbour Council, Kiama Council and Fisheries NSW comments
7	12/07/2021	Emilie Mascarenhas (Cambium Group)	Mark Nolan (Cambium Group)	Updated to incorporate DPIE comments
8	27/10/2023	Emilie Mascarenhas (Cambium Group)	Mark Nolan (Cambium Group)	Updated following annual review

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Abbreviations

BAM	Biodiversity Assessment Method
BCD	Biodiversity & Conservation Division within the Department
CoA	Condition of Approval
DPIE	Department of Planning, Investment & Environment
DLSP	Dunmore Lakes Sand Project
EEC	Endangered Ecological Community
EPA	Environment Protection Authority
FFMP	Flora and Fauna Management Plan
HTE	High Threat Exotic
VENM	Virgin excavated natural material
SEPP	State Environmental Planning Policy
TEC	Threatened Ecological Community

1 INTRODUCTION

1.1 BACKGROUND

The Dunmore Lakes Sand Project (DLSP) is a sand dredging and processing operation producing a range of sand and landscaping products into the local and Sydney markets. The Project is located on the Princess Highway approximately seven kilometres north of Kiama on the NSW South Coast.

Development Consent (DA 195-8-2004) as modified in 2020 for Stage 5 requires the preparation implementation of a number of management plans to guide the environmental management of the development throughout its operational life.

Dunmore Lakes Sand Project currently manages flora and fauna for this project in accordance an approved Flora and Fauna Management Plan (FFMP) prepared by Aradis (2017). This FFMP incorporated a Vegetation Clearing Protocol, a Compensatory Habitat Management Plan and a Pest and Weed Management Plan. The Consolidated Consent as modified in 2020, Schedule 3, Condition of Approval 38, requires the FFMP to be updated. The FFMP has been updated by Cambium Group, who have been endorsed by the Planning Secretary (Appendix A).

1.2 PROJECT DESCRIPTION

The DLSEP is owned and operated by Boral Resources (NSW) Pty Ltd. The site is located at Tabbita Road, Dunmore within the Shellharbour Local Government Area.

The existing site (Stages 2, 3 and 4) covers 88 hectares and is bound by the Princes Motorway (Kiama Bypass) to the east and private property, predominantly agricultural grazing land, to the south, north and west (Figure 1). Operation of the quarry involves the sequential dredging and excavation of approximately 8 million tonnes of sand and soil from Stage 2, 3 & 4 and 1.35 million tonnes of sand and soil from stage 5.

Stage 5 is located approximately 1.1 km south- south east of the existing site, covers approximately 38 ha and is on an alluvial coastal flood plain, adjacent to the tidal reaches of the Minnamurra River. The northern portion of the extraction area has been partially cleared and has historically been used for grazing. Stage 5 is bound by Riverside Drive to the north and Princes Highway to the west.

Operation of the quarry involves the sequential dredging and excavation of approximately eight million tonnes of sand and soil from Stage 2, 3 & 4, and 1.35 million tonnes of sand and soil from Stage 5.

The method of extraction of these resources includes both sand and soil extraction by excavator and dredge sand extraction, followed by washing, processing and material blending.

Upon the completion of sand extraction, progressive backfilling of each stage with virgin excavated natural materials (VENM) will be undertaken, to progressively rehabilitate the site. The reconstructed landform will ultimately support lakes, wetlands and revegetated Endangered Ecological Communities and grazing land.

1.3 OBJECTIVES OF THE PLAN

The purpose of this Flora and Fauna Management Plan (FFMP) is to provide a single operational document that clearly identifies key management issues, management objectives and actions to be implemented in accordance with development consent requirements, the proposed schedule for implementation as well as the monitoring and review of commitments included in this FFMP. This FFMP

will also include a set of clear and concise maps and diagrams showing the locations of management areas.

1.4 CONSULTATION

The previous version of the FFMP was prepared in consultation with Department of Planning, Shellharbour City Council, DPI-Fisheries and Department of Environment and Conservation.

Shellharbour Council, Kiama Council and Fisheries NSW have been consulted in the development of this updated plan. Evidence of correspondence with these agencies is provided in Appendix F and responses to their comments are provided in Table 1 below.

Table 1 Response to comments from Kiama Council, Shellharbour Council and Fisheries NSW

Comment	Response	Update to FFMP
Kiama Council		
Section 3.1.4 - Should Cotoneaster be a weed that is being controlled not planted?	Cotoneater is an exotic species. This paragraph indicates it was used in landscaping/garden plantings around buildings, along with a range of native (but not necessarily endemic) species. Details on the type of garden plants in this area are not relevant to the FFMP.	Detail on garden species in Stage 4 has been removed to avoid confusion.
Section 4.1.4 – Correct spelling error	Typographical error.	Corrected.
Section 4.2.3 – Correct spelling error	Typographical error.	Corrected.
Shellharbour Council		
Section 2.5 - Alignment with other Plans. The Biodiversity Development Assessment Report should be listed as there would have been mitigation measures provided that should be included in the Plan.	This is included in Appendix F of the EIS (already listed), but this can be clarified in the text.	Required detail entered into the document.
Appendix B- Vegetation Clearing Protocol, B.3 Relevant Legislation. Should list the Biodiversity Conservation Act (due to the EEC's present and the potential for threatened species to be present	Acknowledged.	Required detail entered into the document.
Appendix C – Region specific approval requirements. Approvals to be considered- NSW- Local Council - I don't believe that there is a requirement for Local Council to approve vegetation clearing, this is all through the Major Project application/SEPP, EIS and associated BDAR.	This is Boral's Ground Disturbance and Vegetation Clearing Form 01.	No proposed changes to the document.
Appendix D- Compensatory Habitat Management Plan. D.3 Relevant Legislation. Should list the Biodiversity Conservation Act (due to the EEC's present and the potential for threatened species to be present).	Acknowledged.	Required detail entered into the document.
Appendix E Pest and Weed Management Plan - E.3 Relevant Legislation. Could also list the Local Land Services Act.	Acknowledged.	Required detail entered into the document.
Appendix E Pest and Weed Management Plan - E.4 - Relevant References. The plan is to be consistent with the Regional Pest Management Plan 2018-2023 South East Regional Strategic Pest Animal Plan 2018-2023 (nsw.gov.au)	Acknowledged.	Required detail entered into the document.

Appendix E Pest and Weed Management Plan - E.5 Weed and Pest Species of the Site should also reference the High threat weeds list to be consistent with the Biodiversity Assessment Method	High threat weeds are listed in Section 5.1.	Update heading of Section 5.1 for clarity.
Appendix E Pest and Weed Management Plan - E.6.3 Chemical Treatment of weeds - Should list that chemicals are to be used consistently as listed by the Australian Pesticides and Veterinary Medicines Authority (APVMA).	Acknowledged.	Required detail entered into the document.
Fisheries NSW		
We note that the works have provided buffers to the adjacent important wetland and fish habitats and will not impact on key fish habitat. We therefore do not have any further comments in relation to the plan.	Acknowledged.	No proposed changes to the document.

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Figure 1
Stie locality
Flora and Fauna Management Plan / Dunmore Lakes Sand Project

CAMBIUM GROUP

Source: LPI (2017), Aerometrex (2023), Boral (2016), Cambium Group (2019).

1.5 Document Structure

The structure of this FFMP is outlined in Table 2.

Table 2 Structure of this FFMP

Section	Content
1	Provides an overview of the project, previous environmental assessments of the project, and the purpose and scope of this plan.
2	Details the statutory requirements for the Plan as outlined in the CoA issued by the NSW Department of Planning and Infrastructure and other legislative requirements.
3	Describes the existing environment of the site and significant biodiversity values contained within the site.
4	Describes the management actions to be undertaken to effectively manage the flora and fauna values of the site.
5	Outlines the monitoring, reporting and review requirements pertaining to flora and fauna management within the site
6	Specifies the environmental induction training to delivered to all staff and subcontractors involved in the project
7	Outlines the requirements pertaining to contingency planning, including emergency incident reporting and management
8	Lists the references used in the preparation of this plan
Appendix A	Endorsement of experts
Appendix B	Vegetation Clearing Protocol
Appendix C	Ground Disturbance and Vegetation Clearing
Appendix D	Compensatory Habitat Management Plan
Appendix E	Weed and Pest Management Plan
Appendix F	Evidence of consultation

2 RELEVANT LEGISLATION, GUIDELINES AND PLANS

2.1 LEGISLATION

Key environmental legislation relating to flora and fauna management includes:

- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *NSW Biodiversity Conservation Act 2016* (BC Act)
- *NSW Threatened Species Conservation Act 1995* (TSC Act)
- *NSW Fisheries Management Act 1994* (FM Act)
- *NSW Environment Planning and Assessment Act 1979* (EP&A Act)
- *NSW National Parks and Wildlife Act 1974* (NPW Act)
- *NSW Biosecurity Act 2015* (BS Act)
- *NSW Water Management Act 2000* (WM Act).

2.2 GUIDELINES

Guidelines that have been applied to the development of this Plan include:

- Hygiene Protocol for the control of Disease in Frogs (DECC 2008).
- Code of Practice for Injured, Sick and Orphaned Protected Fauna (OEH 2011).
- Code of Practice for injured, sick and orphaned flying foxes (OEH 2012).
- Code of Practice for injured, sick and orphaned koalas (OEH 2011).
- Guidelines for the rehabilitation of birds of prey (DECCW 2011).
- Prevention of Cruelty to Animals Act 1979.
- FloraBank Native Seed Collection Guidelines (FloraBank NSW 1999).
- Guidelines for the Translocation of Threatened Plants in Australia – Second Edition (Australian Network for Plant Conservation 2004).

2.3 CONDITIONS OF APPROVAL

The quarry operates under Development Application DA 195-8-2004 first granted on 29 June 2005, which has been modified three times. The latest modification occurred in 2020 (MOD 2 Consolidated Consent).

A number of the Conditions of Approval (CoA) from MOD 2 Consolidated Consent are relevant to this Plan and have been considered in its preparation (Table 3).

Table 3 Conditions of Consent

Condition of Approval	Condition Requirements	Where referenced in this plan
Flora and Fauna Management Plan		
38	Prior to undertaking any vegetation clearing associated with Modification 2, the Applicant must update the Flora and Fauna Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:	This Plan
	a) be prepared by suitably qualified ecologist and experienced person/s whose appointment has been endorsed by the Planning Secretary;	Section 1.1
	b) be prepared in consultation with Shellharbour Council, Kiama Council and Fisheries NSW;	Section 1.4 Evidence of Consultation (Appendix F)
	c) describe the short, medium and long-term measures to be undertaken to manage remnant vegetation and fauna habitat on the site;	Section 4.2
	d) describe the measures to be implemented within the approved disturbance areas to: (i) minimise the amount of clearing where practicable (eg through adaptive management of ancillary infrastructure) and delineate the areas of vegetation to be cleared;	Section 4.1 Vegetation Clearing Protocol (Appendix B)
	(ii) ensure that clearing is undertaken progressively;	Section 4.2 Vegetation Clearing Protocol (Appendix B)
	(iii) minimise impacts on fauna, including undertaking pre-clearance surveys;	Vegetation Clearing Protocol (Appendix B)
	(iv) provide for the reasonable salvage, transplanting and/or propagation of threatened flora found during pre-clearance surveys, in accordance with the *Guidelines for the Translocation of Threatened Plants in Australia* (Vallee et al., 2004); and	Vegetation Clearing Protocol (Appendix B)
	(v) maximise the salvage of resources, including tree hollows,	Vegetation Clearing Protocol (Appendix B)
	e) describe the measures to be implemented on the site to: (i) minimise impacts to threatened ecological communities listed under the BC Act and contribute to conservation strategies for these communities;	Section 4.2 Section 4.7 Compensatory Habitat Management Plan (Appendix D)
	(ii) minimise impacts on fauna habitat resources such as hunting and foraging areas, habitat trees, fallen timber, hollow-bearing trees and downstream fish habitats;	Section 4.1 Vegetation Clearing Protocol (Appendix B)

	(iii) enhance the quality of vegetation, vegetation connectivity and wildlife corridors including through the revegetation of appropriate canopy, sub-canopy, understorey and ground strata within the wetland vegetation to be established around the pond verges;	Section 4.7 Compensatory Habitat Management Plan (Appendix D)
	(iv) introduce naturally scarce fauna habitat features such as nest boxes and salvaged tree hollows in the final landform and promote the use of these introduced habitat features by threatened fauna species;	Section 4.6 Vegetation Clearing Protocol (Appendix B)
	(v) manage any potential conflicts with Aboriginal heritage values;	Section 4.1.4 Ground Disturbance and Vegetation Clearing (Appendix C)
	(vi) protect vegetation and fauna habitat outside of the approved disturbance areas;	Section 4.2 Vegetation Clearing Protocol (Appendix B)
	(vii) manage the collection and propagation of seed from the local area;	Section 4.7 Vegetation Clearing Protocol (Appendix B)
	(viii) control weeds, including measures to avoid and mitigate the spread of noxious weeds;	Pest and Weed Management Plan (Appendix E)
	(ix) control feral pests with consideration of actions identified in relevant threat abatement plans;	Pest and Weed Management Plan (Appendix E)
	(x) control erosion;	Vegetation Clearing Protocol (Appendix B)
	(xi) manage any grazing and agriculture;	Vegetation Clearing Protocol (Appendix B)
	(xii) control access to vegetated or revegetated areas; and	Vegetation Clearing Protocol (Appendix B)
	(xiii) manage bushfire hazards	Section 4.5
	f) include a seasonally based program to monitor and report on the effectiveness of the above measures, progress against the detailed performance indicators and completion criteria, and identify any improvements that could be implemented to improve biodiversity outcomes;	Section 4.7
	g) include a Compensatory Habitat Management Plan that: (i) describes the compensatory habitat proposal; (ii) justifies why the proposed area(s) is suitable for the compensatory habitat proposal, including how the area will integrate with existing habitat areas on and near the site; (iii) establishes baseline data for the existing habitat in the proposed area(s);	Compensatory Habitat Management Plan (Appendix D)

	(iv) describes how the compensatory habitat proposal would be implemented; (v) sets completion criteria for the compensatory habitat proposal; and (vi) (vi) describes how the performance of the compensatory habitat proposal would be monitored over time;	
	h) include detailed performance and completion criteria for evaluating the performance of the compensatory habitat and offset requirements of conditions 37 and 37A and rehabilitation of the site, including triggers for remedial action, where these performance or completion criteria are not met; and	Section 4.7
	i) include details of who would be responsible for monitoring, reviewing, and implementing the plan.	Section 5

2.4 Licences and Permits

2.4.1 Environmental Protection Licence

The Environment Protection Authority (EPA) issues environment protection licences to the owners or operators of various industrial premises under the *Protection of the Environment Operations Act 1997* (POEO Act). Licence conditions relate to pollution prevention and monitoring, and cleaner production through recycling and reuse and the implementation of best practice. All licence holders must:

- Comply with the conditions of their licence.
- Prepare pollution incident response management plans.
- Publish and/or make pollution monitoring data available.

2.5 Alignment with other Plans relevant to the Project

This document updates the Dunmore Lakes Sand Project Flora and Fauna Management Plan prepared by Arcadis (2017), and has also been informed by:

- Flora and Fauna Assessment for the Dunmore Lakes Sand Extraction Proposal Stage 2, 3 and 5 (Kevin Mills & Associates 2004).
- Dunmore Lakes Sand Extraction Proposal Stage 2, 3 and 5 Environmental Impact Assessment (R.W. Corkery & Co. 2004).
- Dunmore Lakes Sand Extraction Project Modification 2 Environmental Assessment (Element Environment 2019) updated April 2019 (including Appendix F - Biodiversity Development Assessment Report) and associated Response to Submissions updated June 2019.

A number of other management plans apply to Dunmore Lakes Sand Project including a Rehabilitation Management Plan, Water Management Plan, Heritage Management Plan and Bushfire Management Plan. The management actions in this plan complement those outlined in these other plans, and should be considered holistically.

3 EXISTING ENVIRONMENT

3.1 SITE DESCRIPTION

Dredging commenced for stages 2 to 4 in June 2007. Since then, due to the high demand for sand in the Sydney market, Sand in Stage 2 has been extracted with dredging recently moving into Stage 3. Given recent high demand, the sand resource in Stage 3 is expected to be exhausted during 2021. The last extraction stage (Stage 4) encompasses an area containing the road access and private rail line to the approved project, supporting infrastructure for stages 2 to 4 and Boral's adjacent Dunmore Hard Rock Quarry. Given this, Stage 4 cannot be extracted until these activities are relocated. Stages 5A and Stage 5B are the next sand extraction areas to be developed providing product sand for the next 4 to 5 years.

Four stages (Stages 2 -5) of sand extraction within the site are shown in Figure 2.

Stage 2

Stage 2, covering 37 hectares, adjoins the northern boundary of Tabbita Road and encompasses a large area of cleared and disturbed grassland and the footprint of sand extraction activities, which is now being rehabilitated..

Stage 2 also contains the sand processing infrastructure, which will continues to be utilised during sand extraction activities in Stage 3, 4 and 5. Several tributaries drain into the sand extraction boundary; the Western tributary flows east into the western sand extraction boundary, and the Northern Tributary flows south into the northern sand extraction boundary. Stage 2 is largely drained by the Western Tributary in the south- east corner, which eventually flows into to Rocklow Creek downstream of the site.

Stage 3

Stage 3, covering 21 hectares, adjoins the southern boundary of Tabbita Road. Rocklow Creek transects Stage 3, which flows into the a wetland located to the east of Kiama Bypass, conveyed by a culvert beneath Kiama Bypass.

Stage 4

Stage 4, covering five hectares, encompasses the Tabbita Road corridor, which includes the current road and rail access to Dunmore Hard Rock Quarry, located to the west of the site. Stage 4 is unlikely to be subject to sand extraction in the near future.

Stage 5

Stage 5, covering 38 hectares, is located approximately 1.1 km south- south east of the existing site and is on an alluvial coastal flood plain, adjacent to the tidal reaches of the Minnamurra River. The northern portion of the extraction area has been partially cleared and has historically been used for grazing. Stage 5 is bound by Riverside Drive to the north and Princes Highway to the west.

