

## Biodiversity Management Plan – Newcastle Golf Course and Retirement Village, Fern Bay, NSW

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## 1.0 Biodiversity Management Plan Objectives

The purpose of this plan is to define and outline actions required to support biodiversity within Newcastle Golf Club and the proposed Newcastle Golf Course Retirement Village. The BMP outlines the objectives and techniques for maintaining and improving biodiversity and wildlife corridors within the site while ensuring the historical use and significance of the existing golf course can be maintained.

The objectives of the Biodiversity Management Plan (BMP) are as follows:

- Applying an adaptive management approach to ensure the historical use of the site is enhanced and maintained;
- Maintaining and improving the biodiversity present through the promotion of natural regeneration of the Plant Community Types within the retained bushland areas;
- Reduction in both priority and environmental weeds;
- Maintaining, improving and enhancing habitat; and
- Maintaining and improving wildlife corridors within the site and to offsite areas of habitat.

### 1.1 Site Location

Biodiversity Management Plan (BMP) works will be undertaken as part of the proposed upgrading of the existing Golf Course and the proposed Retirement Village at 4A Vardon Road, Fern Bay, NSW (Lot 105 DP614883). **Figure 1** shows the site location.

The Site current has four distinct areas:

- Native bushland;
- Aquatic areas;
- Active play golfing corridors; and
- Buildings and infrastructure.

The BMP land is currently zoned RE2 – Private Recreation and is located within the Port Stephens Council Local Government Area (LGA). The proposed development plan is depicted in **Figure 2**.

### 1.2 Existing Vegetation

The site was inspected and floristic surveys were undertaken by AEP ecologists in 2017, 2018, 2019 and 2021. These inspections included BAM Plots, flora transects and general site reconnaissance to verify previously mapped vegetation communities and to achieve a comprehensive vegetation assessment of the current site. This has allowed us to conclude that the vegetation within the BMP lands consists of:

- **PCT 1646** - *Smooth-barked Apple* - *Blackbutt* - *Old Man Banksia* woodland on coastal sands of the Central and Lower North Coast. This PCT is not associated with a Threatened Endangered Community (TEC);
- **PCT 1724** - *Broad-leaved Paperbark* - *Swamp Oak* - *Saw Sedge* swamp forest on coastal lowlands of the Central Coast and Lower North Coast. This PCT is associated with a TEC, being Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions;

- **PCT 1727** - *Swamp Oak* - *Sea Rush* - *Baumea juncea* swamp forest on coastal lowlands of the Central Coast and Lower North Coast., This PCT is associated with a TEC, being Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions;
- **PCT 771** - *Coast Banksia* - *Coast Tea-tree* low moist forest on coastal sands and headlands, Sydney Basin Bioregion and South East Corner Bioregion. This PCT is not associated with a TEC; and
- Non-native exotics and weeds – Due to current land and operational turf management practices, aquatic and managed club garden and surrounds, there are some escapees and other introduced exotic species throughout the site.

**Figure 3** outlines the present boundaries of the vegetation communities as well as identifying the areas impacted by the development, resulting in the removal of vegetation.

### 1.3 Management Zones

The Site has been broken down into eight (8) Management Zones (MZs) to simplify identification of objectives, targets and for ease of implementation. Refer to **Figure 4** for the location of each Management Zone noting that the BMP Lands are primarily focused on Management Zone 2:

- Management Zone 1 – Playing Corridors (includes tees, greens, fairways, maintained rough etc);
- Management Zone 2 – Reconstruction;
- Management Zone 3 – Natural Regeneration (Understorey Only);
- Management Zone 4 – Natural Regeneration (Canopy Only);
- Management Zone 5 – Natural Regeneration;
- Management Zone 6 - Wallum Froglet habitat;
- Management Zone 7 - Archaeological heritage works; and
- Management Zone 8- Civil infrastructure works.

As the Management Zones are adjoining each other, management of the zones will need to consider edge effects from golfcarts and high pedestrian activity, management of all areas will need to have a high focus on weeds throughout the duration of this BMP.

## 2.0 Adaptive Management of BMP Lands

An adaptive management approach will allow for flexibility and adaptation of the management plans and actions, to address changes in site conditions and continue to achieve the BMP Objectives and Regeneration Targets. Regeneration Targets are detailed in **Section 2.2**.

To achieve both an adaptive and integrated approach to managing the BMP lands this Plan has utilised and applied the principles from *Audubon Cooperative Sanctuary Program for Golf Courses* (ACSP) and *Society for Ecological Restoration Australasia* (2018) *National standards for the practice of ecological restoration in Australia*.

## 2.1 Environmental Management Practices for Managed Zones.

The managed lands are located within Zones 1 and 2 and are generally managed in accordance with the *Audubon Cooperative Sanctuary Program for Golf Courses* (ACSP). This program provides mechanisms which allow for the day-to-day golf course operations to be implemented while protecting wildlife and habitat management. The key focus areas for the BMP managed lands are:

- Chemical use reduction and safety;
- Water conservation;
- Water quality management; and
- Pest management.

## 2.2 Integrated Regeneration Approach for Bushland and Aquatic Zones

In accordance with *National standards for the practice of ecological restoration in Australia* (2018), the ecological regeneration approach has been determined for the bushland areas. This approach utilises three integrated restoration techniques to achieve the goal of Natural Regeneration Area. The National Guidelines have three levels of regeneration based on their history of disturbance, and the level of intervention needed to initiate and sustain the desired ecological communities. The three approaches are:

- Reconstruction Approach;
- Assisted Regeneration Approach; and
- Natural Regeneration Approach.

Given the condition of the bushland within the BMP land, the Reconstruction and Natural Regeneration Approach will be utilised within the BMP Lands.

### 2.2.1 Reconstruction

This approach is where damage is high, and pre-existing biota is unlikely to be able to recover without planting and management. The aim of this approach is to move into Assisted Regeneration within two years.