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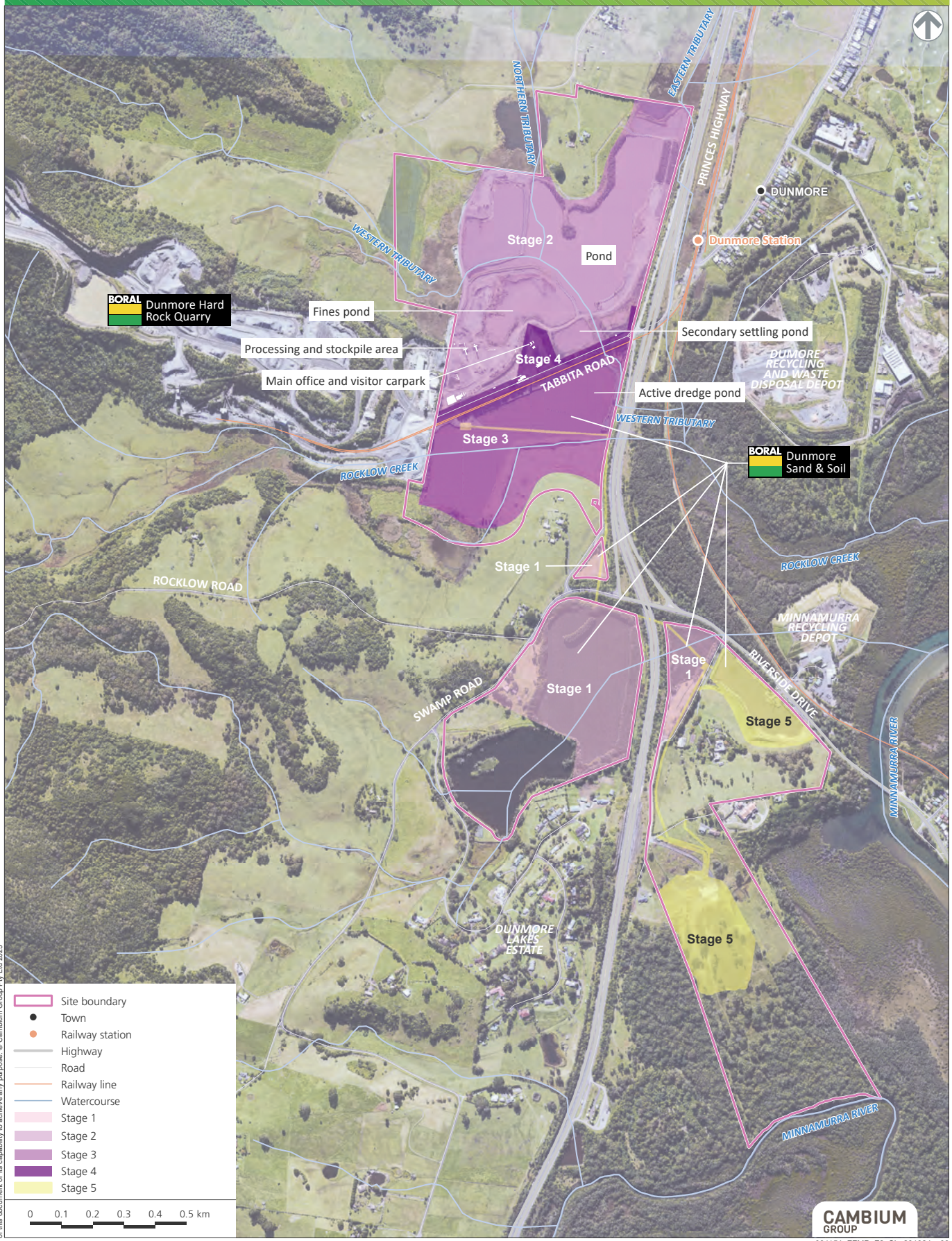
Figure 2
Site layout

Flora and Fauna Management Plan / Dunmore Lakes Sand Project



Source: LPI (2017), Aerometrex (2023), Boral (2016), Cambium Group (2019, 2023).

3.1.1 Land use

The site is characterised by existing sand extraction activities (i.e. in Stage 3), land under rehabilitation and agricultural land that has been predominantly cleared of native vegetation for the grazing of cattle. Land use in the surrounding locality includes:

- Agricultural land, primarily cattle grazing.
- Commercial and industrial development, including Dunmore Hard Rock Quarry and Dunmore Concrete Batching Plant immediately to the west and Dunmore Resource and Recycling Facility in the east.
- Residential development, including Dunmore Lakes Estate to the south west of Stage 5 and Minnamurra to the east of Stage 5,
- Infrastructure development, including the Princes Highway and the South Coast Rail Line divides the site .
- Minnamurra River and associated wetland (protected under State Environmental Planning Policy (Coastal Management) 2018) (Coastal SEPP) is located adjacent to Stage 5..

3.1.2 Hydrology

The existing site is located within the catchment of Rocklow Creek, a tributary of the Minnamurra River. The confluence of Rocklow Creek and the Minnamurra River is located one kilometre downstream of the site.

Rocklow Creek has been highly modified from its natural state and is predominantly conveyed through man-made channels. In some areas the creek has been redirected for agricultural activities. Rocklow Creek flows from west to east through the southern portion of Stage 3 to a culvert in the south-eastern of the site, which channels the creek under the Princes Highway and Railway line to a Coastal SEPP wetland (see 3.2.1.4) (Cumberland Ecology 2010). The tidal influence of these wetlands extends a short distance upstream of the Princes Highway into the Stage 3 area. Tidal inundation to Stage 3 only occurs during above average high tides (R.W. Corkery & Co. 2004).

Several tributaries drain into the sand extraction boundary; the Western tributary flows east into the western sand extraction boundary, and the Northern Tributary flows south into the northern sand extraction boundary. Stage 2 is largely drained by the Western Tributary in the south-east corner, which eventually flows into to Rocklow Creek downstream of the site.

The Eastern Tributary runs in a southerly direction along the north eastern boundary of the site. The Eastern Tributary is mostly contained within the adjacent Roads and Traffic Authority easement, however flows across the north-eastern corner of the site (Cumberland Ecology 2010).

The Stage 5A and Stage 5B extraction areas are located between the Minnamurra River to the south, an unnamed tributary almost directly west, and Rocklow Creek to the north (South East engineering + environmental 2019).

3.1.3 Topography

The existing site is located upon the Illawarra Coastal Plains and is characterised by low lying alluvial land (Cumberland Ecology 2010). The site lies within an area of flat to gently inclined alluvial plains on the Illawarra coastal plain. Surrounding relief is generally less than 20m and slopes are generally less than 30%. The entire site is low lying at approximately 1.5m to 2m AHD (R.W. Corkery & Co 2004).

The site is subject to periodic inundation caused by flooding of Rocklow Creek and Minnamurra River (Cumberland Ecology 2010).

3.1.4 Vegetation

Stage 2

Vegetation has been removed from the Stage 2 extraction area. Vegetation that has been retained on the margins of the extraction area includes scattered *Casuarina glauca* (Swamp Oak) and grasslands dominated by exotic species such as *Pennisetum clandestinum* (Kikuyu Grass), *Axonopus affinis* (Carpet Grass), *Paspalum dilatatum* (Paspalum), *Plantago lanceolata* (Ribbed Plantain), *Senecio madagascariensis* (Fireweed), *Cirsium vulgare* (Spear Thistle) and *Trifolium repens* (Clover) (R.W. Corkery & Co. 2004).

Rehabilitation works are ongoing along the northern area of stage 2 with 6,300 native plants from the Swamp Oak Floodplain Forest and Freshwater Wetlands in Coastal Floodplains community types planted along the north western edge of Stage 2 in 2017. A bird island was also constructed and planted out with these communities.

In December 2019 a further 8500m2 of Swamp Oak Floodplain Forest was planted on the NE section of Stage 2. These saplings are progressing well. The tree screens planted in 2007 are progressing well with individuals now 13 years old. Landform construction using VENM is ongoing along the southern and eastern section of Stage 2. This landform will form the foundations for a further section of Swamp Oak Floodplain Forest to be planted.

Stage 3

Vegetation has been removed from the Stage 3 extraction area.

The banks of the realigned Western Tributary channel in Stage 3 commenced rehabilitation in 2017, with the laying of jute matting and approximately 2,600 tube stock of freshwater wetland species planted out. Backfilling and landform construction in Stage 3 has commenced starting with the Eastern edge and the south eastern tidal zone.

Stage 4

Stage 4 is characterised by cleared and disturbed areas associated with Tabbita Road, the rail easement, parking areas and buildings, and planted garden trees and shrubs.

Stage 5

The majority of Stage 5 constitutes exotic Grassland/shrubland, with stock grazing and other disturbances having occurred over decades. Two native vegetation types were identified within the disturbance footprint:

- Bangalay Sand Forest; and
- Swamp Oak Floodplain Forest.

Both communities are listed Threatened Ecological Communities (TECs) under State or Commonwealth legislation.

The Bangalay Sand Forest community was identified in Stage 5B of the site in three different condition classes: good, moderate and poor (derived grassland). The Swamp Oak Floodplain Forest community was identified along the proposed pipeline easement adjacent to the dam west of the Stage 5A dredge pond. The community is considered to be in moderate condition and predominantly consists of regenerating or young Swamp Oak (*Casuarina glauca*) and a mix of native and exotic ground cover.

3.1.5 Fauna Habitat

Stages 2-4 site offers limited habitat for fauna species. Remnant trees, predominantly Swamp Oaks located along Rocklow Creek, offer potential foraging, sheltering and roosting habitat to birds. Wetlands and tributaries offer potential habitat to waterbirds, reptiles and amphibians, particularly where fringing and aquatic vegetation occurs. Fauna habitats will improve as rehabilitation progresses in these areas.

Fauna habitats in Stage 5 are limited with notable habitat elements consisting of scattered trees and stags with hollows and a single farm dam which provides some aquatic habitat. Pasture offers very little habitat to locally occurring native fauna species.

No areas of protected aquatic habitat or threatened aquatic species are present in the site.

3.1.6 Habitat connectivity

Adjacent patches of intact vegetation provide the main connectivity pathways to and around the Stage 5 site. The Stage 5A extraction area is cleared and disconnected from remnant vegetation areas and thus does not contribute to local or regional connectivity. The Stage 5B extraction area is adjacent to consolidated patches of vegetation which provide local connectivity and contribute to regional connectivity. The Stage 5B disturbance footprint has been designed to minimise clearing of consolidated vegetation, therefore reducing potential impacts on connectivity.

3.2 Significant Biodiversity Values

Significant biodiversity values of the site are described below and illustrated in Figure 3.

3.2.1 Wetlands

Three freshwater wetlands are partly located within the site, located in the north-west, north-east and south-west of the site.

3.2.1.1 North-eastern wetland

The north-eastern wetland spans the site boundary, falling within the north-eastern corner of the site (within Stage 2) and the adjoining private property. However, the north-eastern wetland does not fall within the sand extraction boundary in Stage 2.

3.2.1.2 North-western wetland

The north-western wetland spans the site boundary, falling within the north-western corner of the site (within Stage 2) and the adjoining private property. However, the north-eastern wetland does not fall within the sand extraction boundary in Stage 2. The north-western wetland is drained by the Northern Tributary.

3.2.1.3 Southern wetland

The southern wetland spans the site boundary, falling within the south-western corner of the site (within Stage 3) and the adjoining private property. It is sourced and drained by Rocklow Creek, including various man-made channels that divert the Creek's natural alignment for agricultural purposes (Cumberland Ecology 2010).

This wetland is dominated by *Juncus usitatus* (Common Rush), with *Persicaria decipiens* (Slender Knotweed), *Ranunculus inundatus* (River Buttercup), *Persicaria hydropiper* (Water Pepper) and *Triglochin procerum* (Water Ribbons) also recorded.

3.2.1.4 Coastal SEPP Wetland

Minnamurra River and associated wetland (protected under State Environmental Planning Policy (Coastal Management) 2018) (Coastal SEPP) is located to the east and south of the site, and adjacent to Stage 5.Rocklow Creek, which flows through Stage 3 area to a culvert in the south-east of the site, is conveyed to the Coastal SEPP wetland via culverts under the newly constructed North Kiama Bypass.

3.2.2 Endangered Ecological Communities

Three Endangered Ecological Communities (EECs) have been identified within the site;

- Swamp Oak Floodplain Forest,
- Freshwater Wetlands on Coastal Floodplains: and
- Bangalay – Old-man Banksia open forest on coastal sands.

The remainder of vegetation within the site is characterised by exotic pasture and scattered weeds (Mills 2004, Niche 2019).

3.2.2.1 Freshwater Wetlands on Coastal Floodplains

Vegetation of the three wetlands partially located within the site (North-eastern, North- western and Southern Wetland) includes species characteristic of Freshwater Wetlands on Coastal Floodplains EEC. Revegetation efforts in Stages 2 and 3 has started and includes establishment of species consistent with the Freshwater Wetlands on Coastal Floodplains EEC.

3.2.2.2 Swamp Oak Floodplain Forest

Some scattered Swamp Oak (*Casuarina glauca*) trees have been retained in Stages 2. Revegetation efforts in these stages have started and includes establishment of species consistent with the Swamp Oak Floodplain Forest EEC.

Swamp Oak Floodplain Forest also occurs along the proposed pipeline easement adjacent to the dam west of the Stage 5A dredge pond. The community is considered to be in moderate condition and predominantly consists of regenerating or young Swamp Oak (*Casuarina glauca*) and a mix of native and exotic ground cover. The proposed overland pipeline from the Stage 5A and 5B extraction areas to the Stage 2 processing area would be placed through some sections of Swamp Oak Floodplain Forest. Some minor trimming of *Casuarina glauca* may be required however, no vegetation clearing would occur.

3.2.2.3 Bangalay – Old-man Banksia open forest on coastal sands.

Within the site, the Bangalay Sand Forest occurs within and to the south of Stage 5B. Within the disturbance footprint of Stage 5B, the condition of the Bangalay Sand Forest deteriorates towards the north, in areas that have historically been cleared and are now exotic grassland. Areas in poor condition (derived grassland) have no canopy or midstorey cover and a high cover of exotic grass and other introduces species. These areas are essentially pasture with persistence of some hardy native groundcover species. Moderate condition areas have higher (though still limited) native species diversity and scatted canopy trees including some large hollow bearing Bangalay (*Eucalyptus botryoides*) trees. There has been limited recruitment of younger trees and shrubs due to frequent grazing. Good condition sites have higher plant diversity, some understorey and midstorey cover, and a denser canopy cover.

3.2.3 Threatened Flora Species

No threatened flora species have been identified within the site (R.W. Corkery & Co. 2004, Cumberland Ecology 2010, Niche 2019).

3.2.4 Threatened Fauna Species

No threatened fauna species have been identified within Stages 1-4 of the site (R.W. Corkery & Co. 2004, Cumberland Ecology 2010).Seven species of threatened fauna were detected during targeted survey within Stage 5, including Dusky Woodswallow (*Artamus cyanopterus cyanopterus*), Varied Sittella (*Daphoenositta chrysoptera*), Southern Myotis (*Myotis macropus*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), Eastern Freetail-bat (*Mormopterus norfolkensis*), Grey-headed Flying Fox (*Pteropus poliocephalus*) and Whitebellied Sea Eagle (*Haliaeetus leucogaster*). Additional threatened fauna are likely to utilise the foraging habitat of the site on an intermittent basis (Niche 2019).

3.2.5 Fauna habitats

An assessment of hollow-bearing resources was undertaken in 2021 in the Stage 5B area (EMM, 2021). This assessment identified 143 hollows of varying sizes and was used to calculate the offset for the loss of tree hollows based on a 1:1 replacement ratio (Section 4.6) (EMM, 2023)

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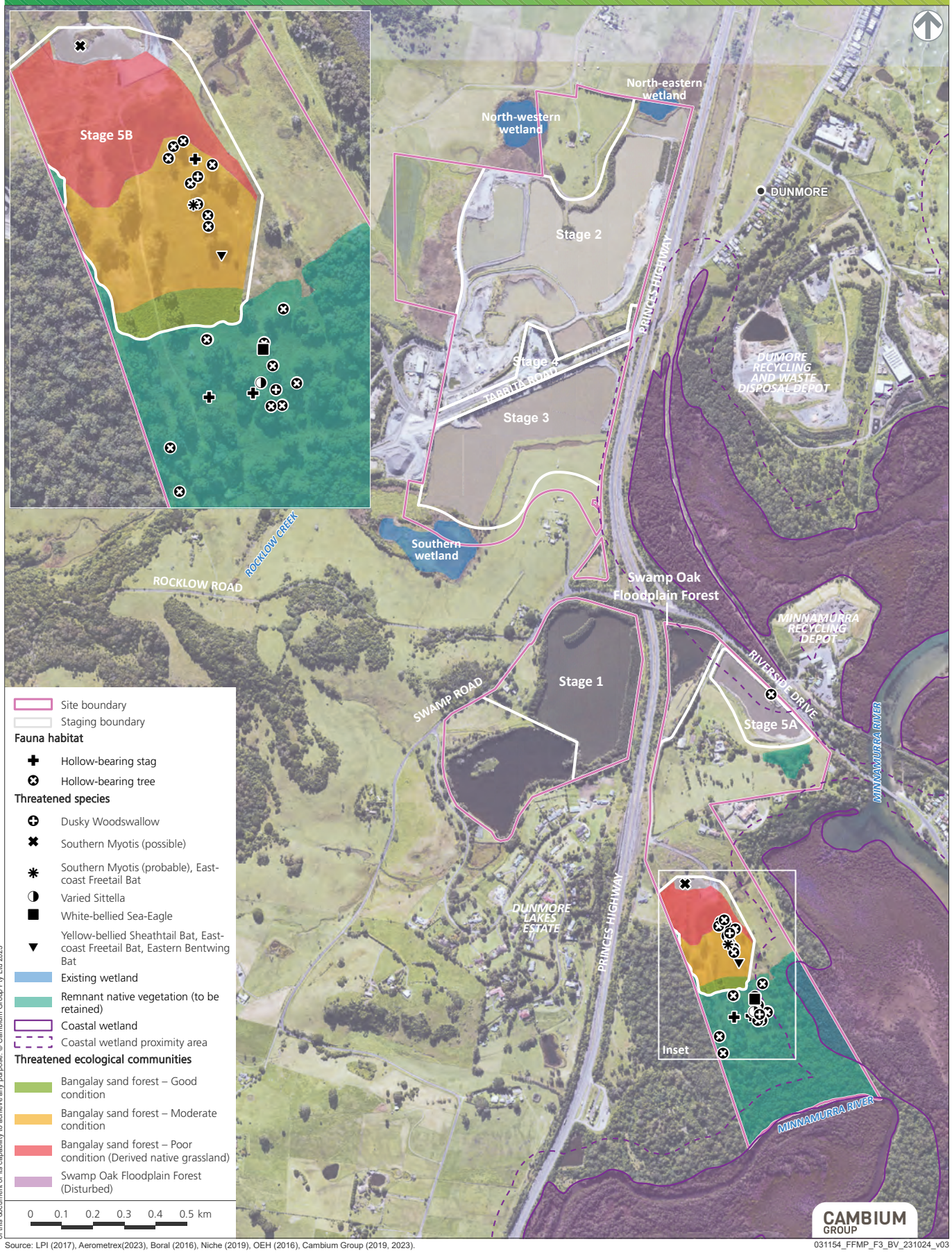
Figure 3
Biodiversity values
Flora and Fauna Management Plan / Dunmore Lakes Sand Project



Source: LPI (2017), Aerometrex(2023), Boral (2016), Niche (2019), OEH (2016), Cambium Group (2019, 2023).

4 MANAGEMENT ACTIONS

4.1 VEGETATION CLEARING

4.1.1 Disturbance footprint

After a preliminary Environmental Constraints Assessments and further ecological survey as part of the Environmental Assessment for Modification 2, there was substantial re-design of the Stage 5 site including reducing the disturbance footprint of the Stage 5B dredge pond, and siting specific project infrastructure to avoid and mitigate impacts to biodiversity with a particular emphasis on avoiding the following features:

- Threatened ecological communities (i.e. Bangalay – Old-man Banksia open forest on coastal sands (particularly areas in good condition), Swamp Oak Floodplain Forest and Littoral Rainforest) and other intact native vegetation;
- Coastal wetlands (including wetlands listed in the Coastal SEPP); and
- Hollow bearing trees.

In addition to avoidance measures incorporated into design, planning for the proposed modification has avoided or minimised impacts on biodiversity through the following actions:

- Relocation of infrastructure that requires clearing and excavation on non-sensitive land. Hollow bearing trees were avoiding through this measure; and
- Avoidance of direct impacts within the 'proximity area for coastal wetlands' located immediately east of the Stage 5B extraction area.

4.1.2 Progressive clearing

Vegetation to be cleared from Stage 5 is proposed in two separate extraction areas, namely Stage 5A (immediately south of Riverside Drive), and Stage 5B (to the north of Minnamurra River). Vegetation clearing from Stage 5A will commence prior to Stage 5B.

4.1.3 Vegetation Clearing Protocols

A Vegetation Clearing Protocol is provided in Appendix B. This includes protocols for:

- clearing of vegetation and fauna habitats,
- protecting retained vegetation;
- minimising impacts on fauna
- salvage of threatened flora and fauna habitats such as tree hollows.

Vegetation Clearing Protocol explains the actions and measures applicable to all native and exotic vegetation and fauna habitats that occur in the site.

4.1.4 Ground Disturbance and Vegetation Clearing

The Ground Disturbance and Vegetation Clearing assessment (Appendix C) is required to be completed and authorised if DLSP is planning to undertake actions that will, or have the potential to:

- disturb areas of virgin ground outside of an established approved disturbance footprint on site; or
- clear / cut / disturb any vegetation, including shrubs or ground covers (excluding pruning to landscaped gardens); or
- disturb Aboriginal Cultural Heritage or European Heritage.

Controls specified in this assessment must be implemented and require that all Boral staff and contractors must stop works immediately if there are any artefacts or cultural heritage values found.

4.2 Remnant Vegetation and Fauna Habitat Management

Notable remnant vegetation and fauna habitats occur primarily to the south of Stage 5B and comprise areas of native vegetation (Bangalay- Old-man Banksia open forest on coastal sands and Swamp Oak Floodplain Forest) and hollow-bearing trees. A summary of the short, medium and long term measures to be undertaken to manage remnant vegetation and fauna habitats on the site is provided below.

4.2.1 Short term (Year 1 – prior to clearing)

Short term measures for the management of remnant vegetation and fauna habitats are detailed in the Vegetation Clearing Protocols and summarised below:

- Implementation of sediment and erosion controls;
- Review the condition of fencing around Stage 5 operations area and repair/replace if required. This fencing must be suitable to:
    - prevent cattle, horses and other livestock from entering the site; and
    - prevent access to surrounding remnant vegetation and any protected trees to be retained to ensure these areas are not impacted by site operations
- Fauna pre-clearance surveys and identification of suitable habitat for the release of fauna encountered during pre-clearance surveys

4.2.2 Medium term (Years 1-5 – clearing, dredging operations and revegetation)

Medium term measures for the management of remnant vegetation and fauna habitats are detailed in the Vegetation Clearing Protocols and summarised below:

- Protocols for reporting the detection of previously undetected threatened species;
- Protocols for inducting all site personnel about clearing limits, noxious weeds, threatened species and Endangered Ecological Communities, native fauna identification and management;
- Requirement for earthworks, where possible, (and certainly all works in the vicinity of drainage lines) to be undertaken during dry weather conditions. Clearing of vegetation will not to be undertaken during overland flow events;
- Requirement for soil or mulch stockpiles to be located away from watercourses and key stormwater flow paths; and
- Hygiene requirements for vehicles, equipment, materials and footwear to minimise the introduction or spread of *Phytopthora cinnamomi*.

4.2.3 Long term

Long term measures for the management of remnant vegetation and fauna habitats include:

- Pest and weed management will be undertaken in accordance with the Pest and Weed Management Plan provided in Appendix E.

4.3 Compensatory Habitat Management

A Compensatory Habitat Management Plan is provided in Appendix D. This Compensatory Habitat Management Plan briefly describes how the proposed compensatory habitats (Freshwater Wetlands and Swamp Oak Floodplain Forest) within the site will be re-established. This plan has been developed in accordance within CoA 38.

Implementation of the compensatory habitat proposal is described in detail in the Rehabilitation Management Plan (Boral 2021), that has been developed in accordance with CoA 43. The Rehabilitation Management Plan includes methods to be implemented to rehabilitate and revegetate compensatory habitat, and also includes maintenance and monitoring measures pertaining to compensatory habitat.

4.4 Pest and Weed Management

A Pest and Weed Management Plan is provided in Appendix E. This Pest and Weed Management Plan details how to manage weeds in accordance with the requirements of the CoA, relevant Authorities and the *Biosecurity Act 2015*. This plan applies to weed species known and likely to occur within DLSP. This strategy has been developed in accordance with CoA 38.

4.5 Bushfire Management

The majority of vegetation within Stage 5 consists of stands of native woodland vegetation, interspersed with exotic grassland. The land within Stage 5 is considered to pose a low to moderate risk of bushfire due to limited available fuel source, and existing vegetation composition interspersed with disturbed agricultural areas.

Undisturbed vegetated areas surrounding the modification site, including environmental conservation areas to the south and south east would represent a high risk of bushfire. Bushfires within the reserves will be managed by NSW Rural Fire Service along with the relevant land authority including National Parks & Wildlife Service and/or Shellharbour City Council.

A Bushfire Management plan is currently being prepared for the site and the management actions in this FFMP complement the management actions in the Bushfire Management Plan.

4.6 Nest Box Management

One hundred and forty three nest boxes were installed in 2023 to provide safe locations for hollow-dependent species to create habitats. These nest boxes have been attached using a durable external grade fixing system that has not damaged the trees to which they are attached. A report outlining details pertaining to these nest boxes can be found in Appendix (insert number).

Nest boxes will be inspected by an ecologist on a six monthly basis for 2 years after clearing of Stage 5B. The following information will be recorded:

- Species present and, if possible, the number of individuals and any breeding activity; and
- Evidence of occupation by feral animals (e.g. honey bees, Common Mynas).

Any damaged nest boxes or nest boxes containing feral animals are to be taken down and repaired on site where possible.

4.7 REHABILITATION

The sand extraction activities will substantially modify the existing landform within the site. Following the completion of extraction activities, the site will be reconstructed, to provide conditions suitable for the establishment of the two EECs for which compensatory habitat is required: Freshwater Wetlands on Coastal Floodplains and Swamp Oak Floodplain Forest. Reconstructed areas will support lakes, wetlands and revegetated EECs. Reconstruction will also involve the realignment of Rocklow Creek and other drainage lines.

Lakes, wetlands and areas proposed for reconstruction and revegetation are illustrated on the Final Landform (Figure 4) Reconstruction of habitats and revegetation of EECs is outlined in the Rehabilitation Plan (Boral 2021). This Rehabilitation Plan has been developed in accordance with CoA 43 and includes management actions to:

- enhance the quality of vegetation, vegetation connectivity and wildlife corridors including through the revegetation of appropriate canopy, sub-canopy, understorey and ground strata with in the wetland vegetation established on the pond verges; and
- manage the collection and propagation of seed from the local area

The Rehabilitation Management Plan details a seasonally based program that has been developed to monitor and report on the effectiveness of revegetation on the site. The program monitors the success of vegetation establishment and ecosystem development by:

- recording the survival rate of plantings; and
- monitoring the composition, structure and function of the establishing vegetation using BAM methodology (DPIE 2020)

Detailed performance and completion criteria for the revegetation of the site (including areas of Compensatory Habitat) are also detailed in the Rehabilitation Management Plan. The results of the monitoring program will be evaluated against these criteria to:

- Identify any improvements that could be implemented to improve biodiversity outcomes; and
- Identify triggers for remedial action where these performance or completion criteria are not met.

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Figure 4
Final Landform
Flora and Fauna Management Plan / Dunmore Lakes Sand Project

CAMBIUM GROUP

Source: LPI (2017), Aerometrex (2023), Boral (2016), Cambium Group (2019, 2021, 2023).

5 MONITORING, REPORTING AND REVIEW

5.1 MONITORING

Flora and fauna management actions will be measured through regular environmental performance reviews. A status update of the rehabilitation of the site is reported in the Annual Review as per Schedule 5 Condition 9.

These will be based on the measurable outcomes identified in:

- Vegetation Clearing Protocol (Appendix B).
- Pest and Weed Management Plan (Appendix E).
- Rehabilitation Management Plan (which includes measures specific to compensatory habitat).

The reviews will be used to assess progress in meeting project environmental objectives and targets and will be undertaken by the Environmental Manager or delegate:

- In response to new or revised Boral Project approvals; and
- In response to major changes in site conditions or work methods.

Environmental performance is measured through compliance with the plans listed above, in addition to other environmental plans such as the Water Management Plan.

Should an environmental non-conformance be identified as a result of a monitoring result, a non-conformance report will be completed and archived by the Environmental Manager or delegate.

5.2 REPORTING

Reporting on the implementation of this Plan would include the following:

- The results of all environmental monitoring and inspections, including adequacy of site-specific environmental safeguards and management measures
- Any community/stakeholder complaints or non-conformances with licences/criteria, including any responses provided or actions undertaken in response to the complaint or non-conformance
- Any remediation actions or changes to management and mitigation measures.

5.2.1 Annual Review

The results of regular environmental performance reviews (as described in Section 5.1) will be presented in the Annual Review. This will include recommendations for implementing specific management actions, such as:

- Refining flora and fauna management objectives and initiating remedial action.
- Altering monitoring frequency, parameters or locations.

5.3 REVIEW

5.3.1 Review of Monitoring Actions

Any non-compliance identified during monitoring actions, of management and mitigation measures, will be highlighted and an environmental incident report will be completed. The non-conformance will be considered unresolved until:

- The non-compliance issue has been resolved;
- A new or revised procedure has been established and implemented;
- Training has been provided to relevant personnel/ sub-contractors; or
- Additional specific environmental management inspections are detailed in this flora and fauna management plan.

5.3.2 Review of Management Plan

This Plan will be reviewed as per Schedule 5 Condition 3 as reproduced below:

- The submission of an incident report
- The submission of an Annual Review
- The submission of an audit report
- The approval of any modifications (unless the conditions require otherwise).

A review of the adequacy of site-specific environmental safeguards and management measures will be carried out by the Environmental Manager or delegate on a regular basis as required. This review will encompass site inspection and auditing reports as well as root cause assessments undertaken for any incidents reported.

6 TRAINING

6.1 ENVIRONMENTAL INDUCTION

Environmental induction training will be delivered to all staff and subcontractors involved in the Project. This will be delivered by the relevant Boral personnel (e.g. Environmental Manager or delegate). This will include a component on environmental/what this Plan is for management and the associated controls and mitigation measures that will be implemented for the Project. All personnel will be required to sign an induction sheet, a copy of which will be maintained on site and appropriate records maintained.

Appropriate training and induction will include, but not be limited to:

- Raising awareness of on-site environmental management issues;
- Instruction and detail on how to report matters relating to ecology and rehabilitation to the site environmental representative or site manager.
- Providing information on the location and importance of EECs, threatened fauna species (and habitat) known to occur within the site;
- Providing information on the boundaries for any proposed vegetation clearing; and
- Training on procedures on encountering fauna (e.g. snakes)

6.2 SITE-SPECIFIC ENVIRONMENTAL TRAINING

Where identified by the Environmental Manager or delegate, additional site-specific training may be developed and implemented by the Project manager, delivered to relevant personnel/contractors as required regarding sensitive environmental issues. Specific training may include:

- Training in the use and location of spill kits.
- Management, and environmental incident response training.

7 CONTINGENCY PLANNING

7.1 EMERGENCY INCIDENT PLAN

Emergency incident planning will be as per the site Pollution Incident Response Management Plan (PIRMP) which has been developed to respond to uncontrolled discharges of fuels, oils and chemicals/unforeseen events as per EPL 11147 licence conditions.

Response procedures for protection of the water environment will aim to:

- Contain and control emergency incidents;
- Safeguard people on-site and offsite;
- Protect drainage paths and waterways;
- Minimise damage to the environment and property;
- Identify appropriate disposal techniques for contaminated soils and water; and
- Facilitate remediation of the environment.

Suitable containment and clean up materials will be maintained within easy and quick access.
All reporting will be in accordance with Boral's incident reporting management system. Similar complaints will be addressed through the site complaints register. Compliance with statutory requirements will be assessed through implementation of Boral's site audit program that is aligned to ISO 19011:2003. Results of the above-mentioned aspects will be used to ensure appropriate corrective actions are in place and to verify appropriate close out actions, follow up and reporting has occurred.

8 REFERENCES

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Appendix A ENDORSEMENT OF EXPERTS

Mr Ben Williams
Environmental Coordinator – Dunmore Lakes
Boral Resources (NSW) Pty Ltd

Via email: Ben.Williams@boral.com.au

20/05/2021

Dear Mr Williams

Dunmore Lakes Sand Extraction Project (DA 195-8-2004)
Endorsement of Experts

I refer to your request (DA-195-8-2004-PA-17) for the Planning Secretary's approval of suitably qualified persons to prepare the Flora and Fauna Management Plan and the Rehabilitation Management Plan for the Dunmore Lakes Sand Extraction Project (DA 195-8-2004).

The Department has reviewed the nominations and information you have provided and is satisfied that these experts are suitably qualified and experienced. Consequently, I can advise that the Planning Secretary approves the appointment of Mr Mark Nolan and Dr Emilie Mascarenhas of Cambium Group to prepare the Flora and Fauna Management Plan and the Rehabilitation Management Plan.

If you wish to discuss the matter further, please contact Joel Herbert on (02) 8289 6614 or joel.herbert@planning.nsw.gov.au

Yours sincerely

Matthew Sprott
Director
Resource Assessments (Coal & Quarries)

As nominee of the Planning Secretary

Appendix B VEGETATION CLEARING PROTOCOL

B.1 INTRODUCTION

This Vegetation Clearing Protocol explains the actions and measures to be implemented prior to the commencement of vegetation clearing in the site, and is applicable to all native and exotic vegetation that occurs in the site.

This Vegetation Clearing Protocol aims to:

- Implement pre-clearing survey methods to minimise adverse impacts on fauna;
- Protect habitat features and vegetation adjoining the vegetation clearing footprint during clearing activities to be retained; and
- Protect Coastal SEPP wetland located downstream of clearing activities.

Minimise the introduction and establishment of weeds in uninfested areas. All personnel undertaking clearing activities, or directly involved with works, will be training in this protocol through Toolbox Talks or a site induction.

B.2 SCOPE

This protocol has been developed in accordance with CoA 39 and aims to:

- Delineate the areas of vegetation to be cleared;
- Describe the procedures that would be implemented for:
  - Pre-clearance surveys;
  - Progressive clearing;
  - Fauna management;
  - Conserving and reusing topsoil;
  - Collecting seed from the site;
  - Salvaging and reusing material from the site;
  - Managing waste vegetation; and
  - Controlling weeds.

B.3 RELEVANT LEGISLATION

Relevant legislation to this Protocol includes:

- *NSW Biodiversity Conservation Act 2016* (BC Act)
- *NSW National Parks and Wildlife Act 1974* (NPW Act);
- *NSW Biosecurity Act 2015* (BS Act); and
- *NSW Coastal Management Act 2016* (CM Act)

B.4 VEGETATION TO BE CLEARED

B.4.1 Stages 2 and 3

Vegetation has already been removed from Stage 2 and 3 extraction areas, since the preparation of the Flora and Fauna Management Plan in 2017 (Arcadis 2017). The sand resource has been exhausted in Stage 2 and sand extraction is approaching completion in Stage 3.

B.4.2 Stage 4

Vegetation to be cleared from Stage 4 includes planted trees and shrubs. No extraction date has been proposed for Stage 4 and as such, vegetation removal will occur at a later date.

B.4.3 Stage 5

A total of 10.3 ha is proposed be cleared in Stage 5 (Figure B.1). The majority of vegetation to be affected has been subject to historic clearing and other agricultural activities such as grazing and is therefore thinned, fragmented and predominantly consists of exotic grassland. The extent of clearing of native vegetation is conservatively estimated at 3.7 ha of Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin Bioregion and South East Corner Bioregion (PCT 659), which is listed as an EEC under the BC Act.

The proposed overland pipeline from the Stage 5A and 5B extraction areas to the Stage 2 processing area would be placed through some sections of Swamp Oak Flood Plain Forest. Some minor trimming of *Casuarina glauca* may be required however, no vegetation clearing would occur. The proposed location of the booster pump station was inspected and found to contain exotic ground cover. Swamp Oak Floodplain Forest would not be impacted by any vegetation clearing

B.5 VEGETATION CLEARING MANAGEMENT ACTIONS

Vegetation clearing management actions are outlined in Table B.1.

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Figure B.1
Vegetation to be cleared

Flora and Fauna Management Plan / Dunmore Lakes Sand Project

Source: LPI (2017), Aerometrex (2023), Boral (2016), Niche (2019), Cambium Group (2019, 2021, 2023).