### 2.2.2 Assisted Regeneration

This approach is where damage is moderate and with weeding and replacement of dead plantings the biota is likely to be able to recover. The aim of this approach is to move into Natural Regeneration within two years.

### 2.2.3 Natural Regeneration Approach

This approach is where damage is relatively low, and pre-existing biota should be able to recover after cessation of degrading practices.

The Natural Regeneration Approach requires limited to no interventions with weeding being the only task undertaken to encourage continual natural regeneration.

This approach is the overall aim for the entirety of the BMP lands to achieve this state within 5 years.



## 2.3 Management Zones

All vegetation that is required to be planted within the entire BMP Lands must be sourced from local provenance seed stock in accordance with the *Port Stephen Technical Specification Trees* (2014).

### 2.3.1 Management Zone 1 – Playing Corridors

This Zone consists of:

- Current Sports Turf Management and Groundskeeping staff will continue to monitor and implement best practice management techniques. As this Management Zone includes the tees, greens, holes, fairways, rough and water features, there is some edge management that will require:
- Weed management; and
- In consultation with traditional owners (the worimi people) and Rural Fire Service, fire management of rough is to be undertaken to assist with weed management and regeneration of native grasses within this zone.

### 2.3.2 Management Zone 2 – Reconstruction

This zone is to have monitoring plots within each PCT. Specific Regeneration tasks for this Zone are:

- Installation of large woody debris;
- Installation of a combination of salvaged hollow-logs and Nest boxes;
- Primary weed management;
- Planting of trees, shrubs including; Koala Feed Trees (refer planting schedule **Appendix C**) of locally sourced plants (Koala Feed Trees are highlighted in green);
- Watering;
- Mulching;
- Secondary weed management;
- Replacement of dead plants;
- Long term maintenance weeding; and
- Monitoring and recording the diversity and abundance of native flora and fauna.

Due to the vegetation type regular ecological burns are not recommended as a tool in maintaining ecological function.

Note: planting or direct seeding of groundcover species is to be undertaken if natural regeneration has not occurred at the end of year 3.

### 2.3.3 Management Zone 3 - Natural Regeneration (Understorey Only)

This zone is to have monitoring plots within each PCT. Specific Regeneration tasks for this Zone are:

- Primary weed management;
- Secondary and Long term weed management;
- Long term maintenance weeding; and

- Monitoring and recording the diversity and abundance of native flora and fauna.

Due to the vegetation type regular ecological burns are not recommended as a tool in maintaining ecological function.

### 2.3.4 Management Zone 4 - Natural Regeneration (Canopy Only)

This zone is to have monitoring plots within each PCT. Specific Regeneration tasks for this Zone are:

- Primary weed management;
- Secondary and Long term weed management;
- Long term maintenance weeding; and
- Monitoring and recording the diversity and abundance of native flora and fauna.

Due to the vegetation type regular ecological burns of the understorey are recommended as a tool in maintaining ecological function. This will be conducted in consultation with the traditional owners and Rural Fire Service.

### 2.3.5 Management Zone 5 – Natural Regeneration

This zone is to have monitoring plots within each PCT. Specific Regeneration tasks for this Zone are:

- Installation of a combination of salvaged hollow-logs and Nest boxes;
- Planting of Koala Feed Trees along edge with construction works (after completion of works) refer planting schedule **Appendix C** of locally sourced plants (Koala Feed Trees are highlighted in green);
- Installation of large woody debris;
- Primary weed management;
- Secondary and Long term weed management;
- Long term maintenance weeding; and
- Monitoring and recording the diversity and abundance of native flora and fauna.

Due to the vegetation type regular ecological burns are not recommended as a tool in maintaining ecological function.

### 2.3.6 Management Zone 6- Manufactured Wallum Froglet Habitat

This zone is to have monitoring plots within each PCT. See **section 4.4** for further information on the habitat requirements of the Wallum froglet (*Crinia tinnula*). The top of the hill will be regenerated to create a corridor down to the bottom of the slope where natural indentations already occupy the site. The specific tasks for this Zone are:

- Accentuate the natural indentation in cut area proposed on site.
- Planting of native heathland species and swamp forest species sourcing plants local to the Fern Bay / Port Stephens area;
- Continue to monitor pH levels throughout the planting, and management process to ensure habitat remains at a suitable acidic level.

Due to the vegetation type regular ecological burns are not recommended as a tool in maintaining ecological function.

### 2.3.7 Management Zone 7: Archaeological Heritage

This zone is to have monitoring plots within each PCT. Specific tasks for this Zone are:

- Primary weed management;
- Secondary and Long term weed management;
- Long term maintenance weeding;
- Planting of endemic species; and
- Monitoring and recording the diversity and abundance of native flora and fauna.

Function and planting will be undertaken in consultation with the Worimi people to ensure all works are respectful of their history within the Management Zone. Refer to **Section 4.5** for further information.

### 2.3.8 Management Zone 8: Civil Infrastructure Works

This zone is to have monitoring plots within each PCT. These works will be supervised by an AQF5 to ensure where possible all vegetation will be retained. A regeneration plan to be prepared after civil works in consultation with hydraulic Engineer. Refer to **Section 4.6** for further information.

## 2.4 Targets

### 2.4.1 for Managed Lands

There are no set targets within this BMP for these zones. However, it is recommended that annual review of the maintenance program is required to ensure all management activities meet current best practice for the industry.

### 2.4.2 Targets for Bushland and Aquatic Zones

The Natural Regeneration Approach will be used across Management zones 3 to 5 and the following targets have been designed to be measurable, providing quantitative data on species abundance and cover for the vegetation communities within the BMP Lands noting constraints associated with management in MZ 3 and 4.

The targets have been adjusted to represent reasonable on-ground management objectives, refer **Table 1**.