Table B.1 Vegetation clearing protocol management actions

Management Action Ref ID	Environmental Management Measure	Location (where appropriate)	Timing	Responsibility	Source (this can provide link to relevant CoA)
Planning					
VC01	Vegetation clearing will be undertaken in stages: Stage 5A will be cleared and excavated first, followed by Stage 5B.	Stage 5A, Stage 5B	Pre-clearing	Environmental Manager or delegate Contractors	CoA 38(d)
VC02	Sediment and erosion controls must be implemented in accordance with Soil and Water Management Plan.	Vegetation clearing footprint	Pre-clearing	Environmental Manager or delegate	CoA 38(e)
VC03	Vegetation clearing limits and the sand extraction boundary must be identified on all design, construction and operational drawings as well as sensitive area drawings.	Vegetation clearing footprint	7 days prior to the commencement of clearing.	Environmental Manager or delegate Contractors	CoA 38(e)
VC04	Review the condition of fencing around Stage 5 operations area and repair/replace if required. This fencing must be suitable to: • prevent cattle, horses and other livestock from entering the site; and • prevent access to surrounding remnant vegetation and any protected trees to be retained to ensure these areas are not impacted by site operations.	Stage 5	Pre-clearing	Environmental Manager or delegate Contractors	CoA 38(e)
VC05	No extraction will be undertaken within 10 metres of the bank of wetland. The 10 metre buffer of the southern wetland boundary must be delineated by installing highly visible barrier or tape as shown on the drawings.	Vegetation clearing footprint	Check and verify limits 5 days prior to the commencement of clearing. Highly visible flagging tape	Ecologist	MCoA 39(a)

			or fencing that delineates vegetation to be retained (i.e. wetlands) will be maintained until the completion of clearing		
VC06	Carry out native seed collection from trees and shrubs to be cleared	Trees and shrubs occurring within vegetation clearing footprint	Consult with bush regenerator in early spring to late summer prior to clearing, to determine optimal timing for seed collection, with regard to flowering periods of plants species to be removed	Bush regenerator	CoA 38(e)
Pre-clearance surveys					
VC07	Inspect trees proposed to be cleared prior to clearing activities for the presence of fauna species, ie birds and/or arboreal mammals	Vegetation clearing footprint	Prior to clearing	Ecologist	CoA 38(d)
VC8	Fauna species identified inhabiting trees proposed to be removed are to be encouraged to vacate the tree (deter with loud noise).	Vegetation clearing footprint	Prior to clearing	Ecologist	CoA 38(d)
VC9	Identify nearby habitat suitable for the release of fauna that may be encountered during the pre-clearing process.	Vegetation clearing footprint	Pre-clearing	Ecologist	CoA 38(d)
VC10	If a flora or fauna species is identified by the Project Ecologist, as a threatened species that was not identified and assessed in the *Environmental Assessment* or other Project documentation, then the Project Ecologist must inform the Environmental Manager, who will: • Immediately cease all work that may affect the threatened species. • Contact the Environmental Manager and advise them of the situation. • Contact stakeholders, including EES, Project Ecologist any other as instructed	Vegetation clearing footprint	Pre-clearing and during clearing	Ecologist	CoA 38(d)

	by RMS or EES. • Determine in consultation with stakeholders, corrective actions and additional safeguards to be undertaken.				
VC11	If threatened flora species are identified during pre-clearance surveys, a plan will be developed for the transplanting and/or propagation of the threatened, in accordance with the *Guidelines for the Translocation of Threatened Plants in Australia* (Australian Network for Plan Conservation 2018 (third edition))	Vegetation clearing footprint	Pre-clearing and during clearing	Ecologist	CoA 38(d)
VC12	Construction works may recommence only once the Environmental Manager in consultation with the Project Ecologist, has confirmed that all corrective actions and additional safeguards have been implemented				CoA 38(d)
VC13	All site personnel involved in clearing activities must be inducted during Toolbox Talks on the requirements of this Environmental Work Method Statement prior to commencing work on the site. Site personnel are to be: • Made aware of the clearing limits and how they are marked • Informed that they are not to encroach on areas beyond the clearing limits • Made aware of the locations of priority weeds within clearing limits • Made aware of the locations of threatened flora species, Endangered Ecological Communities and trees that will be retained, measures required to protect them, and the consequences of damage to these areas. • Made aware of the local fauna of the site and identification of protocols to be	Vegetation clearing footprint	Clearing	Environmental Manager or delegate Contractors	CoA 38(e)

	undertaken if fauna are encountered				
PROGRESSIVE CLEARING					
VC14	Where possible, earthworks (and certainly all works in the vicinity of drainage lines) will be undertaken during dry weather conditions. Clearing of vegetation will not to be undertaken during overland flow events.	Vegetation clearing footprint	Clearing	Environmental Manager or delegate	CoA 38(e)
VC15	Soil or mulch stockpiles will be located away from watercourses and key stormwater flow paths to limit potential transport of these substances into the watercourses (and downstream Coastal SEPP Wetland) via runoff.	Vegetation clearing footprint	Clearing	Environmental Manager or delegate	CoA 38(e)
VC16	Emergency response protocols and procedures for implementation in the event of a contaminant spill or leak will be clearly articulated in the Soil and Water Management Plan.	Vegetation clearing footprint	Clearing	Site Manager or Delegate	CoA 38(e)
VC17	Spill kits will be located to allow for timely response to uncontained spills. Site inductions will include a briefing on the use of spill kits.	Vegetation clearing footprint	Clearing	Contractors Environmental Manager or delegate	Best practice
VC18	Vehicles, equipment, materials and footwear are to be clean on entry where necessary if previously identified to been at a high risk site or area (free of soil, mud and/or seeds) to minimise the introduction or spread of *Phytopthora cinnamomi.*	Vegetation clearing footprint	Clearing	Contractors Environmental Manager or delegate	CoA 38(e)
FAUNA MANAGEMENT					
VC19	A pre-start check for sheltering native fauna of all infrastructure, plant and/or stored equipment during clearing activities is to be undertaken.	Vegetation clearing footprint	Daily, prior to commencement of works	Personnel involved in clearing activities Contractors	CoA 38(d)

VC20	If an animal is located within the works area, stop all work in the vicinity of the animal and immediately notify the Environmental Manager. The Environmental Manager is to notify the Project Ecologist, who may nominate to contact a rescue agency (e.g. WIRES).	Vegetation clearing footprint	As soon as an animal is identified in the construction footprint	Personnel clearing activities Contractors	CoA 38(d)
VC21	Dangerous animals such as venomous reptiles must not be handled by inexperienced/unqualified personnel. The following actions must therefore be taken when a dangerous animal is identified within the construction footprint: • Exclude all personnel from the vicinity with visible barriers and/or signage. • Contact the Project Ecologist. The Project Ecologist may nominate to contact rescue agency (e.g. WIRES) or professional snake handler to assist. - WIRES: 1300 094 737 - Wildlife Rescue South Coast: 0418 427 214 - Snake Catcher Sydney: 1300 599 938 • Record the exact location of the animal and provide this location to the local wildlife rescue agency. • The Project Ecologist or other nominated personnel are, where practical, to keep the dangerous animal in sight where it remains within the construction site.	Vegetation clearing footprint	As soon as possible after a venomous snake or other dangerous animal is identified in the construction footprint	Wildlife Rescue Agency	CoA 38(d)
VC22	Contact the Project Ecologist if an injured animal is found on or in the vicinity of the construction site. The Project Ecologist will determine if the animal is seriously injured and requires attention. If the animal is injured, contact one of the following local wildlife rescue agencies and/or veterinary surgeries	Vegetation clearing footprint	As soon as practical after injured animal is identified in the construction footprint	Environmental Manager or delegate	CoA 38(d)

	immediately: - WIRES: 1300 094 737 - Wildlife Rescue South Coast: 0418 427 214 - Shellharbour Veterinary Clinic: 4295 4000				
MATERIAL RE-USE, DISPOSAL AND MANAGEMENT					
VC23	Topsoil removed from Stage 3 prior to sand extraction activities will be stockpiled for re-use in Stage 2	Sand extraction footprint	Post clearing, pre-sand extraction	Site Manager or Delegate	
VC24	Salvage any tree hollows and place as ground habitat in areas to be revegetated. Felled trees are to be mulched for use in revegetation areas.	Vegetation clearing footprint	Post clearing, pre-sand extraction	Environmental Manager or delegate Contractor for bush regeneration	CoA 38(d)
VC25	Stockpiled soil must not be driven across or compacted.	Vegetation clearing footprint	Post-clearing	Environmental Manager or delegate Contractors Contractor for bush regeneration	CoA 38(d)
VC26	Treat stockpiles for potential contamination by weed seeds (e.g. with herbicides or other suitable chemical treatment) to prevent germination of seeds and spread of weeds to new areas	Outside of vegetation clearing footprint and sand extraction footprint	Post-clearing	Environmental Manager or delegate Contractor for bush regeneration	CoA 38(e)

VC27	Bury or remove stockpiled soil (disposed of at Council green waste depot such as Dunmore Recycling & Waste Disposal Depot) that is contaminated by priority weed seeds	Outside of vegetation clearing footprint and sand extraction footprint	Post-clearing	Environmental Manager or delegate Contractor for bush regeneration	CoA 38(e)
VC28	Stabilisation of disturbed areas, including mulching will be undertaken as soon as practicable after disturbance.	Vegetation clearing footprint	Post-clearing	Site Manager or Delegate	CoA 38(e)
VC29	All cleared vegetation can remain onsite or if necessary can be removed from site and disposed of at Council green waste depot (i.e. Dunmore Recycling & Waste Disposal Depot).	Vegetation clearing footprint	Post-clearing	Site Manager or Delegate	CoA 38(d)
VC30	Weed control and management will be undertaken in accordance with the Pest and Weed Management Plant provided in Appendix E.	Vegetation clearing footprint	Post-clearing	Site Manager or Delegate	CoA 38(e)
REHABILITATION AND REVEGETATION					
VC31	Rehabilitation and revegetation of Stage 2, 3, 4 and 5 will be undertaken in accordance with the Dunmore Lakes Sand Project - Rehabilitation Management Plan	Entire site	Progressive, with completion of sand extraction activities	Site Manager or Delegate	CoA 38(e)

Appendix C GROUND DISTURBANCE AND VEGETATION CLEARING

Form 01: Ground disturbance and vegetation clearing

8-03 Land Management
8-08 Ecosystems and Biodiversity Management
8-09 Culture & Heritage Protection

When to use this form?

If you are planning to, or have the potential to:

- disturb areas of virgin ground outside of an established approved disturbance footprint on site; or
- clear / cut / disturb any vegetation, including shrubs or ground covers (excluding pruning to landscaped gardens); or
- disturb **Aboriginal Cultural Heritage** or **European Heritage**

This form and its process can take months to complete, so engage early with your Environment Manager.

Who uses this form?

Site Managers or their delegate.

Who is responsible for managing actions resulting from this form?

The Site Manager.

If in doubt, call your regional Environment Manager (see below).

Environmental contacts (public document details removed)

Region / business	Environment contact	Contact details
NSW/ACT		
QLD		
VIC/TAS		
SA		
WA/NT		
Cement		
Timber & RME		

PROCESS

PART A	Vegetation Clearing / Ground disturbance details	This section to be completed by: Site Manager
Site:	**{type text here]**	
Requestor Name and Position:		
Date of request:		
Proposed timing of the vegetation clearing/ ground disturbance:		
Purpose of vegetation clearing/ ground disturbance:		
Description and location of vegetation clearing/ ground disturbance:		
Proposed clearing methods and controls. I.e.: • Method and equipment to be used • Survey, mark out vegetation and/ or peg area • Install Sediment and Erosion Controls • Engage Fauna Spotter and Catcher • Commission Aboriginal Cultural Heritage Survey		
Attachments (i.e. map, photos, plans)):	*[Insert text and images here or list larger images appended to this request]*	

PART B - Approval Review Checklist (*This section to be completed by: Environment, BLPG and NRG)*		
Checklist	**Is the site compliant (yes/ no/ comments)**	**List action if required Refer PART C**
NRG – QUARRIES ONLY		
Is the proposed clearing/ ground disturbance consistent with the approved Mine Operating Plan (MOP) or other mine regulator documentation?		
Is the mapping layer to be provided to the surveyor consistent with relevant approvals? This may need to be checked with BLPG.		
BLPG		
Are the required approvals in place for the proposed clearing/ ground disturbance activities (local, state/ territory, federal government levels)? Refer to Attachment 2 for region specific approvals.		
Is the clearing in accordance with the approved Clearing Plans?		
Have relevant pre-clearance approval conditions been satisfied?		
Is the clearing / ground disturbance within the Boral property boundaries?		
Is there a requirement for Offsets? If so have the offsets been legally secured?		
Have we taken appropriate steps to investigate the presence of cultural heritage values and engaged with appropriate groups / authorities under the Cultural Heritage legislation (i.e. Reports, Agreements, Cultural Heritage Management Plan or Due Diligence) and have all pre-ground disturbance / clearing conditions been satisfied (ie. Cultural Heritage Surveys, Inductions)?		
Environment		
Have relevant Environment approval and Environment Permit Planner (EPP) requirements been completed?		
Has Site proposed appropriate sediment and erosion control measures?		
Has Site proposed appropriate fauna/ protected flora management?		
Has Site proposed adequate method of vegetation clearing and appropriate disposal?		

PART C - Actions / Controls *(This section to be completed by, Environment, BLPG and NRG)*				
#	**Implementation Action/Control**	**Timing (prior to and post clearing)**	**Responsibility**	**Evidence required**
1	During ground disturbance or vegetation clearing activities, all Boral staff and contractors must STOP WORKS IMMEDIATELY if there are any artifacts or cultural heritage values found.		Site Manager	
2				
3				
4				

PART D – Authorisation *(This section to be completed by: Environment, BLPG and NRG)* **This authorisation is valid for 3 months from the date issued if not varied – after 3 months, or varied, this authorisation will need to be re-issued based on any changes.**			
Position	**Name**	**Signature**	**Date**
Regional Resources Manager, NRG			
Regional Environment Manager, HSE			
Planning and Development Manager, BLPG			
Operations / Regional Manager			
General Manager			
*Executive General Manager / Director of business			

**Approval required if:*

- *Endangered, threatened or vulnerable flora and fauna are impacted; or*
- *Aboriginal Cultural Heritage or European Heritage will be impacted; or*
- *Offsets of more than $75,000 unbudgeted or $150,000 budgeted are required.*

ATTACHMENT 1 - Process

The following process must be followed prior to undertaking any vegetation clearing, ground disturbance activities that may disturb Aboriginal Cultural Heritage or European Heritage. Vegetation includes, but is not limited to, trees, shrubs, grasslands, wetlands and re-growth. Ground disturbance means undertaking activities that physically impact previously undisturbed areas. This process is managed by the Regional Environment Manager (REM).

Step	Responsible	Actions
1	Site Manager	1.1 Site Manager to **call** the Regional Environment Manager (REM)and explain what vegetation clearing and/ or ground disturbance is planned
2	Environment Manager	*2.1* REM to determine if the Vegetation Clearing/Ground Disturbance Assessment and Approval Form are required to be completed. *Most activities will require the form to be completed however some, such as clearing some weeds, will be exempt.* 2.2 If the form is **not** required the REM will advise the Site Manager they can commence vegetation clearing and/ or ground disturbance – and follow up with an email. 2.3 If a form **is** required, the REM shall provide Site Manager the form and explain the process (as outlined below) 2.4 REM to record all requests in the register
3	Site Manager	3.1 Site Manager to complete ***PART A*** of the form and send to the REM with any attachments
4	Environment Manager	4.1 REM to upload the form onto the collaboration page and email relevant BLPG and NRG Managers that the form has been
5	Environment, BLPG & NRG Manager	5.1 REM, BLPG and NRG Managers to complete ***PART B, PART C*** and ***PART D*** of the form and notify Environment Manager when it is complete
6	Environment Manager	6.1 REM to send completed form to Site Manager and if required discuss the implementation actions (including any evidence required prior to commencing clearing/ ground disturbance)
7	Site Manager	7.1 Site Manager to **complete** any **implementation actions from PART C** as per the timing schedule and obtain evidence required. Evidence shall be provided to Environment Manager 7.2 Site Manager to complete vegetation clearing/ ground distance in accordance with the form.
8	Environment Manager	8.1 REM to file completed form and evidence

ATTACHMENT 2 – Region specific approval requirements

State	Approvals to be considered
National	• Department of Agriculture, Water and the Environment (DAWE) National EPBC Approval (*for matter of national environmental significance, which is in addition to relevant state/local based approvals*)
ACT	• Clearing laws are regulated predominantly by the Nature Conservation Act 2014 (ACT). • Environment, Planning and Sustainable Development Directorate - The Executive Director of Policy holds the office of the Conservator of Flora and Fauna. • Written approval from the Conservator required as a part of Development approval/variation.
NSW	• Department of Planning, Industry and Environment Development Approval • Local Land Services Clearing Approval • WaterNSW Controlled Activity Approval (CAA) for disturbance of any land within 40m of a watercourse • Local Council Vegetation Clearing Approval
NT	• Department of Primary Industry and Resources (DPIR) Mining Managament Plan. • Departmeent of Lands, Planning and the Environment Clearing Permit (Freehold land) • Pastoral Land Board Clearing Permit (Pastoral leases) • NT Environment Protection Authority (NTEPA) Ministerial Statement (State based assessment)
QLD	• MCU DA • OPW Vegetation Clearing • Local Law Permit Vegetation Clearing • NCA Permit or Exemption • EPBC Act/ Referral/ Exemption
SA	• Clearance approval under Section 28 of the Native Vegetation Act 1991 • Council / Local Laws / Permits for tree and vegetation removal
TAS	• Council / Local Laws / Permits for tree and vegetation removal • Certified forest practices plan to authorise land clearing for clearing forest or clearing and converting threatened native vegetation communities
VIC	• Council / Local Laws / Permits for tree and vegetation removal • EPBC Act/ Referral/ Exemption
WA	• Department of Mines, Industry Regulation and Safety (DMIRS) Mining Proposal (Tenements only) • Local Government Extravtive Industry Licence and Development Approval (Private land only) • Department of Water and Environment Regulation (DWER) Clearing Permit • Environment Protection Authority (EPA) Ministerial Statement (State based assessment)

Appendix D COMPENSATORY HABITAT MANAGEMENT PLAN

D.1 INTRODUCTION

In accordance with CoA 37 Boral must establish, conserve and maintain at least six (6) hectares of Freshwater Wetlands on Coastal Floodplains (which may include areas of associated wetland pondage) and three (3) hectares of Swamp Oak Floodplain Forest, in addition to visual screening plantings on the site, in a manner that integrates the compensatory habitats with existing similar habitats on and near the site.

D.2 SCOPE

This Compensatory Habitat Management Plan has been prepared in accordance with CoA 38g) and aims to:

- Describe the compensatory habitat proposal.
- Justify why the proposed area(s) is suitable for the compensatory habitat proposal, including how the area will integrate with existing habitat areas on and near the site.
- Establish baseline data for the existing habitat in the proposed area(s).
- Describe how the compensatory habitat proposal would be implemented.
- Set completion criteria for the compensatory habitat proposal.
- Describe how the performance of the compensatory habitat proposal would be monitored over time.

D.3 RELEVANT LEGISLATION

Relevant legislation includes the following:

- *NSW National Parks and Wildlife Act 1974* (NPW Act);
- *NSW Biodiversity Conservation Act 2016* (BC Act); and
- *NSW Biosecurity Act 2015* (BS Act).

D.4 COMPENSATORY HABITAT PROPOSAL

D.4.1 Description

The proposed compensatory habitats (Freshwater Wetlands and Swamp Oak Floodplain Forest) form part of the Final Landform, as illustrated in Figure 4.

Proposed areas of compensatory habitat exceed the requirements of CoA (37): areas of compensatory habitat identified in the Final Landform Plan include over 11.5 hectares of Freshwater Wetlands on Coastal Floodplains and over 11 hectares of Swamp Oak Floodplain Forest.

D.4.2 Justification

Freshwater Wetlands and Swamp Oak Floodplain Forest have been selected based on their occurrence within the site prior to sand extraction activities, and representation in the surrounding locality.

D.4.3 Baseline data for the existing habitat

Habitat is areas proposed for compensatory habitats in Stages 2 and 3 have been removed for sand extraction activities. Vegetation that has been retained on the margins of the extraction area includes scattered *Casuarina glauca* (Swamp Oak) and grasslands dominated by exotic species.

D.4.4 Implementation of compensatory habitat proposal

The site will be rehabilitated in a manner that is generally consistent with the Final Landform (Figure 4). Rehabilitation and subsequent revegetation is being undertaken in Stage 2. Backfilling and landform construction in Stage 3 has commenced starting with the eastern edge and the south eastern tidal zone.