**Table 1 – Targets for Cover and Diversity**

Regeneration Targets	Native Cover (%)	Native Species Diversity (%)	Cover Priority Weeds (%)	Cover of Other Weeds (%)
Year 1	20	20	<50	<50
Year 2	30	30	<35	<35
Year 3	50	50	<25	<25
Year 4	60	60	<20	<20
Year 5	70	70	<10	<15



### 3.0 Site Preparation

Prior to the commencement of clearing and regeneration, the site and BMP Lands must be prepared. The following works have been recommended to assist in site preparation:

- Establishment of pathogen and disease controls. Appropriate hygiene controls are to be employed to minimise the chances of any such introduction occurring. This may include a hygiene station to clean boots, tools and machinery. Response plans are needed to be designed and implemented to mitigate impacts in the event of disease or pathogen outbreaks;
- Clearly mark native vegetation for retention;
- Removal of rubbish and all barbed wire;
- Install fencing around the BMP Lands, and clearly mark as a "No Go Area";
- Fencing should have clearly visible signage erected at key entry points to BMP (refer **Appendix C**);
- Implement Erosion and Sediment control measures in accordance with specifications set out in the latest edition of the Landcom publication "Soils and Constructions – Volume 1 (The Blue Book);
- Prior to clearing, nest-boxes and/or salvaged hollows are to be installed within the BMP area to replace the 8 habitat trees to be removed, at Council rate of 2:1 to total 16 nest-boxes of appropriate size and design to mitigate habitat lost. Installation should be conducted by suitably qualified climbing ecologists.
- Vegetation Clearance procedures (refer to **Section 5.2**);

#### 3.1.1 Fencing

The boundary of the development site should be marked by surveyor in and subsequently marked using flag reel fencing (or similar method) to facilitate identification of the development/conservation land interface.

This should be undertaken prior to any clearing activity commencing and will not impede the placement of logs along the boundary of the development site and mulching the area for buffering. This will also facilitate access to BMP Lands for relocation of hollow logs.

Once clearing has been completed a temporary minimum 1.8-metre-high construction mesh fence must be installed prior to any further work commencing:

- The fence must be installed around the entire interface between the development site and BMP Lands
- All fenced conservation areas are to be clearly marked as a "No Go Area" on the fencing itself;
- No clearing of vegetation, storage of vehicles or machinery, stockpiling, materials storage or unauthorised access is to occur within the fenced conservation area; and
- The fence must be maintained for the duration of all construction works. Construction impacts must be restricted to the development site and must not encroach into areas of retained native vegetation and habitat;

- Install temporary signs on fence as per **Appendix D** of this BMP. Signs should be placed at 50 metres interval along the entire length of the fence and will be removed along with construction fencing; and
- Permanent fencing may be considered post BMP in discussion with Council.

### 3.2 Vegetation Clearing - Habitat Tree Protocol

Clearing of vegetation on site must follow the procedure below to ensure safety of utilising the site and best environmental outcomes. All clearing works are to be undertaken under the supervision of the Project Ecologist;

- Prior to clearing:
  - Conduct pre-clearance diurnal and nocturnal surveys to identify native fauna and habitat. All habitat features must be clearly marked with flagging tape;
  - Native seed should be collected for propagation of plants for revegetation;
  - The boundary between the BMP area and the impact area of the culvert construction and the construction areas should be clearly flagged.
- In addition, prior to, and following clearing of any vegetation, an Ecologist is to inspect the area for any signs of resident fauna requiring attention.
- Where such is identified, appropriate strategies are to be developed and instigated to minimise impacts;
- Fallen timber and hollow logs identified to be retained and relocated into the BMP Lands at a rate of 100 linear metres per hectare (approx. 50m). Larger logs to be placed along boundary by machinery, while hollows to be sectioned and carried into site using walkover technique;
- Civil Construction staff to be inducted into pre-clearing and clearing protocols, and to identify environmental features for protection; and
- Live mulch and topsoil that is free of weeds is ideal for reuse in rehabilitation of conservation lands.

#### 3.2.1 Stage 1 Clearing Works

- Stage 1 works will include the clearing of understorey vegetation, ground litter and logs without habitat features.
- Stage 1 works are to be undertaken under the supervision of the Project Ecologist;
- Clearing will be undertaken in a general direction from the east to west towards retained vegetation to enable fauna a safe escape route into the retained vegetation.
- Habitat features, including HBTs, trees and ground habitat are marked. These are not to be disturbed during Stage 1 clearing works.
- Unexpected fauna encounters will be dealt with on a case-by-case basis by the Project Ecologist. Habitat features thought to be occupied will be avoided as far as practicable during Stage 1 works and the Project Ecologist may postpone felling these features until Stage 3 clearing works.
- Fauna encountered will captured and relocated to retained vegetation area after clearance has ceased for the day, after dark if suitable for the

species. And fauna harmed by the clearance will be transported to a nearby vet or wildlife rescue.

#### 3.2.2 Stage 2 Clearing Works

- Stage 2 works includes the clearing, felling and windrowing of all non-habitat trees. The following protocols will apply:
- Stage 2 works are to be undertaken under the supervision of the Project Ecologist;
- Clearing will be undertaken in a general direction from the east to west towards retained vegetation to enable fauna a safe escape route into the retained vegetation;
- Suitable logs from felled trees are to be pushed to the cleared/retained boundary to create a physical barrier between Subject Site and the retained lands.
- All trees should be lowered in the most gradual manner possible;
- Soft-felling techniques are also to be conducted on all trees with DBH >300mm;
- All cleared vegetation is to be mulched on site and spread to help stabilise any exposed soil and minimise offsite movement of biomass and;
- Fallen timber and hollow logs identified to be retained to be relocated into the retained lands.
- Unexpected fauna encounters will be dealt with on a case-by-case basis by the Project Ecologist. Habitat features thought to be occupied will be avoided as far as practicable during Stage 1 works and the Project Ecologist may postpone felling these features until Stage 3 clearing works.
- Fauna encountered will captured and relocated to retained vegetation area after clearance has ceased for the day, after dark if suitable for the species. And fauna harmed by the clearance will be transported to a nearby vet or wildlife rescue.