Rehabilitation and subsequent revegetation of compensatory habitats is described in the Rehabilitation Management Plan (Boral 2021). A summary of these works to be carried out in the site is provided below.

D.4.5 Species Selection

Swamp Oak Floodplain Forest

Swamp Oak Floodplain Forest are areas adjacent to constructed and existing wetlands, as well as areas within the site that are low lying or subject to inundation, and will be established as the Swamp Oak Floodplain Forest EEC. Revegetation of Swamp Oak Floodplain Forest will be undertaken in areas identified as such on Figure 4, which cover an area of approximately 11.5 hectares. Much of the eastern boundary of Stage 2 and Stage 3 will be revegetated with Swamp Oak Floodplain Forest, and this forest vegetation will serve as a visual screen of the site from the adjacent Princes Highway.

Locally occurring species have been selected for revegetation, to maximise plant survival and provide habitat resources to local wildlife. Species selected include native species presently occurring on the site and characteristic species of Swamp Oak Floodplain Forest (DECC 2007, NSW Scientific Committee 2011a).

The spatial arrangement of plantings will emulate a natural vegetation formation such that plants will be placed in a random arrangement. Ground layer species will be planted in small dense groups to create a mosaic effect, while trees will be planted as more widely spaced individuals. Planting densities were determined in accordance with the lessons learned from Stage 1.

The planting of tubestock will be complemented with direct seeding of locally occurring grass species, such as *Microlaena stipoides* (Weeping Grass). This grass has been previously recorded within the site (Cumberland Ecology 2015), is commonly used for revegetation of river and stream edges to reduce erosion, and has high shade tolerance (Native Seeds 2016).

Species selected for revegetation will depend upon availability at the time of ordering, and may not include all species listed in Table D.1.

Table D.1 Planting species selection and density for Swamp Oak Floodplain Forest

Scientific name	Common name	Planting desity
Trees		
Casuarina glauca	Swamp Oak	1 plant per 2-4m²
Acmena smithii	Lilly Pilly	1 plant per 5m²
Glochidion ferdinandi	Cheese Tree	
Melaleuca spp. (Melaleuca quinquenervia, ericifolia,	Paperbarks	

and/or styphelioides)		
Ground covers		
Lomandra longifolia	Spiny-headed mat-rush	2 plants per 1 m²
Carex appressa	Tussock Sedge	
Centella asiatica	Indian Pennywort	
Commelina cyanea	Commelina	
Gahnia clarkei	Tall Saw Sedge	
Oplismenus imbecillis	Basket Grass	
Persicaria decipiens	Slender Knotweed	
Microlaene stipoides	Weeping Grass	20-25kg seed per hectare
Vines and climbers		
Parsonsia straminea	Common Silkpod	1 plant per 5m²
Geitonoplesium cymosum	Scrambling Lily	
Stephania japonica	Snake Vine	

Wetlands

Revegetation of Freshwater Wetlands will be undertaken in areas identified as such on Figure 4. Locally occurring species have been selected for revegetation, to maximise plant survival and provide habitat resources to local wildlife. Plantings will comprise of grasses, sedges and rushes that are characteristic of Freshwater Wetlands (DECC 2008, NSW Scientific Committee 2011b), and will be planted in clumps of same species. Species selected for revegetation will depend upon availability at the time of ordering, and may not include all species listed in Table D.2. Revegetation will occur in two zones:

Littoral zone

The littoral zone surrounds the wetland edge and is frequently dry, although it undergoes regular water level fluctuations. The primary role of plants in the littoral zone is to provide an edge buffer zone to protect banks from erosion. Dense plantings of sedges and *Gahnia* species (Table D.2), to achieve 80% vegetation coverage, will be established in the littoral zone.

Shallow Marsh

Shallow marsh is flooded most of the time but plants will be tolerant of some exposure to dry conditions. The primary role of plants in the shallow marsh zone is to provide a substratum for algal epiphytes and biofilms to enhance soluble pollutant uptake. A diversity of edges and rushes (Table D.2) will be established in the shallow marsh zone.

Table D.2 Planting species selection and density for Freshwater Wetlands

Scentific name	Common name	Planting density
Littoral zone		
Baumea articulata	Jointed Twig-rush	~3 plants per m²
Baumea rubiginosa	Twig-rush	
Bolboschoenus caldwellii	Marsh Club-rush	
Carex appressa	Tall Sedge	
Cyperus lucidus	Leafy Flat Sedge	

Hemarthria uncinata	Matgrass	
Juncus usitatus	Common Rush	
Panicum obseptum	White Water Panic	
Paspalum distichum	Water Couch	
Pseudoraphis spinescens	Spiny Mud Grass	
Shallow marsh (to 20cm depth)		
Baumea acuta	Pale Twig-rush	
Baumea rubiginosa	Soft Twig-rush	
Bolboschoenus fluviatilis	Marsh Clubrush	~6 plants per m²
Cyperus lucidus	Leafy Flat Sedge	
Eleocharis acuta	Common Spike rush	

Habitat Island

The proposed habitat islands (one in Stage 2, two in Stage 3) will remain dry. Vegetation to be established will include tall grasses, shrubs and trees characteristic of Swamp Oak Floodplain Forest (Table Table D.1).

D.4.6 Seed Provenance

All plants (seeds and tubestock) sourced for revegetation will be of local provenance (i.e. Illawarra region). Local provenance plants are often better adapted to local environmental conditions and have a greater capacity to provide habitat, food and other resources for local wildlife.

Canopy trees such as eucalypts and certain pioneer shrubs (often species of the family Fabaceae such as peas and wattles) are generally the most easily obtained, collected and propagated species that are most commonly used in revegetation projects. Groundcovers, particularly in any quantity or diversity, are less often used. Accordingly, the final species selection depends on the availability of species listed in Table D.1 and Table D.2, and not all species may be used.

Seeds and tubestock are to be sourced from a reputable supplier of local provenance plants, such as:

- Shellharbour City Council Nursery: 02 4221 6191
- Jamberoo Native Nursery: 02 4236 0445
- Native Seeds (for native grasses): 03 9555 1722

Plants will be ordered with sufficient time prior to the commencement of proposed revegetation works to determine the availability of various species.

D.4.7 Soil Preparation

A successful planning program starts with appropriate soil management. Ground preparation techniques are used to soften the soil and increase water infiltration, root area and soil aeration. Any damage to the soils' biological and chemical properties are most likely to happen through inappropriate stockpiling. The physical properties of the soil can be damaged through excessive compaction, over working or working the soil at the wrong moisture content.

The following recommendations will be implemented with respect to the management of soils (Landcom, 2004):

- Use topsoil on all lands to be revegetated;
- Before spreading topsoil, scarify the ground surface along the line of the contour to break any compacted and / or smooth materials and enable key bonding of the materials to one another;
- Apply topsoil to a depth appropriate for the gradient of the slope, generally between 50 and 100mm. Topsoil must not be placed on slopes steeper than 2h:1v without any additional means of stabilisation; and
- On completion of the respreading process, leave disturbed lands with a scarified surface to inhibit soil erosion, encourage water infiltration and help with keying topsoil later.

Prior to seeding or planting of tubestock, areas to be revegetated must be free of weeds. Weed management and control is to be undertaken in accordance with the Pest and Weed Management Plan (Appendix E).

D.4.8 Planting

Revegetation will involve two methods:

- Direct seeding: Sowing seeds directly onto the site on which you wish to establish them by mechanical or hand methods.
- Planting: Planting nursery-grown seedlings such as cell or tube-grown plants by mechanical or hand methods.

Timing

Ideally, planting will be undertaken during wetter and milder conditions during the year (spring/summer). Seeds and tubestock need to have been ordered with sufficient time prior to the proposed planting period. If the upper soil horizon is not moist at the time of planting, it may be appropriate to water seedlings.

Plant Protection

Stakes and ties will be used if necessary to protect tubestock.

Watering

Watering is to be undertaken regularly to promote plant growth, in accordance with water restrictions imposed by Council or the NSW State Government at that time. It is recommended that watering of plants be conducted twice per week during their initial establishment phase (0-3 months), before 10am or after 4pm. Between 6-12 months, watering will be undertaken on a monthly basis or as required to ensure continued plant growth.

Record keeping

For each discrete patch of native revegetation (ie each area of Swamp Oak Floodplain Forest or Freshwater Wetland as shown in Figure 4), the following data will be recorded:

- Date of planting;
- Species planted;
- Type of planting (seed or tubestock);
- Number of plants of each species planted;
- Provenance of each species and source nursery;
- Whether any protective treatment has been applied; and
- Depth of water planted in (for shallow marsh species).

These records must be submitted to DLSP within four weeks of planting, for each discrete area

D.4.9 Maintenance

Maintenance (timing, frequency and methods) are described in detail in the Rehabilitation Management Plan.

D.4.10 Performance monitoring

As described in the Rehabilitation Management Plan, a monitoring program will be undertaken to measure the success of native revegetation efforts against the completion criteria. This will allow DLSP to:

- track progress against performance criteria and attainment of completion criteria;
- provide feedback for continuous improvement; and
- assess and manage impacts/potential impacts on biodiversity.

Native revegetation monitoring will be undertaken by a suitably qualified bush regenerator or ecologist in areas identified as proposed Swamp Oak Floodplain Forest and proposed Wetland on the Final Landform

Monitoring of native revegetation will comprise 2 components:

- Vegetation establishment monitoring: to assess the successful establishment of planting in the short term (measured biannually for 3 years); and
- Ecosystem development monitoring: a seasonally based monitoring program to assess changes in the structure and composition of the vegetation and key fauna habitats in the medium – long term (measured every 2 years).

Details on the timing, methods and reporting requirement for the monitoring are provided in the Rehabilitation Management Plan

D.4.11 Completion criteria

As described in the Rehabilitation Management Plan, completion criteria and monitoring measures have been developed for application in accordance with the Conditions of Consent.

Completion criteria relevant to the vegetation establishment in disturbed areas include:

- Vegetation establishment monitoring of revegetated areas in accordance with timing and methodology prescribed in the Rehabilitation Management Plan
- Progressive revegetation of Swamp Oak Floodplain Forest, Freshwater wetlands and habitat island in accordance with the Final Landform
- A success rate (survival) of 80% for all plants in Swamp Oak Floodplain Forest, Freshwater wetlands and habitat island
- Within 24 months of the rehabilitation of each stage, achieve a percent cover of 5% (or less) of woody noxious weeds across this same stage

Completion criteria relevant to ecosystem development in disturbed areas include:

- Ecosystem development monitoring of revegetated areas in accordance with timing and methodology prescribed in the Rehabilitation Management Plan
- The Composition score (derived from the BAM calculator) is at least 50% of the scores from PCT benchmark.
- The Structure score (derived from the BAM calculator) is at least 50% of the scores from PCT benchmark.
- The Function score (derived from the BAM calculator) is at least 50% of the scores from PCT benchmark.

- The Vegetation Integrity score (derived from the BAM calculator) is at least 50% of the scores from PCT benchmark.
- In the Swamp Oak Floodplain Forest, the density of native trees is at least 50% of that of the analogue site (no./ 1000m2 plot).
- Exotic plant cover is <20%.
- The total cover of high threat exotic species (HTEs) is <10%.

Rehabilitation management actions will be measured through regular environmental performance reviews. A status update of the rehabilitation of the site is reported in the Annual Review as per Schedule 5 Condition 9.

These will be based on the measurable outcomes identified in each environmental management plan. The reviews will be used to assess progress in meeting project environmental objectives and targets and will be undertaken by the Environmental Manager or delegate:

- In response to new or revised Boral Project approvals; and
- In response to major changes in site conditions or work methods.

Environmental performance is measured through compliance with the various environmental management plans.

Should an environmental non-conformance be identified as a result of a monitoring result, a non-conformance report will be completed and archived by the Environmental Manager or delegate.

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Appendix E PEST AND WEED MANAGEMENT PLAN

E.1 INTRODUCTION

This Pest and Weed Management Plan (PWMP) is a component of the Flora and Fauna Management Plan (FFMP) for Dunmore Lakes Sand Project (DLSP).

This plan details how to manage weeds in accordance with the requirements of the CoA, relevant Authorities and the *Biosecurity Act 2015.* This plan applies to weed species known and likely to occur within DLSP.

The pest and weed control program has been designed mainly for post-rehabilitation weed control, given that the existing weed species will be removed from the site (as part of broad vegetation clearing) prior to sand extraction. This plan also applies to remnant native and exotic vegetation within the Stage 5 site.

E.2 SCOPE

This strategy:

- Identifies potential terrestrial and aquatic pests and weeds that may be expected on the site;
- Describes the measures that would be implemented to prevent and eradicate the occurrence of pests and weeds on the site; and
- Describes how the performance of these measures would be monitored over time.

E.3 RELEVANT LEGISLATION

Relevant legislation includes the following:

- NSW Biosecurity Act 2015 (BS Act); and
- NSW Local Land Services Act 2013 (LLS Act).

E.4 RELEVANT REFERENCES

Relevant references include the following:

- High Threat Weeds list (DPIE 2020);
- Noxious and environmental weed control handbook – A guide to weed control in non-crop, aquatic and bushland situations (DPI 2011);
- National Heritage Trust Introductory Weed Management Manual (CRC for Australian Weed Management, 2004);
- South East Regional Strategic Pest Animal Plan 2018-2023 (nsw.gov.au); and
- WeedWise website (DPI 2021)

E.5 WEED AND PEST SPECIES OF THE SITE

E.5.1 High Threat and Priority weeds

Assessment for the existing site (Stages 2-4) identified a total of three noxious weed species declared for the Shellharbour Local Government Area (LGA) under the now repealed *Noxious Weeds Act 1993*.

- Gorse (*Ulex europea*)
- African Boxthorn (*Lycium ferocissimum*)
- Fireweed (*Senecio madagascariensis*)

These species are listed as priority species for the South East Local Land Services region (DPI 2021) under the NSW *Biosecurity Act 2015*.

Field assessment undertaken for the Stage 5 site (Niche 2019) identified the following high threat weeds:

- Sheep's sorrel (*Acetosella vulgaris*);
- Cape Ivy (*Delairea odorata*);
- Lantana (*Lantana camara*);
- Panic veldtgrass (*Ehrharta erecta*);
- Sprenger's asparagus (*Asparagus aethiopicus*);
- Balloon Vine (*Cardiospermum grandiflorum*);
- Rhodes grass (*Chloris gayana*);
- African boxthorn (*Lycium ferocissimum*);
- St. Augustine grass (*Stenotaphrum secundatum*); and
- Dallis grass (*Paspalum dilatatum*).

African boxthorn and Lantana are also listed as priority weed species for the South East Local Land Services region (DPI 2021). Descriptions of the priority weeds recorded on the site are provided in Table E.1.

Table E.1 Priority weeds identified within the site

Species	Description	Photo (DPI)
Ulex europea (Gorse)	A spiny shrub that forms dense impenetrable thickets, Shrubs are typically 1-2.5 metres tall. Flowers are bright yellow and pea-like, 15– 3 25 mm long and have a distinct coconut scent. Seeds are brown to green in colour, very hard, heart- shaped and up to 4 mm long.	
Lycium ferocissimum (African Boxthorn)	A woody, thorny shrub that grows to five metres high and three 3 metres across. The flowers are white with pale blue markings and fragrant berries are green when young and red-orange when ripe.	
Senecio madagascariensis (Fireweed)	A daisy-like plant that grows from 10 to 60 cm high. Leaves are Generally bright green in colour, fleshy and narrow, flowers are 4 Small, yellow and daisy-like, flowers are 1–2 cm in diameter and arranged in clusters at the end of each branch.	
Lantana camara (Lantana)	Lantana is a usually a dense shrub, although it can drop its leaves in dry times. It usually grows from 2 – 4 m high but can scramble up into trees. There are five main types with different flower colours: pink, red, orange, white and pink-edged red. Red lantana has pricklier stems and darker green leaves than pink lantana.	

Source: NSW WeedWise (DPI 2020)

E.5.2 Other weed species

Other weed species that occur in the site include exotic grasses and herbs, introduced pasture grasses, non-indigenous plants or native plants that are either beyond their natural range, hybridise with indigenous plants or threaten local vegetation communities. New weed species could also spread from nearby infestations and become established on the site.

E.5.3 Pest species

It is unknown whether introduced aquatic species occur in the wetlands and watercourses within the site, due to a lack of aquatic surveys being undertaken. Commonly occurring exotic fish species such as Carp (*Cyprinus carpio)*, Mosquito fish (*Gambusia holbrooki*), Redfin perch (*Perca fluviatilis)* and Goldfish (*Carassius auratus)* may occur (Cumberland Ecology 2010). Feral goats and deer are known to occur in the surrounding locality and may occur in the site on occasion. If these species are recorded in the site, a suitably qualified pest controller will be engaged.

Four exotic terrestrial fauna species have been identified in the site: Common Myna (*Acridotheres tristis*), Spotted Turtle Dove (*Streptopelia chinensis)*, European Goldfinch *(Carduelis carduelis)* (Kevin Mills & Associates 2004) and the Red-whiskered Bulbul (*Pycnonotus jocosus*) (Niche 2019). These highly mobile bird species do not occur in high abundances within the site and occur in the site on a temporary and/or transient basis, given the lack of fauna habitat features in the site.

E.6 WEED MANAGEMENT ACTIONS

E.6.1 Removal of weeds

Weed removal will be staged, in accordance with the staging of sand extraction activities in Stage 2, 3, 5 and at a later date, Stage 4. Weed removal will commence in remnant vegetation to the south of Stage 5B on the commencement of sand extraction activities in Stage 5.

E.6.2 Mechanical

Mechanical removal of weeds will be undertaken where weeds occur within the sand excavation footprint, in Stage 4 and 5. Excavators or bulldozers may be used to remove larger shrubs and root systems if required. Stumps are to be ground out of the soil. Alternatively, slashers can be used to remove shrubby weeds. Seedlings or regrowth of weed species can be slashed.

E.6.3 Chemical Treatment of weeds

Control methods for weed species are identified in this section and are based mainly on a targeted approach using biodegradable chemical controls. Chemical treatment of weeds will be required following mechanical removal of weeds from the sand extraction footprint, for any weeds that occur on land to be retained (i.e. outside of the sand extraction footprint).

Chemical control will target localised weed infestations to avoid water pollution and downstream impacts on the Coastal SEPP wetland located to the south and east of the site.

Herbicide application is to be administered by authorised personnel, with ChemCert Accreditation AQF 3 (in accordance with Workcover requirements). Chemicals are to be used in accordance with the First Aid Instructions, Safety Directions, Warning Statements and General Safety Precautions for Agricultural and Veterinary Chemicals (FAISD) Handbook (Australian Pesticides and Veterinary Medicines Authority).

Herbicide application

High threat and priority weeds are to be treated in accordance with the herbicide specific to each species, as listed in the NSW WeedWise website (DPI 2020). These treatments (for priority weed species currently occurring in the site) are listed in Table E.2. Treatments additional species of priority weeds that may colonise the site can also be found on the NSW WeedWise website.

Although trade names are used in Table E.2, in most cases there are other products with the same active constituents and quantities. Any product with the same active constituents may be used.