#### 3.2.3 Stage 3 Clearing Works

- Stage 3 works includes the clearing, felling and windrowing of HBTs and other habitat features, a minimum of 36 hours (two overnights) after Stage 1 under-scrubbing and Stage 2 felling of trees not identified as habitat features. The following protocols will apply:
- Stage 3 works are to be undertaken under the supervision of the Project Ecologist;
- Directly prior to any clearing (i.e. in the same diurnal period) in any area containing vegetation within the Subject Site, the project ecologist must make sure:
- All accessible hollows and other habitat features (i.e. bird nests, dreys, burrows, etc.) are to be visually inspected by the Project Ecologist, and hollows blocked with rags or similar material if found to be occupied by resident fauna or if occupation cannot be ruled out.
- Unexpected occupied nests, dreys or burrows shall be dealt with on a case-by-case basis by the Project Ecologist. Potentially occupied habitat features will be avoided as far as practicable in Stage 1 works. Where clearing of habitat features is required as part of Stage 2 clearing works,



wildlife carers will be contacted to confirm availability and fauna handling procedures.

- Felling of habitat trees is to be undertaken by tree climbers, inspecting hollows and other habitat features for fauna;
- After inspection, stick nests and dreys will be carefully removed and hollows sectionally dismantled and safely lowered using ropes;
- The Project Ecologist will inspect lowered hollows and manage fauna found;
- Immediately following felling of a habitat tree (or other trees at the Project Ecologist's discretion); the tree and all hollows will be inspected by the Project Ecologist for resident fauna;
- The Project Ecologist will manage fauna relocation of occupied hollows to surrounding retained bushland or to a wildlife carer;
- Felled Stage 3 vegetation should be left in-situ for a minimum of 36 hours (two overnights) prior to being windrowed, processed or removed from site;
- Salvageable hollows and hollow logs will be assessed by the Project Ecologist, and, where practical, taken from site to be remanufactured for reuse;
- To augment ground habitat for native fauna, where practical, hollows and habitat features not suitable for salvage but suitable for ground habitat will be relocated to BMP area of retained vegetation;
- Hollows suitable for relocation will be determined at the time of clearing. These hollows will be dismantled in manageable sections, placed in the clearance supervisor's vehicle and driven into the BMP lands to be relocated;
- Sectional dismantling will be done carefully by shining a torch through the hollow first, to estimate depth and assert occupancy status. If fauna present is deemed possible to remove without injuring, the hollow limb will be carefully sectioned until the individual is reachable by the spotter-catcher;
- If dismantling the hollow limb is deemed too dangerous for the resident fauna, it will be set aside till dusk and monitored to ensure the fauna self-relocate;
- Fauna will be encouraged to self-relocate by tapping the hollow limb in situ;
- The supervising ecologist will have the power to stop work at any time if situation is deemed dangerous for native fauna and/or contravene native wildlife code of ethics/scientific license conditions; and
- Unexpected fauna encounters will be dealt with on a case-by-case basis by the Project Ecologist. Habitat features thought to be occupied will be avoided as far as practicable during Stage 1 works and the Project Ecologist may postpone felling these features until Stage 3 clearing works.
- Fauna encountered will captured and relocated to retained vegetation area after clearance has ceased for the day, after dark if suitable for the species. And fauna harmed by the clearance will be transported to a nearby vet or wildlife rescue.
- Once hollows containing or potentially containing fauna are sectionally dismantled, they are to be relocated to retained areas where nest boxes

have been installed. Hollows should be placed at the base of trees containing unoccupied nest boxes to allow displaced fauna to migrate to the supplementary habitat.

- Vegetation clearing is to be timed to avoid fauna breeding periods and cold weather periods where overnight temperatures are forecast to be less than 12°C. Cold weather is likely to make it difficult for resident hollow dependent fauna to successfully relocate. This is particularly relevant for low body-weight species.

### 3.3 HBT Removal and Retention

Before the removal of HBT trees suitable nest boxes must be installed in retained trees, then adequately documented and approved by Council's Natural System's Section before removal is commenced. Refer **Section 4.1** for further Nest information.

**Table 2** below outlines the HBT clearance scheduling, outlining the Hollow sizes and DBH sizes of each HBT, which has then been considered when designing the Nest Boxes to be installed. The HBT's being removed within the retirement area is indicated by the green highlights.

The exact clearance schedule for the HBT's is to be obtained from the Contract arborists and will be added at a later date.

**Table 2- HBT Retain / Remove Schedule**

HBT	Species	Small	Med.	Large	XL
005HBT	<i>Angophora costata</i>	3	1		
006HBT	<i>Angophora costata</i>	2	2	1	
007HBT	<i>Angophora costata</i>	1	3	1	
008HBT	<i>Angophora costata</i>	2	2		
009HBT	<i>Eucalyptus pilularis</i>	2			
010HBT	<i>Eucalyptus pilularis</i>				2
013HBT	<i>Angophora costata</i>	4			
014HBT	<i>Angophora costata</i>				1
015HBT	<i>Eucalyptus pilularis</i>	1	1		
016HBT	<i>Angophora costata</i>	5	9	6	2
017HBT	<i>Angophora costata</i>	1			
018HBT	<i>Angophora costata</i>	2			
019HBT	<i>Eucalyptus pilularis</i>	1	1		