Herbicide applicators aim to maximise the amount of herbicide reaching the target plants, and minimise the likelihood of the herbicide reaching off-target areas through spray drift.

In accordance with the principles outlined in *Noxious and Environmental Weed Control Handbook* (DPI 2011), herbicides will:

- Not be sprayed in wind speeds of 10km/h or greater, causing spray to drift into non- target areas;
- Not be sprayed on days when the temperature exceeds 28°C;
- Not be continued to be sprayed if weather conditions change and become unsuitable;
- Use the largest droplets that give adequate spray coverage; and
- Use the least-volatile formulation of herbicide available.

Other requirements include:

- Herbicides will not be used where they will detrimentally affect water quality, or so close to a watercourse that the herbicide can enter the water and contaminate the waterway. Only pesticides registered for use near water may be used near water.
- Herbicide Application Record Sheet must be completed. A copy must be submitted to the Environmental Manager or delegate and development Certifier.
- A record sheet is not required where herbicide is applied by hand or using hand- held equipment, or, if applied in quantities of no more than 5 litres/5 kilograms of concentrated product or 20 litres/20 kilograms of the ready-to-use product.

Table E.2 Chemical weed control for noxious weeds known from the site

Chemical and concentration	Rate of application	Comments
Ulex europea (Gorse)		
Picloram 100 g/L + Triclopyr 300 g/L + Aminopyralid 8 g/L Grazon Extra®	250 or 350 mL per 100 L of water	Handgun application to actively growing plants. Use higher rate on bushes over 1.5 m high or as an autumn treatment.
Picloram 100 g/L + Triclopyr 300 g/L + Aminopyralid 8 g/L Grazon Extra®	500 mL in 100 L of water	Handgun application for Winter treatment
Triclopyr 300 g/L + Picloram 100 g/L Grazon® DS	250 or 350 mL per 100 L of water	Handgun application for actively growing plants. Use higher rate on bushes over 1.5 m high or as an autumn treatment.
Triclopyr 300 g/L + Picloram 100 g/L Grazon® DS	500 mL per 100 L of water	Handgun application for Winter treatment
Triclopyr 200 g/L + Picloram 100 g/L Tordon® DSH	375 mL per 100 L of water	Handgun application from September to March.
Triclopyr 600 g/L Garlon® 600	170 or 340 mL per 100 L water	Handgun application, add non-ionic surfactant. Spring to mid-summer, higher rate on older bushes.
Metsulfuron methyl 300 g/kg + Aminopyralid 375 g/kg Stinger™	30 g per 100 L of water	Handgun application for bushes up 2m tall. Add Pulse penetrant.
Glyphosate 835 g/kg + Metsulfuron-methyl 10 g/kg Trounce®	1 measured pack (173 g) in 100 L of water	Apply to bushes up to 2 m high when actively growing.
Glyphosate 360 g/L Roundup®	1.0 L per 100 L of water	Add Pulse (wetting agent), apply to actively growing bushes. Spray to wet all foliage.
Metsulfuron-methyl 600 g/kg	10 g per 100 L of water, plus 200 mL of glyphosate 360g/kg	Apply to bushes up to two metres tall. Ensure thorough spray penetration and coverage of whole plant.
Picloram 44.7 g/L + Aminopyralid 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
Lycium ferocissimum (African Boxthorn)		
Triclopyr 300 g/L + Picloram 100 g/L Grazon® DS	500 mL per 100 L water	Handgun application for when bushes have good leaf cover, growth and no leaf fall. Only apply to plants less than 2 m tall.
Triclopyr 240 g/L + Picloram 120 g/L Access™	1.0 L per 60 L of diesel	Basal bark application up to 5 cm basal diameter. Cut stump application for over 5 cm diameter.
2,4-D 300 g/L + Picloram 75 g/L Tordon® 75-D	1.3 L per 100 L of water	Handgun application for small bushes only. Spray soil to drip line. Thorough coverage is essential. Spray prior to budburst.
Glyphosate 360 g/L Roundup®	0.7–1.0 L per 100 L	Handgun application, with low rate on young bushes, high water rate on mature bushes. Do not spray in hot dry summer periods.
Triclopyr 600 g/L Garlon® 600	2.0 L per 60 L of diesel	Basal bark application up to 5 cm basal diameter. Cut stump application for over 5 cm diameter.

Tebuthiuron 200 g/kg Graslan®	2 g per m2	Hand application (granules). Estimate the area within 30 cm beyond the drip line of the target plant and calculate the amount of Graslan required. Do not apply near desirable trees.
Picloram 44.7 g/L + Aminopyralid 4.47 g/L Vigilant II®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm .
Glyphosate 360 g/L with Metsulfuron-methyl 600 g/kg	10 g metsulfuron plus 1 litre glyphosate in 100 L of water	Always add non-ionic surfactant to the spray mix. Apply to actively growing weeds
Glyphosate 360 g/L Roundup®	1 part glyphosate to 1.5 parts water	Stem injection or stem scrape application
Senecio madagascariensis (Fireweed)		
Bromoxynil 200 g/L Bromicide®	1.4 L/ha	Boom spray. Seedling application. In pastures apply with low volume boom spray during autumn/winter when weeds are young and actively growing. Observe withholding period.
Bromoxynil 200 g/L Bromicide®	2.8 L/ha	Boom spray. Early flowering application. In pastures apply with low volume boom spray during autumn/winter when weeds are young and actively growing. Observe withholding period.
Picloram 100 g/L + Triclopyr 300 g/L + Aminopyralid 8 g/L Grazon Extra®	350 mL in 100 L of water	Apply as a thorough foliar spray
Fluroxypyr 140 g/L + Aminopyralid 10 g/L Hot Shot™	500 mL in 100 L of water	Apply to flowering plants up to 30 cm tall
Fluroxypyr 140 g/L + Aminopyralid 10 g/L Hot Shot™	1.5 L/ha	Treat seedling plants up to flowering
2,4-D amine 625 g/L Amicide® 625	2–2.5 L/ha	Boom spray application
Metsulfuron-methyl 600 g/kg Brush-off®	10 g in 100 L of water	Spot spray application
Metsulfuron-methyl 600 g/kg Brush-off®	40 g/ha	Boom spray
Lantana camara (Lantana)		
2,4-D 300 g/L + Picloram 75 g/L Tordon® 75-D	650 mL per 100 L of water	High volume spot spray. Thoroughly wet foliage and soil around the base of plant during March to May.
2,4-D amine 625 g/L Amicide® 625	320 m/L in a 100 L of water	Apply to actively growing bushes
Dichlorprop 600 g/L Lantana 600®	1.0 L per 200 L of water	Spot spray application, completely wet all leaves and stems
Fluroxypyr 140 g/L + Aminopyralid 10 g/L Hot Shot™	500 mL per 100 L of water	Seedlings and regrowth 0.5–1.2 m height. Apply to actively growing plants
Fluroxypyr 140 g/L + Aminopyralid 10 g/L Hot Shot™	700 mL per 100 L of water	Mature plants and regrowth 1.2–2.0 m. Apply to actively growing plants

Fluroxypyr 200 g/L Starane™	500 mL or 1.0 L per 100 L of water	Apply to actively growing bushes from October to April. Use lower rate on seedlings or bushes to 1.2 m high, higher rate on bushes over 1.2 m
Fluroxypyr 333 g/L Starane™ Advanced	300 - 600 mL in 100 L of water	Apply to actively growing bushes from October to April. Use lower rate on seedlings or bushes to 1.2 m high, higher rate on bushes over 1.2 m
Glyphosate 360 g/L	1.0 L per 100 L of water	Actively growing with full foliage. Avoid summer stress
Glyphosate 360 g/L with Metsulfuron-methyl 600 g/kg	10 g metsulfuron-methyl plus 200 mL glyphosate per 100 L of water	Apply to bushes up to 2 m high. Thoroughly wet all foliage and stems. Add organosilicone penetrant.
Glyphosate 360 g/L	1 part per 9 parts water	Gas gun / Splatter gun application. Apply 2 x 2 mL doses per 0.5 m of bush height
Glyphosate 835 g/kg + Metsulfuron-methyl 10 g/kg Trounce®	1 measured pack (173 g) per 100 L of water	Apply when actively growing, thoroughly wet all foliage and stems. Do not apply during stress periods
Metsulfuron-methyl 300 g/kg + Aminopyralid 375 g/kg Stinger™	20 g in 100 L of water	Hand gun application
Metsulfuron-methyl 600 g/kg	10 g per 100 L of water	Apply to bushes up to two metres tall. Spray to wet all foliage and stems. Re-treatment will be necessary
Picloram 100 g/L + Triclopyr 300 g/L + Aminopyralid 8 g/L Grazon Extra®	350 - 500 mL in 100 L of water	Wet thoroughly, use higher rate on large bushes, 1–2 m tall. Low rates for bushes up to 1 m tall. Apply from summer to autumn
Picloram 44.7 g/kg + Aminopyralid 4.47 g/L Vigilant II ®	Undiluted	Cut stump application. Apply a 3–5 mm layer of gel for stems less than 20 mm. Apply 5 mm layer on stems above 20 mm
Triclopyr 240 g/L + Picloram 120 g/L Access™	1.0 L per 60 L of diesel	Basal bark or cut stump application
Triclopyr 300 g/L + Picloram 100 g/L Grazon® DS	350 - 500 mL per 100 L of water	Wet thoroughly, use higher rate on large bushes, 1–2 m tall. Low rates for bushes up to 1 m tall. Apply from summer to autumn
Triclopyr 600 g/L Garlon® 600	1.0 L per 60 L of diesel	Basal bark application for basal diameter less than 5 cm or cut stump application above 5 cm

NOTE: NSW WeedWise (DPI 2020) should be sourced to regularly review these recommendations)

E.6.4 Prevention of importation of weeds

Once priority weeds have been removed from each stage (prior to sand extraction activities), the next management action involves preventing, or minimising the potential, for weeds species to be introduced and to become established within that stage.

To control the importation of weeds into the site from external sources, the Environmental Manager must be diligent in ensuring that plant and equipment is free of weeds prior to being brought to the site; that all vegetative material and soil has been removed from plant used within the site.

All construction machinery used within the site to remove weeds is to be thoroughly cleaned to remove all plant material and soil potentially containing weed seeds and propagules.

Equipment used for treating weed infestation will be cleaned prior to moving to a new area within the site to minimise the likelihood of transferring any plant material and soil.

All site personnel are to be inducted on the existence of weeds on the site during the project induction and as required in toolbox talks and the controls they are required to implement to minimise weed spread.

E.6.5 Weed monitoring

Weed monitoring will evaluate the effectiveness of weed management across each stage within the site. Monitoring actions will include regular site visits, mapping and fixed point photographs and will be implemented on a stage-by-stage basis. Regular monitoring will allow for the rapid treatment of weed outbreaks, to reduce the spread and establishment of the weed elsewhere within the site.

E.6.6 Monitoring methodology

Monitoring inspections are to be undertaken in accordance with the monitoring timing and methodology outlined in the Rehabilitation Management Plan. This involves monitoring on a monthly basis for the first 12 months, followed by monitoring on a six monthly basis for the following two years. The monitoring will be undertaken by a suitably qualified bush regenerator or ecologist.

In addition to the indicative monitoring locations identified in the Rehabilitation Management Plan, weed monitoring will involve a monthly random meander traverse throughout the site for the first 12 months after the completion of rehabilitation in each stage, to identify the presence of weeds outside of the aforementioned monitoring locations. Random meander traverse monitoring throughout the remnant vegetation to the south of Stage 5B will also be undertaken on a 6 monthly basis commencing when sand extraction activities start in Stage 5.

E.6.7 Ongoing weed management

Given the disturbed nature of the soil profile, due to past and current land management practices within the site, ongoing weed management will be required to prevent and control weed infestations and/or spread during sand extraction works in each stage. Weed management will be required after rehabilitation of Stage 2, Stage 3, Stage 5 and at a later date, Stage 4.

Weeds must be treated within two weeks of identifying their presence during a monitoring period. Weed infestations are to be managed in accordance with the removal methods outlined in this Section. Verification of proposed control measures and supervision of weed control activities is to be undertaken in consultation with a qualified weed contractor, which may include:

- Herbicide treatment, in accordance with chemicals specific to weeds species as listed in Table E.2 and on the NSW WeedWise website (DPI 2020).
- Minimal impact/disturbance methods: removal of weeds by hand or low disturbance mechanical means will be used (i.e. dug out with a mattock or cut and paint technique.

All weed removal activities must be reported to the Environmental Manager.

E.6.8 Performance measures

Performance measures for effective weed management in the site are listed in Table E.3.

E.7 Pest Management Actions

Pest Management will be conducted in rehabilitated areas as required. Plans of management will be developed in consultation with the NPWS and LLS where required and be consistent with the relevant threat abatement plans, which may include:

- Threat abatement plan for predation by European red fox (DEWHA 2008);
- Threat abatement plan for predation by feral cats (DoE 2015);

- Threat abatement plan for competition and land degradation by rabbits (DoEE 2016); and
- Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (DoEE 2017).

All feral animal control will be undertaken by trained contractors.

Table E.3 Performance measures for effective weed management

Management Action Ref ID	Performance Measure	Management Action	Timing	Responsibility	Source (this can provide link to relevant CoA)
PWMP01	No new high threat or priority weed species become established within the site.	All vehicles, trucks, and plant to have been cleaned where necessary if previously identified to been at a high risk site or area (to remove vegetative material and soil), including tyre treads, prior to entry into the site.	During clearing and soil removal prior to sand excavation activities	Environmental Manger Contractors	CoA 38(e)
PWMP 02		All vehicles, trucks, and plant used within the site to remove weeds is to be thoroughly cleaned where necessary if previously identified to been at a high risk site or area to remove all plant material and soil potentially containing weed seeds and propagules	During clearing and soil removal prior to sand excavation activities	Environmental Manger Contractors	CoA 38(e)
PWMP 03		Clean equipment used for weed treatment prior to moving between stages	Prior to and during sand excavation activities, where works are required in weed infested area	Environmental Manger Contractors Contractor for bush regeneration	CoA 38(e)
PWMP 04		Induct all site personnel on the existence of noxious weeds and the controls they are required to implement to minimise weed spread	During sand excavation activities, where works are required in weed infested area	Environmental Manger Contractors Contractor for bush regeneration	CoA 38(e)
PWMP 05	Treatment of weeds within two weeks of identifying its presence during a	Undertake monitoring in accordance with monitoring requirements described in the Rehabilitation Management Plan	As specified in the Rehabilitation Management Plan	Environmental Manger Contractor for bush regeneration	CoA 38(e)

PWMP 06	monitoring period within the site	In addition to the monitoring described in the Rehabilitation Management Plan, undertake monthly random meander traverse throughout the site to identify the presence of weeds outside of the aforementioned monitoring locations	For the first 12 months after the completion of rehabilitation in each stage	Environmental Manger Contractor for bush regeneration	CoA 38(e)
PWMP 07		Commence 6 monthly random meander traverse monitoring throughout the remnant vegetation to the south of Stage 5B.	Ongoing, from the commencement of sand extraction in Stage 5	Environmental Manger Contractor for bush regeneration	CoA 38(e)
PWMP 08		Record location and species of weed required to be treated, if identified during monitoring period	During monitoring period, as specified in the Rehabilitation Management Plan	Contractor for bush regeneration	CoA 38(e)
PWMP 09		Treat weed infestation with mechanical removal or herbicide application	Within two weeks of identifying presence of weed	Contractor for bush regeneration	CoA 38(e)
PWMP 10	Within 24 months of the rehabilitation of each stage, achieve a percent cover of 5% (or less) of woody high threat and priority weeds across this same stage, including the remnant native vegetation to the south of Stage 5B	Undertake monitoring in accordance with monitoring requirements described in the Rehabilitation Management Plan	As specified in the Rehabilitation Management Plan	Contractor for bush regeneration	CoA 38(e)
PWMP 11		Treat weed infestation with mechanical removal or herbicide application	Within two weeks of identifying presence of weed	Contractor for bush regeneration	CoA 38(e)
PWMP 12		Continue weed treatment as required to achieve percent cover of 5% (or less)	As required, following rehabilitation of stage	Contractor for bush regeneration	CoA 38(e)

Appendix F EVIDENCE OF CONSULTATION

RE: Request for Consultation Dunmore Lakes Sand Project Flora and Fauna Management Plan

Byron Robinson <byronr@kiama.nsw.gov.au>

Thu 01/07/2021 2:21 PM

To: Ben Williams <Ben.Williams@boral.com.au>
Cc: Adnan Voloder <adnan.voloder@boral.com.au>

No worries Ben,

That's the comments I had, and I don't think anyone else has had any time to take a look. I'll need to follow up with Jessica about who may be nominated by Council as a representative on the CCC and get back to you. For example Council may want to appoint a councillor as their representative similar to another CCC, or they may choose to nominate a Council staff member.

Regards

Byron Robinson
Environmental/Sustainability Officer
Kiama Municipal Council
P: 02 4232 0444
PO Box 75, Kiama NSW 2533
www.kiama.nsw.gov.au

RESPECT • INNOVATION • INTEGRITY • TEAMWORK • EXCELLENCE

From: Ben Williams <Ben.Williams@boral.com.au>
Sent: Thursday, 1 July 2021 2:05 PM
To: Byron Robinson <byronr@kiama.nsw.gov.au>

Cc: Adnan Voloder <adnan.voloder@boral.com.au>
Subject: Re: Request for Consultation Dunmore Lakes Sand Project Flora and Fauna Management Plan

Hi Byron,

Thanks for getting back to me. Apologies I missed the pdf as it was in reply to the RMP thread. Was the only comment from KMC the below?

- Should this be a weed that is being controlled not planted? not sure of a native cotoneaster, just the weed?
- correct spelling error in section 4.1.4
- correct spelling error in section 4.2.3

Can you confirm and I will get our consultants to make the amendments. I will follow up with the reference to planting cotoneaster as it was referenced in the original 2017 plan.

Regards,

BEN WILLIAMS
Environmental Coordinator Dunmore

Telephone: 02 42378414
Mobile: 0401 895 478
Email: Ben.Williams@boral.com.au

Boral Dunmore Sand and Soil
38 Tabbita Road, Dunmore NSW 2529
www.boral.com.au

From: Byron Robinson <byronr@kiama.nsw.gov.au>
Sent: Thursday, 1 July 2021 1:47 PM
To: Ben Williams <Ben.Williams@boral.com.au>
Cc: Adnan Voloder <adnan.voloder@boral.com.au>; Jessica Rippon <jessicar@kiama.nsw.gov.au>; Council <council@kiama.nsw.gov.au>
Subject: RE: Request for Consultation Dunmore Lakes Sand Project Flora and Fauna Management Plan

Hi Ben,

I sent it through on 25 June?? I sent it through as comments on the pdf, so maybe your firewall or our firewall held it up, although I don't have a message saying it was rejected. Did it get diverted to your junk folder? I can try and send the pdf through again.

Regards

Byron Robinson
Environmental/Sustainability Officer
Kiama Municipal Council
P: 02 4232 0444
PO Box 75, Kiama NSW 2533
www.kiama.nsw.gov.au

RESPECT • INNOVATION • INTEGRITY • TEAMWORK • EXCELLENCE

From: Ben Williams <Ben.Williams@boral.com.au>
Sent: Thursday, 1 July 2021 12:52 PM
To: Byron Robinson <byronr@kiama.nsw.gov.au>; Jessica Rippon <jessicar@kiama.nsw.gov.au>; Council <council@kiama.nsw.gov.au>
Cc: Adnan Voloder <adnan.voloder@boral.com.au>
Subject: Re: Request for Consultation Dunmore Lakes Sand Project Flora and Fauna Management Plan

Hi Byron,

I am just following up the consultation of the Flora and Fauna Management Plan. We are required to submit this document to DPIE next week. Are you able to provide comments on the plan by the end of this week COB 2 July 2021?

Regards,

BEN WILLIAMS
Environmental Coordinator Dunmore

Telephone: 02 42378414
Mobile: 0401 895 478
Email: Ben.Williams@boral.com.au

Boral Dunmore Sand and Soil
38 Tabbita Road, Dunmore NSW 2529
www.boral.com.au

From: Byron Robinson <byronr@kiama.nsw.gov.au>
Sent: Thursday, 24 June 2021 9:44 AM
To: Ben Williams <Ben.Williams@boral.com.au>; Jessica Rippon <jessicar@kiama.nsw.gov.au>; Council <council@kiama.nsw.gov.au>
Cc: Adnan Voloder <adnan.voloder@boral.com.au>
Subject: RE: Request for Consultation Dunmore Lakes Sand Project Flora and Fauna Management Plan

Sorry Ben,

I got the Riparian Management Plan and I was not at work yesterday so haven't yet reviewed the Flora and Fauna one, I will try and get you some feedback this afternoon.

Regards

Byron Robinson
Environmental/Sustainability Officer
Kiama Municipal Council
P: 02 4232 0444
PO Box 75, Kiama NSW 2533
www.kiama.nsw.gov.au

RESPECT • INNOVATION • INTEGRITY • TEAMWORK • EXCELLENCE

From: Ben Williams <Ben.Williams@boral.com.au>
Sent: Wednesday, 23 June 2021 11:25 AM

To: Jessica Rippon <jessicar@kiama.nsw.gov.au>; Council <council@kiama.nsw.gov.au>; Byron Robinson <byronr@kiama.nsw.gov.au>
Cc: Adnan Voloder <adnan.voloder@boral.com.au>
Subject: Re: Request for Consultation Dunmore Lakes Sand Project Flora and Fauna Management Plan

Hi Jessica/Byron,

Are you able to confirm that you have received the email requesting consultation of the Dunmore Lakes Sand Project Flora and Fauna Management Plan. We were hoping to receive comments by 22/06/21.

If you have any issues, please feel free to contact me,

Regards,

BEN WILLIAMS
Environmental Coordinator Dunmore

Telephone: 02 42378414
Mobile: 0401 895 478
Email: Ben.Williams@boral.com.au

Boral Dunmore Sand and Soil
38 Tabbita Road, Dunmore NSW 2529
www.boral.com.au

From: Ben Williams <Ben.Williams@boral.com.au>
Sent: Friday, 18 June 2021 10:27 AM
To: jessicar@kiama.nsw.gov.au <jessicar@kiama.nsw.gov.au>; Council (council@kiama.nsw.gov.au) <council@kiama.nsw.gov.au>
Cc: Adnan Voloder <adnan.voloder@boral.com.au>
Subject: Re: Request for Consultation Dunmore Lakes Sand Project Flora and Fauna Management Plan

Hi Jessica,

I hope all is well,

Are you able to confirm that you have received the email requesting consultation of the Dunmore Lakes Sand Project Flora and Fauna Management Plan and that you are able to provide comment by 22/06/21?

If you have any issues, please feel free to contact me,

Regards,

BEN WILLIAMS
Environmental Coordinator Dunmore

Telephone: 02 42378414
Mobile: 0401 895 478
Email: Ben.Williams@boral.com.au

Boral Dunmore Sand and Soil
38 Tabbita Road, Dunmore NSW 2529
www.boral.com.au

From: Ben Williams
Sent: Tuesday, 8 June 2021 3:28 PM
To: jessicar@kiama.nsw.gov.au <jessicar@kiama.nsw.gov.au>
Cc: Adnan Voloder <adnan.voloder@boral.com.au>
Subject: Request for Consultation Dunmore Lakes Sand Project Flora and Fauna Management Plan

Dear Jessica,

I hope this email finds you well.

As part of the modification consent issued in November 2020, we are required to consult with Kiama City Council, following Condition 38 of consent DA 195-8-2004 , for the preparation of the Flora and Fauna Management Plan. A copy of the consent is attached for your reference.

Please find attached a copy of the Flora and Fauna Management Plan, prepared in accordance with the requirements of Condition 38 of the consent.

It would be most appreciated if you could send through any comments on the FFMP by COB 22 June 2021.

Any questions or concerns, please get in touch. I would appreciate if you would be able to reply confirming that you have received this email.

Regards,

BEN WILLIAMS
Environmental Coordinator Dunmore

Telephone: 02 42378414
Mobile: 0401 895 478
Email: Ben.Williams@boral.com.au

Boral Dunmore Sand and Soil
38 Tabbita Road, Dunmore NSW 2529
www.boral.com.au

RE: Request for Consultation Dunmore Lakes Sand Project Flora and Fauna Management Plan

Andrew Lee <Andrew.Lee@shellharbour.nsw.gov.au>

Fri 02/07/2021 11:46 AM

To: Ben Williams <Ben.Williams@boral.com.au>; Grant Meredith <Grant.Meredith@shellharbour.nsw.gov.au>
Cc: Adnan Voloder <adnan.voloder@boral.com.au>; Natalia McGregor <Natalia.McGregor@shellharbour.nsw.gov.au>

Hi Ben,

Please see below for my recommendations to the Flora and Fauna Management Plan.

Page 19- Alignment with other Plans. The Biodiversity Development Assessment Report should be listed as there would have been mitigation measures provided that should be included in the Plan.

Appendix B- Vegetation Clearing Protocol, B.3 Relevant Legislation. Should list the Biodiversity Conservation Act (due to the EEC's present and the potential for threatened species to be present.
It should also list the Coastal Management Act, in reference to Part 2 of the Act (Stage 5b)

ATTACHMENT 2 – Region specific approval requirements. Approvals to be considered- NSW- Local Council- I don't believe that there is a requirement for Local Council to approve vegetation clearing, this is all through the Major Project application/SEPP, EIS and associated BDAR.

Appendix D- Vegetation Clearing Protocol, D.3 Relevant Legislation. Should list the Biodiversity Conservation Act (due to the EEC's present and the potential for threatened species to be present.

Appendix E PEST AND WEED MANAGEMENT PLAN- E.3 Relevant Legislation. Could also list the Local Land Services Act and Section E.4 Relevant References the plan I to be consistent with the Regional Pest Management Plan 2018-2023 South East Regional Strategic Pest Animal Plan 2018-2023 (nsw.gov.au)

E.5 WEED AND PEST SPECIES OF THE SITE should also reference the High threat weeds list found here Assessor resources | NSW Environment, Energy and Science to be consistent with the Biodiversity Assessment Method

E.6.3 Chemical Treatment of weeds- Should list that chemicals are to be used consistently as listed by the Australian Pesticides and Veterinary Medicines Authority (APVMA).

Regards

Andrew

Shellharbour CITY COUNCIL

Andrew Lee | Senior Environment Officer - Biodiversity

76 Cygnet Avenue, Shellharbour City Centre
Locked Bag 155, Shellharbour City Centre, NSW 2529
p. 0406 383 047 **m.** 0406 383 047
www.shellharbour.nsw.gov.au

From: Ben Williams <Ben.Williams@boral.com.au>
Sent: Thursday, 1 July 2021 12:44 PM
To: Grant Meredith <Grant.Meredith@shellharbour.nsw.gov.au>; Andrew Lee <Andrew.Lee@shellharbour.nsw.gov.au>

Cc: Adnan Voloder <adnan.voloder@boral.com.au>
Subject: Re: Request for Consultation Dunmore Lakes Sand Project Flora and Fauna Management Plan

Hi Andrew,

I have been passed on your details by Grant (cc'd). I am following up the request for consultation from SCC in relation to our Flora and Fauna Management Plan. I have attached the FFMP and our consent to this email. Please let me know if you have any issues with accessing the files.

We originally sent the request for consultation on 8 June 2021. We are required to submit this document to DPIE next week. Are you able to provide comments on the plan by the end of this week COB 2 July 2021?

If you have any queries at all, please do not hesitate to contact me.

Regards,

BEN WILLIAMS
Environmental Coordinator Dunmore

Telephone: 02 42378414
Mobile: 0401 895 478
Email: Ben.Williams@boral.com.au

Boral Dunmore Sand and Soil
38 Tabbita Road, Dunmore NSW 2529
www.boral.com.au

From: Ben Williams
Sent: Tuesday, 8 June 2021 3:25 PM
To: grant.meredith@shellharbour.nsw.gov.au (grant.meredith@shellharbour.nsw.gov.au) <grant.meredith@shellharbour.nsw.gov.au>
Cc: Adnan Voloder <adnan.voloder@boral.com.au>
Subject: Request for Consultation Dunmore Lakes Sand Project Flora and Fauna Management Plan

Dear Grant,

I hope this email finds you well.

As part of the modification consent issued in November 2020, we are required to consult with Shellharbour City Council, following Condition 38 of consent DA 195-8-2004 , for the preparation of the Flora and Fauna Management Plan. A copy of the consent is attached for your reference.

Please find attached a copy of the Flora and Fauna Management Plan, prepared in accordance with the requirements of Condition 38 of the consent.

It would be most appreciated if you could send through any comments on the FFMP by COB 22 June 2021.

Any questions or concerns, please get in touch. I would appreciate if you would be able to reply confirming that you have received this email.

Regards,

BEN WILLIAMS
Environmental Coordinator Dunmore

Telephone: 02 42378414
Mobile: 0401 895 478
Email: Ben.Williams@boral.com.au

Boral Dunmore Sand and Soil
38 Tabbita Road, Dunmore NSW 2529
www.boral.com.au

RE: Request for Consultation: Dunmore Lakes Sand Project Flora and Fauna Management Plan

Jillian Reynolds <jillian.reynolds@dpi.nsw.gov.au>
Mon 28/06/2021 10:09 AM
To: Ben Williams <Ben.Williams@boral.com.au>

Hi Ben,

Thank you for providing the Flora and Fauna Management Plan to DPI Fisheries for review. We note that the works have provided buffers to the adjacent important wetland and fish habitats and will not impact on key fish habitat.

We therefore do not have any further comments in relation to the plan.

Regards,

Jillian

Jillian Reynolds | Fisheries Manager
NSW Department of Primary Industries | Coastal Systems
4 Woollamia Road | PO Box 97 | Huskisson NSW 2540
T: 02 4428 3007 | M: 0429 918 575 | F: 02 4441 8961 | E: jillian.reynolds@dpi.nsw.gov.au
W: www.dpi.nsw.gov.au/fisheries

DPI Fisheries acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the Traditional Custodians of the land and waters, and we show our respect for Elders past, present and emerging. We are committed to providing places in which Aboriginal people are included socially, culturally and economically through thoughtful and collaborative approaches to our work.

From: Ben Williams <Ben.Williams@boral.com.au>
Sent: Wednesday, 23 June 2021 11:01 AM
To: Scott Carter <scott.carter@dpi.nsw.gov.au>; Jillian Reynolds <jillian.reynolds@dpi.nsw.gov.au>
Cc: Adnan Voloder <adnan.voloder@boral.com.au>
Subject: Re: Request for Consultation: Dunmore Lakes Sand Project Flora and Fauna Management Plan

Hi Jillian/Scott,

I am just touching base to follow up on the consultation for the DLSP Flora and Fauna Management Plan. Have been able to review the plan and do you have any comments on the plan?

If you have any queries please give me a call.

Regards,

BEN WILLIAMS
Environmental Coordinator Dunmore

Telephone: 02 42378414
Mobile: 0401 895 478
Email: Ben.Williams@boral.com.au

Boral Dunmore Sand and Soil
38 Tabbita Road, Dunmore NSW 2529
www.boral.com.au

From: Ben Williams
Sent: Tuesday, 8 June 2021 3:21 PM
To: scott.carter@dpi.nsw.gov.au <scott.carter@dpi.nsw.gov.au>; jillian.reynolds@dpi.nsw.gov.au <jillian.reynolds@dpi.nsw.gov.au>
Cc: Adnan Voloder <adnan.voloder@boral.com.au>
Subject: Request for Consultation: Dunmore Lakes Sand Project Flora and Fauna Management Plan

Dear Jillian/Scott,

I hope this email finds you well.

As part of the modification consent issued in November 2020, we are required to consult with NSW Fisheries, following Condition 38 of consent DA 195-8-2004 , for the preparation of the Flora and Fauna Management Plan. A copy of the consent is attached for your reference.

Please find attached a copy of the Traffic Management Plan, prepared in accordance with the requirements of Condition 38 of the consent.

It would be most appreciated if you could send through any comments on the FFMP by COB 22 June 2021.

Any questions or concerns, please get in touch. I would appreciate if you would be able to reply confirming that you have received this email.

Regards,

BEN WILLIAMS
Environmental Coordinator Dunmore

Telephone: 02 42378414
Mobile: 0401 895 478
Email: Ben.Williams@boral.com.au

Boral Dunmore Sand and Soil
38 Tabbita Road, Dunmore NSW 2529
www.boral.com.au

Appendix G Memorandum – Stage 5B nest box installation

Level 3 175 Scott Street
Newcastle NSW 2300
02 4907 4800
www.emmconsulting.com.au

Memorandum

21 July 2023

To: Matt Bray

From: Luke O'Brien

Subject: Dunmore Sand and Soil Stage 5B nest box installation

Dear Matt,

EMM Consulting Pty Ltd (EMM) was engaged by Boral Dunmore Sand and Soil (DSS) to undertake the installation of compensatory habitat at the Dunmore Lakes Sand Project (DLSP, the 'Project') site. Our methods and results are presented in the remainder of this memo.

1 Background

DSS is overseeing the Project, which involves a sand dredging and processing operation producing a range of sand and landscaping products for the local Sydney markets. The Project is located on the Princes Highway at Dunmore, approximately seven kilometres north of Kiama on the NSW South Coast.

Stage 5B of the Project is located immediately north of the Minnamurra River at Dunmore with access via Riverside Drive. In September 2021, EMM undertook an assessment of trees within Stage 5B to enable the hollow-bearing resources to be quantified. Data collected was used in calculating an offset for the loss of tree hollows within Stage 5B in accordance with the Vegetation Clearing Protocols, Appendix B of the Flora and Fauna Management Plan (EMM 2019). The total number of compensatory hollows (nest boxes) was calculated to be 143 consisting of varying sizes as detailed in Table 1.1, based on a 1:1 replacement ratio (EMM 2021).

Table 1.1 Size classes of hollows requiring offset

Hollow size (diameter in cm)	Number of hollows impacted and compensatory nest boxes required
Less than 5	1
5 to 20	130
21 to 49	5
Greater than 50	7
Total	**143**

2 Methods

Nest boxes were sourced from Hollow Log Homes. The boxes are constructed using CYPLAS, a durable material made from recycled plastic, ensuring longevity of the nest boxes.

The installation was carried out by Matthew Pittard, a qualified arborist from Addicted to Gardens. Matthew's expertise ensured proper placement and secure installation of the nest boxes.

To prioritise safety and minimize ground disturbance, a narrow spider lift was used during the installation process. This approach ensured the safety of the operator and minimised ground disturbance while manoeuvring around the site, compared to using larger machinery.

Nest boxes were strategically placed at different heights to cater to various bird and mammal species. Boxes intended for larger bird species such as owls or cockatoos were installed at a minimum height of eight meters. Alternatively, boxes designed for smaller bird species, possums, and gliders were installed at a height range of approximately four to eight meters.

The installation of the nest boxes took place between 12 April and 16 April 2023. Information such as the nest box type, height, aspect, and the tree species on which each box was installed was recorded in an MS Excel spreadsheet. For geospatial referencing, a handheld GPS was utilised to record waypoints with a general accuracy of ± 5m, and a compass was used to determine the aspect (direction the box was facing). Heights were estimated from ground level.

Photograph 2.1 Narrow spider lift used to install nest boxes.

3 Results

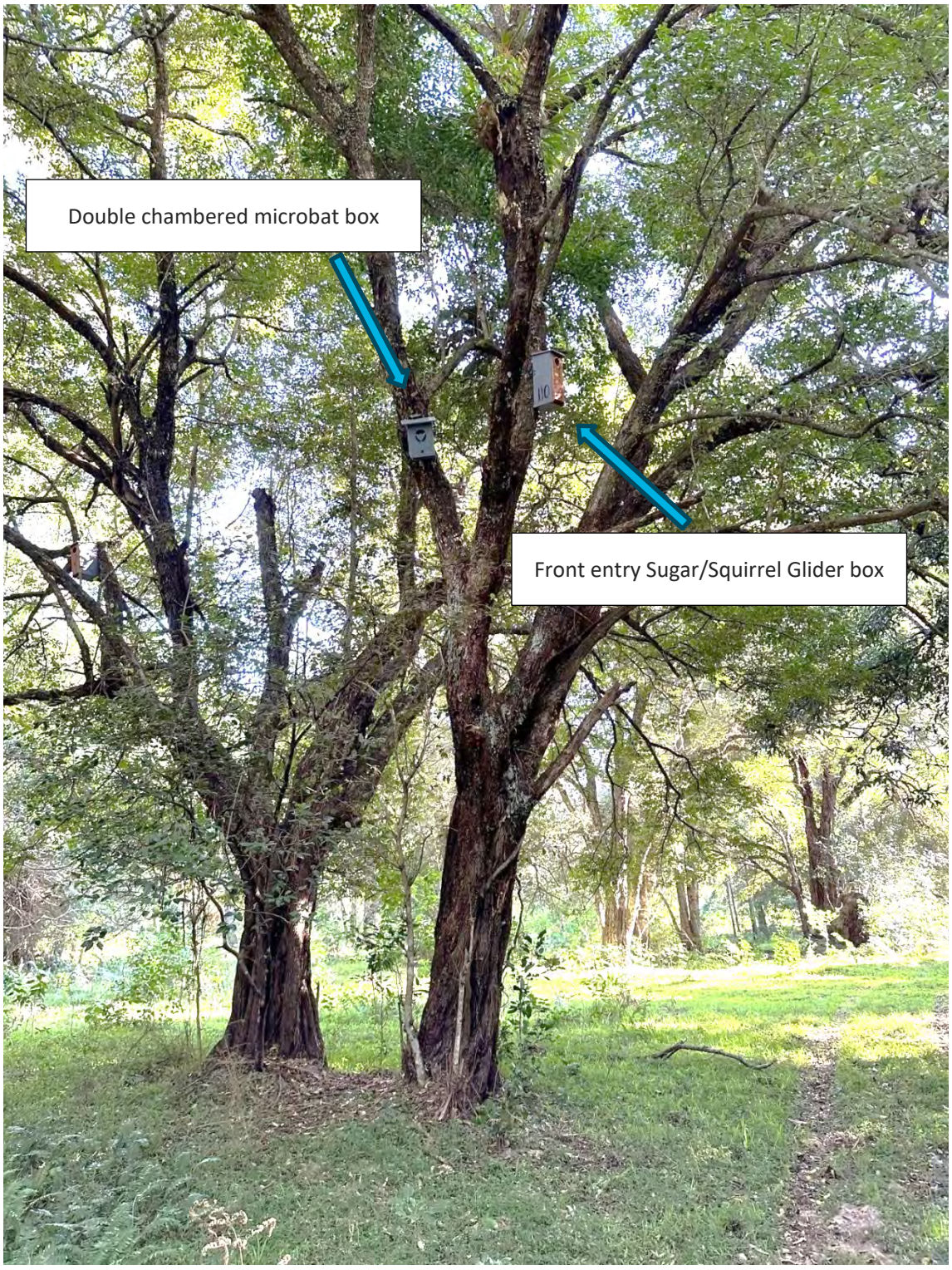
In total, 143 nest boxes were installed. Examples of these boxes are shown in Photograph 3.1 to Photograph 3.4. Details of each location are included in Appendix A.