HBT	Species	Small	Med.	Large	XL
020HBT	<i>Angophora costata</i>	1	3		
021HBT	<i>Eucalyptus pilularis</i>	1	1		
022HBT	<i>Eucalyptus pilularis</i>	1	4	1	
023HBT	<i>Eucalyptus pilularis</i>	2	1		
024HBT	<i>Eucalyptus pilularis</i>	3	1		
025HBT	<i>Angophora costata</i>	1			
026HBT	<i>Angophora costata</i>	2	2		
027HBT	<i>Eucalyptus pilularis</i>	2	1		
028HBT	<i>Eucalyptus pilularis</i>	2	2		1
029HBT	<i>Eucalyptus pilularis</i>		1		2
030HBT	<i>Eucalyptus pilularis</i>	3	1		
037HBT	<i>Angophora costata</i>		1	1	1
039HBT	<i>Angophora costata</i>		2	2	
040HBT	<i>Angophora costata</i>		1	1	
042HBT	<i>Angophora costata</i>	1		3	
043HBT	<i>Angophora costata</i>	3	2	4	4
044HBT	<i>Angophora costata</i>		2		2
045HBT	<i>Angophora costata</i>	3			4
046HBT	<i>Angophora costata</i>		2		4
047HBT	<i>Angophora costata</i>		2		4
HBT002J	<i>Eucalyptus pilularis</i>			1	
HBT005J	<i>Angophora costata</i>	1	1		
HBT006J	<i>Eucalyptus pilularis</i>	1			
HBT007J	<i>Eucalyptus pilularis</i>		1		
HBT009J	<i>Eucalyptus pilularis</i>	2			1
HBT013J	<i>Eucalyptus pilularis</i>	3			1



HBT	Species	Small	Med.	Large	XL
HBT016J	<i>Eucalyptus pilularis</i>	2	2		
HBT017J	<i>Eucalyptus pilularis</i>	2			
HBT018J	<i>Eucalyptus pilularis</i>	5	1		
HBT019J	<i>Eucalyptus pilularis</i>	1			
HBT065Am	<i>Eucalyptus pilularis</i>	1		2	
HBT073Am	<i>Angophora costata</i>		2	3	
HBT074Am	<i>Eucalyptus pilularis</i>	2			
HBT075Am	<i>Angophora costata</i>	1	2	1	
HBT2033	<i>Eucalyptus pilularis</i>		1	1	
HBT4006	<i>Eucalyptus pilularis</i>				1
HBT4010	<i>Eucalyptus pilularis</i>			1	
HBT4012	<i>Eucalyptus pilularis</i>	1	2	1	
HBT4013	<i>Eucalyptus pilularis</i>		1	2	2
HBT4014	<i>Eucalyptus pilularis</i>		2	3	
HBT4016	<i>Eucalyptus pilularis</i>	1	2		
HBT4030	<i>Angophora costata</i>	1	2		
HBT4035	<i>Eucalyptus pilularis</i>		1		
HBT4040	<i>Eucalyptus pilularis</i>				4
HBT4054	<i>Eucalyptus pilularis</i>		2		
1	<i>Angophora sp.</i>			1	
2	<i>Mel quin</i>		1		
3	<i>Melaleuca</i>		1		
5	<i>Eucalyptus pilularis</i>		1		
6	<i>Eucalyptus pilularis</i>		2		
7	Stag			1	
9	<i>Eucalyptus pilularis</i>	1			

HBT	Species	Small	Med.	Large	XL
11	Stag				2
22	<i>Angophora costata</i>	1			
24	<i>Eucalyptus pilularis</i>		1		
26	<i>Angophora costata</i>			2	
28	<i>Angophora costata</i>	1	2		
30	<i>Angophora costata</i>		1		1
<b>Total</b>		<b>76</b>	<b>9</b>	<b>4</b>	<b>3</b>

### 3.3.1 Hollow log and Nest Box Installation

A combination of salvaged hollow logs and nest boxes will be installed for hollow-dependant threatened fauna recorded within the Site including Little Lorikeet, and several Microbat species as well as many other species of lizards, frogs, birds, microbats and mammals that utilise such features. Priority will be given to hollow logs, dependant on availability, size and supply. Nest boxes will be utilised to supplement any shortfall.

Hollow logs and nest boxes will be installed at a rate of 1:1 for removal of HBTs and will range in size ensuring a diverse range of habitat will be provided within the BMP lands. **Table 3** outlines the sizes for particular guilds.

Nest boxes will be constructed of external grade plywood with a minimum thickness of 18mm utilising stainless steel or “highest grade” of galvanised fittings. Box bases will have three drainage holes no more than 10mm in diameter. Hollow logs are to be fitted with tree-safe attachment system such as Habisure™ or similar method (refer **Plate 1**). Toxic substances are not to be used in the manufacture of nest boxes.

**Table 3- Nest Box Sizes**

Species	General Size	Special Requirements
Cockatoos	Extra Large >30cm	Glossy Black-cockatoo and Yellow-tailed Black Cockatoo boxes are the same
Forest Owls	Extra Large >30cm	Large Forest Owl
Little Lorikeet	Small < 10cm	External perch
Squirrel Glider	Small < 10cm	Rear entrance. Approx. 1/25m along lineal length of Squirrel Glider habitat corridors
Microbats	Extra Small	Bottom entry
Eastern Rosella	Med 10 – 20cm	External perch not required; problematic maintenance issue over time
Australian Owlet Nightjar	Med 10 – 20cm	

Species	General Size	Special Requirements
Sacred Kingfisher	Small < 10cm	Horizontal setup
Australian Wood Duck	Large >20 – 30cm	
Southern Boobook	Large >20 – 30cm	Spout
Pardalote	Extra Small < 5cm	
Common Brush-tail and Ringtail Possum	Med 10 – 20cm	Possums and ringtails use the same size boxes, the smaller ringtails take branchlets into the nest hole.



**Plate 1 - Example of AEP remanufactured hollow (60mm entrance to suit Gliders) and tree-safe attachment system.**

**Figures 4** depicts indicative locations of hollow logs or nest boxes within the BMP Lands.

### 3.4 Weed Control

Weeds have significant impact on structural integrity of vegetation communities. The management and control of weeds within the BMP lands is the key focus to regenerating the aquatic and bushland zones. In accordance with *Biosecurity Act 2015* and the Regional Strategic Weed Management Plans the control of Priority Weeds should be the high priority. Baseline surveys identify 15 Priority Weeds within the site:

- *Asparagus aethiopicus* (Asparagus fern);
- *Alternanthera philoxeroides* (Alligator Weed);



- *Chrysanthemoides monilifera subsp. rotundata* (Bitou Bush);
- *Cortaderia selloana* (Pampas Grass);
- *Cardiospermum grandiflorum* (Balloon Vine);
- *Rubus fruticosus sp. agg.* (Blackberry complex);
- *Gloriosa superba* (Glory Lily);
- *Lantana camara* (Lantana);
- *Opuntia stricta* (Common Prickly pear);
- *Opuntia spp.*;
- *Senecio madagascariensis* (Fireweed);
- *Cestrum parqui* (Green Cestrum);
- *Bryophyllum delagoense* (Mother of Millions) and
- *Bryophyllum pinnatum* (Resurrection Plant).

The *Biosecurity Act 2015* outlines several 'duties'; the general biosecurity duty, and additional duties under mandatory measures, regional measures, prohibited matter or biosecurity zone. Specific action for these measures may be required (refer **Table 4**). Weed control is required to occur in the following sequence:

1. **Primary Weeding** – this is where priority weeds are eliminate from MZs 2-5. This should occur within six (6) months of BMP approval.
2. **Consolidation** – over the next few months, the weed control zones will require monthly visits to remove weeds that are regenerating and/or have grown in response to the disturbance and are competing with planted and regenerating native plants. These visits are essential, otherwise the weeds will recolonise, dominate and inhibit the regenerative native species.
3. **Maintenance Weeding** – After the four to six-month (4 – 6) period post-weeding, weeding visits will continue on a monthly basis, due to Priority weeds, and other annual weeds being problematic within the locality.

This interval will be evaluated based on site condition during each monitoring period. Weed control works across the site are to be undertaken over the maintenance period of three years. However, given the adaptive management approach, this time-frame is flexible, and once native plantings are established, maintenance may be intermittent.

#### 3.4.1.1 Herbicides

If herbicide usage is proposed, the following factors are to be taken into consideration when selecting the herbicide:

- The safety of the particular herbicide to users, desirable plants, soil micro-organisms, amphibians, birds and mammals;
- The economics and time constraints of using herbicides over other methods of weed control; and
- The use of appropriate herbicides for use in sensitive areas such as around streams, creeks, dams, channels and drains.

Directions must be strictly followed and all precautions followed over time. For example, Glyphosate herbicides are systemic and non-selective.

**Table 4- Weed Control Activities**

Activity	Minimum Requirement
Pre-works	Undertake baseline surveys to identify priority weeds present on site to be the focus of weed management activities. Priority species should be categorised into high-, medium- and low-threat based on listings under the <i>Biosecurity Act 2015</i> , and site-specific conditions and/or impacts, and targeted accordingly.
Primary Works	Effectively control priority species and areas through appropriate methods to eliminate highly competitive weeds from an area. Include high disturbance activities that could negatively impact later regeneration such as high-volume herbicide application, and physical removal of large trees which would pose safety hazards to the public or others if left to perish <i>in-situ</i> .
Secondary Works	Treat any regrowth from primary weed control and expand on control measures by targeting Priority species and expanding the primary control boundaries where desirable. Thin retained weeds to increase light penetration where appropriate. Generally, expand on and solidify primary work.
Maintenance Works	Maintain exclusion of weeds controlled during Primary and Secondary works. Prevent reinfestation of weeds progressively, and others as time permits.
Woody Trees & Shrubs	Where appropriate, remove woody weeds via mechanical means (i.e. chainsaw or handsaw) and apply chemical to the cut stump. Material may be retained on-Site or disposed of appropriately off-Site. Retained material should be situated to provide additional ground habitat and slope stability but should not be left in such a way that would hamper natural regeneration or existing native plants. Care should be taken with species which have the capacity to regrow vegetatively such as <i>Erythrina x sykesii</i> (Coral Tree). Alternatively, trees and shrubs may be treated via frill or drill application of herbicide and left to perish <i>in-situ</i> as habitat.
Woody Thickets	Treat via cut or scrape and paint or high-concentration low-volume foliar herbicide control (i.e. splatter application). Material may be left <i>in-situ</i> (particularly after spraying) or broken up and rafted off the ground to perish (taking care to remove from expected high flow areas of the creek). Do not manually remove root stock in a manner that will encourage soil instability or erosion. Once dead, standing material may be broken down and left on the ground as mulch. Mechanical removal (i.e. brush cutter equipped with mulching blade or similar) may be used where practical and regrowth treated with foliar application of herbicide.
Vines and Creepers	Skirt from trees and vegetation to prevent smothering and leave material to perish <i>in-situ</i> . Cut or scrape and paint stems or runners. Foliar herbicide control where appropriate. Do not unduly expose soil via manual removal of plants where they may be providing soil stabilisation. Isolated manual removal as appropriate.

Activity	Minimum Requirement
Ground Cover	Retain exotic species where they are providing ground stabilisation or habitat until such time as they hinder native species establishment or are no longer necessary. Relevant examples include retaining <i>Tradescantia fluminensis</i> (Trad) along drainage lines where removal would expose bare soil to erosion. Weed control is to focus on the patch removal of such weeds from around native regeneration or planting, with progressive removal of larger patches over time.
Retention of forage/habitat	Retain trees and shrubs that have evidence of occupation i.e., bird nest/possum drey, until such time as other suitable habitat is available or the nest is abandoned. Retain manageable clumps of vegetation that can be easily removed at a later date for intermediate food and habitat supply within the semi-cleared and disturbed landscape, which will emerge between weed control and establishment of native plants.  These retained features can be removed as they become redundant at the discretion of the Bush Regeneration Contractor (BRC).

## 3.5 Revegetation

Revegetation will be undertaken using species listed in **Appendix B**.