Photograph 3.1 Barn Owl box installed on the Project site

Photograph 3.2 Possum/Galah box installed on the Project site

Photograph 3.3 Front entry Sugar/Squirrel Glider box installed at the Project site

Photograph 3.4 **Double chambered micro bat and front entry Sugar/Squirrel Glider box installed at the Project site**



Source: EMM (2023); ABS (2021); DCSSS (2023); ESRI (2023); GA (2009); MetroMap (2023)

0 50 100 m

GDA2020 MGA Zone 56

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KEY

- Nest box installation location
- Named waterbody
- Cadastral boundary

INSET KEY

- Dunmore Quarry
- Rail line
- Major road

Nest box installation locations

Dunmore Sand and Soil Stage 5B
Nest box installation
Figure 1

EMM
creating opportunities

4 Conclusion and recommendations

In conclusion, the installation of 143 nest boxes was carried out successfully.

4.1 Future monitoring and maintenance

To ensure their continued functionality, it is strongly recommended to implement a monitoring program after 24 months. Regular monitoring will allow for the identification of any impacts resulting from falling branches, strong winds, or other factors. If maintenance requirements are identified during the monitoring process, appropriate actions should be taken promptly. This proactive approach will significantly contribute to the effectiveness of the nest boxes in providing a compensatory habitat for the targeted species.

Monitoring would also provide an opportunity to inspect nest boxes for occupancy or signs of use by fauna. In doing so, data can be gathered to assess the effectiveness of the nest boxes in offsetting hollows removed during clearing.

5 Closing

If you wish to discuss anything within this report, please do not hesitate to contact me.

Yours sincerely,

Luke O'Brien
Ecologist

lobrien@emmconsulting.com.au

6 References

EMM 2019, *Dunmore Lakes Sand Project, Flora and Fauna Management Plan*, Boral Dunmore Operations.

EMM 2021. *Dunmore Sand and soil Tree Hollow Assessment* Prepared for Boral Dunmore Sand and Soil by EMM Consulting Pty Ltd, St Leonards, Sydney.

Appendix A
Nest box details

EMM
creating opportunities

Table A.1 Nest box details

Box Number	Box Type	Lat	Long	Height (m)	Aspect (°)	Tree species
1	Possum/Galah	-34.62948128	150.8410694	7	266	*Glochidion ferdinandi*
2	Possum/Galah	-34.63020531	150.8407114	6.5	280	*Eucalyptus botryoides*
3	Dollarbird/Rosella	-34.63116428	150.8412494	6.5	81	*Eucalyptus botryoides*
4	Possum/Galah	-34.62980532	150.8409524	6.5	255	*Glochidion ferdinandi*
5	Possum/Galah	-34.63010028	150.8408404	6	298	*Banksia integrifolia*
6	Dollarbird/Rosella	-34.6309513	150.8416243	9	88	*Eucalyptus botryoides*
7	Dollarbird/Rosella	-34.63108532	150.8411824	7.5	281	*Eucalyptus botryoides*
8	Possum/Galah	-34.63066531	150.8409704	8	28	*Eucalyptus botryoides*
9	Possum/Galah	-34.62951925	150.8406734	10	139	*Eucalyptus botryoides*
10	Possum/Galah	-34.63019625	150.8412943	8	127	*Ehretia acuminata*
11	Rear entry glider	-34.62950827	150.8410984	7.5	289	*Eucalyptus botryoides*
12	Rear entry glider	-34.63121331	150.8413394	6	192	*Glochidion ferdinandi*
13	Rear entry glider	-34.63008125	150.8408574	7	148	*Ehretia acuminata*
14	Rear entry glider	-34.63041527	150.8408714	9	110	*Eucalyptus botryoides*
15	Rear entry glider	-34.6307653	150.8417164	7	101	*Eucalyptus botryoides*
16	XX Large Custom Box	-34.62954532	150.8404934	10	243	*Eucalyptus botryoides*
17	Rear entry glider	-34.63112027	150.8412594	7.5	250	*Eucalyptus botryoides*
18	Rear entry glider	-34.62998729	150.8411984	6	39	*Ehretia acuminata*
19	Rear entry glider	-34.63025233	150.8413204	6.5	252	*Ehretia acuminata*
20	Rear entry glider	-34.63013733	150.8411884	10	160	*Ehretia acuminata*
21	Rear entry glider	-34.63023825	150.8412444	6	323	*Glochidion ferdinandi*
22	X Large Custom Box	-34.62953425	150.8404754	13	179	*Eucalyptus botryoides*
23	X Large Custom Box	-34.62953626	150.8406704	15	83	*Eucalyptus botryoides*
24	Small parrot	-34.6312253	150.8413073	10	346	*Eucalyptus botryoides*
25	Small parrot	-34.63096228	150.8416274	7	65	*Eucalyptus botryoides*
26	Small parrot	-34.63093328	150.8419154	6.5	154	*Eucalyptus botryoides*
27	Possum/Galah	-34.6304203	150.8412424		150	*Ehretia acuminata*
28	Small parrot	-34.63094828	150.8417454	6.5	260	*Glochidion ferdinandi*
29	Small parrot	-34.6303913	150.8414513	7	294	*Glochidion ferdinandi*
30	Dollarbird/Rosella	-34.6301753	150.8411634	6	118	*Glochidion ferdinandi*
31	Front Entry Sugar/Squirrel Glider	-34.63031327	150.8413614	7	90	*Ehretia acuminata*
32	Possum/Galah	-34.63064225	150.8414194	10	129	*Eucalyptus botryoides*

Table A.1 Nest box details

Box Number	Box Type	Lat	Long	Height (m)	Aspect (°)	Tree species
33	Front Entry Sugar/Squirrel Glider	-34.62915732	150.8414434	8	140	*Eucalyptus botryoides*
34	Rear entry glider	-34.63050127	150.8412874	7	180	*Ehretia acuminata*
35	Barn Owl	-34.63038133	150.8412304	7.5	45	*Eucalyptus botryoides*
36	Barn Owl	-34.63098332	150.8419024	9	283	*Eucalyptus botryoides*
37	Rear entry glider	-34.63020531	150.8411554	6	359	*Glochidion ferdinandi*
38	Rear entry glider	-34.63092632	150.8418553	7	172	*Eucalyptus botryoides*
39	Rear entry glider	-34.63084133	150.8417754	6.5	167	*Eucalyptus botryoides*
40	X Large Custom Box	-34.63082331	150.8417584	9	65	*Eucalyptus botryoides*
41	X Large Custom Box	-34.63065332	150.8414194	8.5	137	*Eucalyptus botryoides*
42	Possum/Galah	-34.63050831	150.8412764	9	155	*Ehretia acuminata*
43	Barn Owl	-34.63018125	150.8411874	6.5	108	*Glochidion ferdinandi*
44	Rear entry glider	-34.6301903	150.8412024	6.5	352	*Glochidion ferdinandi*
45	Large Owl/Cockatoo	-34.63038527	150.8410984	11	54	*Eucalyptus botryoides*
46	Dollarbird/Rosella	-34.63013331	150.8420204	8	82	*Ehretia acuminata*
47	Barn Owl	-34.62996827	150.8411594	7	104	*Eucalyptus botryoides*
48	Large Owl/Cockatoo	-34.62980231	150.8415514	10	74	*Ehretia acuminata*
49	Large Owl/Cockatoo	-34.62993533	150.8418414	8	249	*Banksia integrifolia*
50	Small parrot	-34.62978428	150.8412904	7.5	350	*Eucalyptus botryoides*
51	Barn Owl	-34.62978428	150.8413024	9	298	*Ehretia acuminata*
52	Barn Owl	-34.63073529	150.8414114	11	178	*Eucalyptus botryoides*
53	Barn Owl	-34.62923032	150.8415233	6.5	208	*Glochidion ferdinandi*
54	Barn Owl	-34.63007128	150.8414574	7.5	329	*Ehretia acuminata*
55	Rear entry glider	-34.62978428	150.8413024	10	257	*Ehretia acuminata*
56	XX Large Custom Box	-34.62980231	150.8415514	10	87	*Eucalyptus botryoides*
57	Rear entry glider	-34.63019525	150.8418094	6	94	*Glochidion ferdinandi*
58	Rear entry glider	-34.63003432	150.8419174	6	253	*Glochidion ferdinandi*
59	Rear entry glider	-34.62977825	150.8417994	5.5	347	*Eucalyptus botryoides*
60	Rear entry glider	-34.63017932	150.8419874	5	255	*Glochidion ferdinandi*
61	Rear entry glider	-34.62990733	150.8417714	6.5	282	*Glochidion ferdinandi*
62	Rear entry glider	-34.63011428	150.8419504	6	75	*Eucalyptus botryoides*
63	Rear entry glider	-34.63019232	150.8418244	5	92	*Glochidion ferdinandi*
64	Rear entry glider	-34.62982929	150.8414324	8	89	*Ehretia acuminata*

Table A.1 Nest box details

Box Number	Box Type	Lat	Long	Height (m)	Aspect (°)	Tree species
65	Large Owl/Cockatoo	-34.62976132	150.8417894	7	33	*Eucalyptus botryoides*
66	Owlet-Nightjar	-34.6299313	150.8416673	6	11	*Glochidion ferdinandi*
67	Double Chambered Microbat	-34.62992225	150.8417024	6	270	*Glochidion ferdinandi*
68	Double Chambered Microbat	-34.62988529	150.8417774	6	64	*Glochidion ferdinandi*
69	Front Entry Sugar/Squirrel Glider	-34.62954532	150.8404934	6	115	*Glochidion ferdinandi*
70	Owlet-Nightjar	-34.63019827	150.8419644	6	215	*Glochidion ferdinandi*
71	Kookaburra	-34.6301893	150.8418414	6	300	*Glochidion ferdinandi*
72	Owlet-Nightjar	-34.63031427	150.8419484	5.5	285	*Glochidion ferdinandi*
73	Owlet-Nightjar	-34.63029332	150.8419714	5.5	89	*Glochidion ferdinandi*
74	Kookaburra	-34.63028728	150.8419644	6.5	60	*Eucalyptus botryoides*
75	Dollarbird/Rosella	-34.63031327	150.8420144	5	13	*Ehretia acuminata*
76	Front Entry Sugar/Squirrel Glider	-34.6303913	150.8420024	5	58	*Glochidion ferdinandi*
77	Front Entry Sugar/Squirrel Glider	-34.63040329	150.8420694	6	237	*Glochidion ferdinandi*
78	Front Entry Sugar/Squirrel Glider	-34.63047529	150.8420634	6	187	*Glochidion ferdinandi*
79	Front Entry Sugar/Squirrel Glider	-34.63051326	150.8420714	7	280	*Glochidion ferdinandi*
80	Double Chambered Microbat	-34.6305343	150.8421074	5.5	157	*Glochidion ferdinandi*
81	Dollarbird/Rosella	-34.6305773	150.8421014	6	26	*Glochidion ferdinandi*
82	Kookaburra	-34.63062432	150.8420413	6.5	328	*Glochidion ferdinandi*
83	Kookaburra	-34.63074225	150.8419833	8.5	18	*Ehretia acuminata*
84	Double Chambered Microbat	-34.63072431	150.8420144	6	55	*Ehretia acuminata*
85	Front Entry Sugar/Squirrel Glider	-34.63072431	150.8420114	7	250	*Eucalyptus botryoides*
86	Owlet-Nightjar	-34.63088726	150.8421174	8	318	*Ehretia acuminata*
87	Owlet-Nightjar	-34.63088826	150.8421434	7.5	247	*Eucalyptus botryoides*
88	Double Chambered Microbat	-34.63089028	150.8421884	6	50	*Eucalyptus botryoides*
89	Kookaburra	-34.6309233	150.8421924	8	320	*Eucalyptus botryoides*
90	Front Entry Sugar/Squirrel Glider	-34.63091727	150.8422194	6.5	71	*Eucalyptus botryoides*
91	Double Chambered Microbat	-34.63077025	150.8420634	6	80	*Eucalyptus botryoides*
92	Owlet-Nightjar	-34.63097728	150.8422044	6	211	*Ehretia acuminata*
93	Double Chambered Microbat	-34.62954532	150.8404934	8	218	*Eucalyptus botryoides*
94	Front Entry Sugar/Squirrel Glider	-34.63106931	150.8422684	6	159	*Glochidion ferdinandi*
95	Kookaburra	-34.6310233	150.8421844	8	217	*Ehretia acuminata*
96	Front Entry Sugar/Squirrel Glider	-34.63100226	150.8420164	7.5	70	*Glochidion ferdinandi*

Table A.1 Nest box details

Box Number	Box Type	Lat	Long	Height (m)	Aspect (°)	Tree species
97	Front Entry Sugar/Squirrel Glider	-34.63103227	150.8420133	6	84	*Glochidion ferdinandi*
98	Owlet-Nightjar	-34.63108725	150.8420294	6	281	*Glochidion ferdinandi*
99	Front Entry Sugar/Squirrel Glider	-34.63114928	150.8416243	8	160	*Ehretia acuminata*
100	Dollarbird/Rosella	-34.63089329	150.8413184	8	255	*Ehretia acuminata*
101	Double Chambered Microbat	-34.63106831	150.8420974	5.5	255	*Glochidion ferdinandi*
102	Kookaburra	-34.63132831	150.8417734	8	106	*Ehretia acuminata*
103	Front Entry Sugar/Squirrel Glider	-34.63092833	150.8415154	7	160	*Ehretia acuminata*
104	Front Entry Sugar/Squirrel Glider	-34.63086027	150.8414824	9.5	273	*Ehretia acuminata*
105	Double Chambered Microbat	-34.63107032	150.8420464	6	120	*Glochidion ferdinandi*
106	Double Chambered Microbat	-34.63134432	150.8417154	6.5	252	*Ehretia acuminata*
107	Double Chambered Microbat	-34.63091232	150.8414694	7	253	*Ehretia acuminata*
108	Owlet-Nightjar	-34.63061032	150.8413894	7	88	*Glochidion ferdinandi*
109	Double Chambered Microbat	-34.63037328	150.8413184	7	92	*Ehretia acuminata*
110	Dollarbird/Rosella	-34.63038627	150.8413194	7.5	85	*Ehretia acuminata*
111	Double Chambered Microbat	-34.63031327	150.8413614	5.5	37	*Glochidion ferdinandi*
112	Front Entry Sugar/Squirrel Glider	-34.63017027	150.8414764	5.5	136	*Glochidion ferdinandi*
113	Front Entry Sugar/Squirrel Glider	-34.63003725	150.8415574	7	354	*Eucalyptus botryoides*
114	Front Entry Sugar/Squirrel Glider	-34.63006826	150.8415084	6	267	*Glochidion ferdinandi*
115	XX Large Custom Box	-34.63002526	150.8415474	12	195	*Eucalyptus botryoides*
116	XX Large Custom Box	-34.62914332	150.8412793	7.5	156	*Eucalyptus botryoides*
117	Kookaburra	-34.62923326	150.8415304	8	213	*Eucalyptus botryoides*
118	XX Large Custom Box	-34.6302193	150.8414663	10	207	*Ehretia acuminata*
119	Owlet-Nightjar	-34.63024931	150.8414134	7	32	*Ehretia acuminata*
120	XX Large Custom Box	-34.62951229	150.8414744	8	128	*Eucalyptus botryoides*
121	XX Large Custom Box	-34.6290113	150.8408294	7.5	5	*Ehretia acuminata*
122	X Large Custom Box	-34.62949628	150.8411894	10	96	*Eucalyptus botryoides*
123	Dollarbird/Rosella	-34.63013331	150.8420204	7.5	64	*Eucalyptus botryoides*
124	Small parrot	-34.62949628	150.8411894	8	353	*Eucalyptus botryoides*
125	Front Entry Sugar/Squirrel Glider	-34.62923326	150.8415304	6	218	*Glochidion ferdinandi*
126	Small parrot	-34.62927131	150.8416214	7	158	*Glochidion ferdinandi*
127	Small parrot	-34.62951229	150.8414744	7	14	*Eucalyptus botryoides*
128	Small parrot	-34.62946426	150.8414734	8	108	*Eucalyptus botryoides*

Table A.1 Nest box details

Box Number	Box Type	Lat	Long	Height (m)	Aspect (°)	Tree species
129	Small parrot	-34.62959527	150.8402524	7.5	146	*Eucalyptus botryoides*
130	Small parrot	-34.62925933	150.8416034	6	12	*Eucalyptus botryoides*
131	Small parrot	-34.62892329	150.8409454	7	109	*Glochidion ferdinandi*
132	Small parrot	-34.62927927	150.8405584	7.5	290	*Glochidion ferdinandi*
133	Small parrot	-34.62915732	150.8414434	6	153	*Eucalyptus botryoides*
134	Small parrot	-34.6292843	150.8402604	7	150	*Eucalyptus botryoides*
135	Small parrot	-34.62958731	150.8402614	7.5	5	*Glochidion ferdinandi*
136	Small parrot	-34.6288963	150.8409024	7	46	*Eucalyptus botryoides*
137	Small parrot	-34.62924725	150.8408763	7	332	*Eucalyptus botryoides*
138	Double Chambered Microbat	-34.6291973	150.8407404	7	315	*Eucalyptus botryoides*
139	Double Chambered Microbat	-34.62917727	150.8407613	10	165	*Eucalyptus botryoides*
140	Rear entry glider	-34.62927726	150.8406094	9.5	291	*Eucalyptus botryoides*
141	Rear entry glider	-34.62920426	150.8415494	8	218	*Eucalyptus botryoides*
142	Front Entry Sugar/Squirrel Glider	-34.62927726	150.8407284	10	206	*Ehretia acuminata*
143	Small parrot	-34.62944431	150.8414914	5.5	22	*Glochidion ferdinandi*