All plant stock must be provenance specific seed/ material collected from locally endemic species, grown by suitably experienced and qualified nurseries, and hardened-off before planting. This will ensure the structure and composition of these communities will meet the targets set.

The following measures are recommended to enhance revegetation works:

- Preference should be given to native species known to be pioneering species able to compete with exotic regrowth;
- Timing for revegetation work should avoid the summer months and should ideally be planned for spring and autumn;
- Soil preparation should include terraforming as well as the use of water crystals at the discretion of the bush regeneration contractor if deemed necessary;
- Protection guards should be placed around plantings so that revegetation efforts within BMP lands are not compromised by grazing from rabbits or kangaroos;
- If monitoring within management zones indicates pest species pose notable impediments to achieving the aims of the BMP (i.e., through excessive browsing, etc.), then management actions will be reviewed to address these issues; and
- Mulching will be necessary to help suppress weeds and conserve soil moisture around the planting. This will help with minimizing the maintenance required for the planting to establish. Mulch should be sourced from a reputable source, from native trees only and be cured prior to utilizing to avoid nitrogen draw down.

Watering may be necessary depending on the weather forecast during and in the weeks and month following planting events. As such the watering regime should be adapted to the conditions.

### **3.6 Pest Species**

No significant evidence of feral animals was observed on site; however, it is likely that rabbits are present in the local area. Therefore, protection guards should be placed around plantings so that revegetation efforts within BMP lands is not compromised by grazing. If monitoring within management zones indicates pest species pose notable impediments to achieving the aims of the BMP (i.e., through excessive browsing, burrowing, spreading seed etc.), then management actions will be reviewed to address these issues.



## 4.0 Regeneration Commencement

### 4.1 Management

The BMP lands have been broken into eight (8) Management Zones (**Figure 4**), of which Zone 1 will be continuing to use the current golf course management methods associated with playing areas while Zones 3, 4, and 5 will be improved by utilising Natural Regeneration methods. Management Zone 7 will utilise natural regeneration practises and techniques guided by the local Worimi people. Zone 2, 6 and 8 will involve reconstruction of the local plant community.

To achieve the targets outlined for each vegetation community and within each Management Zone the following key steps need to be undertaken in accordance with the works schedule outlined in **Table 5**:

- Preparing the Site;
- Vegetation clearance;
- Establish monitoring points;
- Control of Weeds; and
- Managing Potential Pathogens / Disease.

Further works will be required in Zone 2, 6 and 7 to ensure the appropriate outcomes.

Noting that the works identified in the works schedule will commence at different stages, due the construction of the golf course and the seniors living. Therefore, there is no set start date for each Zone.

### 4.2 The Worimi people

The Worimi people are the traditional owners of the Fern Bay area. Management Zone 7 extends into a sacred archaeological site. This site currently involves holes 16, 17 and 18 as well as an old clubhouse situated on top of a sand dune which contained sacred aboriginal burials.

A new management zone has been created within MGZ-7. This will be managed in consultation with the Worimi People to ensure all works consider and pay respects to the Traditional Custodians of the land. The incorporation of Traditional Knowledge will effectively assist in enhancing the cultural heritage values of the Worimi people.

Furthermore, as burning practices will be utilised as a natural regeneration and weed control practice throughout the Study Area, the Worimi people will be consulted in regards to the other zones as well.

## 5.0 Wallum Froglet Pond

The Wallum froglet (*Crinia tinnula*), also known as the acid frog, is a small frog (growing up to 2cm) with a brown, grey, cream, beige or reddish back, sometimes with longitudinal stripes or patches. The pupil is horizontal, and the iris is gold. The legs have brown horizontal bars. Fingers and toes are unwebbed and large relative to body size; both are without discs. The Wallum Froglet is listed as Vulnerable within schedules of the NSW *Biodiversity Conservation Act 2016*.

### 5.1 Breeding biology

Eggs are laid singly and in small groups in temporary rock pools, swamps and creeks. Tadpoles can reach up to 3.5 cm and are brown, gold or reddish in colour sometimes with small dark or red spots. Wallum Froglet breed throughout the year, but are most likely to be heard calling between June to August.



Plate 2: Grant Webster- Frog ID guide

### 5.2 Habitat and distribution

Wallum froglet are found along the east coast of Australia from Sydney and the Central Coast NSW up to the Sunshine coast of Queensland. They occupy wallum heaths, open vegetation on sand plains and swamp forests (NSW Survey Guide for Threatened Frogs: A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method). They are associated with low pH (between 6 and 2.5 generally) swamplands and tannin rich waters (Lemckert & Mahony, 2018). They have been known to use roadside ditches and other human-impacted areas, but only where water is maintained at a natural acidic rate (Lemckert & Mahony, 2018)

They have been particularly threatened by habitat fragmentation and destruction from roadsides. Amongst other reasons these habitats are likely to move to a more neutral pH and thus become occupied by more aggressive frog species, in particular *Crinia signifera* (eastern common froglet) (Lemckert & Mahony, 2018).

PCT 771 (Coast Banksia- Coast Tea-tree low moist forest on coastal sands and headlands) located on the site contains the most suitable vegetation for the species, and will need to be added within the zone.

### 5.3 Water Quality Wallum Froglet

AEP undertook a literature review for the species and current ponds that have been established within NSW and QLD. Simpkins et al., 2021 stated

*“Despite the majority of amphibians being intolerant to saline waters some can live in waterbodies with salinity levels close to seawater” Results from this paper showed “C. tinnula were recorded from 14 waterbody transects where the maximum number of individual C. tinnula tadpoles caught for an individual waterbody transect was 44. Waterbodies with C. tinnula tadpoles had mean pH ranging between 3.35 – 6.84, salinity up to 50ppm”*

Biannually, water quality testing for the first three (3) years after construction is proposed artificial pond and the mitigation measures listed below will be considered and / or implemented if parameters in the pond vary due to weather events such as rainfall.

- **Adding Crushed Coral:** as it releases calcium carbonate when it comes into contact with acidic water, which increases alkalinity.

- **Limestone Rocks:** placing limestone rocks around the pond or directly into the water, as they naturally leach minerals that increase alkalinity.
- **Aeration:** increase aeration in your pond by using an air pump or installing water features that disturb the water surface, as this reduces carbon dioxide levels, which in turn reduces acidity.
- **Liming Agents:** use liming agents like quicklime, slaked lime, or calcium carbonate to reduce acidity by adding calcium and magnesium to the water, increasing water hardness and buffering capacity.
- **pH Reducer:** add a pond pH stabilizer, applying enough treatment to shift the levels 0.5 at a time, waiting several hours before re-treating, and testing the water often with your pH Test Kit.
- **Peat Moss or Peat Pellets:** Add peat moss or peat pellets to the pond, as they contain tannins that lower pH.
- **Carbon Dioxide:** Add carbon dioxide, which acts as an acid in water.
- **Adding Salt:** To increase salinity by adding salt to the pond, but do it slowly and monitor the levels.
- **Water Changes:** To reduce salinity, perform partial water changes by replacing a portion of the pond water with freshwater.
- **Dilution:** Dilute the pond water with freshwater to lower the salt concentration.
- **Gradual Changes:** Make sure to change the water gradually to prevent a shock to the pond's inhabitants.
- **Rainwater:** Rainwater can naturally lower salinity due to its low salt content.

AEP aquatic Ecologist and Project Ecologist (Frog Expert) undertook a Site inspection on the 07/03/2025 to undertake water quality analysis within the existing stormwater drain and proposed wetland area in the northwest portion of the site to record salinity and pH levels a total of six locations were sampled (refer extract map from BDAR in **Appendix D**). The groundwater sample was taken after taking a soil core sample that was approximately 30cm deep and water table was exposed.

Water quality testing the following results:

- Point 1 – Salinity 6.92ppm, pH level 6.92;
- Point 2 – Salinity 7.53ppm, pH level 7.64;
- Point 3 – Salinity 6.49ppm, pH level 6.59;
- Point 4 – Salinity 0.20ppm, pH level 7.61;
- Point 5 – Salinity 0.17ppm, pH level 6.86;
- Point 6 – Salinity 4.46ppm, pH level 6.55.

The results show that the current levels for both salinity and pH levels are within the parameters the for Frog, and will require a biannual monitoring for three (3) years post construction to ensure the levels are within the required parameters.

### 5.4 Design

After detailed review of the conditions of consent for the approved Golf Course updates AEP Ecologist contacted Northrop Consulting Engineers to determine how to construct the Wallum Froglet Pond without undertaken additional earthworks to minimise impacts on cultural heritage and biodiversity.



Northrop Engineers identified the area of compensatory cut for the habitat as meeting the requirements outlined by AEP Ecologist:

- Habitat - heaths, open vegetation on sand plains and swamp forests;
- Breeding habitat with rocks and swamp;
- Low pH (between 5 and 2.5 generally); and
- Water depths of 10 40cm for periods of 10 to 12 weeks to allow for breeding (it is noted that during drought times this may not be achieved).

**To support the above** Northrop Consulting Engineers outline the assessment to meet the above in **DA 16-2022-413-1 – Habitat Within Flood Compensatory Cut Area RFI Response dated 23 January 2025**. (refer **Appendix D**). The modelling within this assessment shows that a proportion of the compensatory cut will be permanently inundated.

After construction of the pond other factors will be assessed such as:

- pH level and mitigation measures to meet the species needs will be employed;
- Confirm planting location of aquatic and transitional heath habitat; and
- Installation of rock where required.

## 5.5 Ecological Habitat Regeneration

The northern section of the site has a history of flooding, in order to prevent damage to the retirement village, golf course and native Management zones, a civil infrastructure site will be dug out to create drainage points. This will be conducted within conjunction with an AQF5 Arborists, in order to determine which tree's will be removed and which will be retained.

In order to create suitable frog habitat, a new management zone will be created-MGZ 6. The zone will be located in North West of the Study Area, north of MGZ 8 (**Figure 4** and **Figure 7**). The 'NSW Survey Guide for Threatened Frogs' indicates that there will be a 50 m polygon buffer around any potential breeding habitat. Due to the natural indentations located at the bottom of the slope in the Central West of the zone, this will be further enhanced and regenerated to provide breeding habitat. Areas along and up the slope will be regenerated using suitable local heathland species creating a corridor to the other zones, as per the guidelines.

The following parameters will be used for the zone:

- **Transitional Area:** Regeneration using a combination of PCT 771 and 1724. This will account for the elevation change within the reconstruction area, considering the possibility of an ecotone.  
  
This will generate leaf litter to ensure suitable habitat and suits the soil profile of the management zone. Trees felled during clearing works will be moved into this management zone. It is naturally lower and will provide additional habitat during higher rainfall events, while providing connectivity to MGZ 5.
- **Wetland:** After civil works planting is required, species from the ground covers species form PCT 1724. This will ensure the habitat required by the species is provided and maintained for Wallum Froglet. Specifically, ensuring vegetation within this zone produces the leaf litter required to maintain a suitable pH in the water. As leaf litter results in the input of tannins within waterbodies, adjacent vegetation is key in maintaining acidity and therefore in providing suitable conditions for Wallum Froglet.

The regeneration will consist of heathland species associated with PCT 771 local to the area, and further enhancement of the groundcover species from PCT 1724 vegetation already present within the management zone. As a result of lower elevation, the natural depressions and lower plains will receive excess water from the habitat at higher elevations. This allows for tannins and acidic residue to drain into the natural indentations, creating a suitably acidic water source.

The 'NSW Survey Guide for Threatened Frogs' indicates that there will be a 50 m polygon buffer around any potential breeding habitat.

Aquatic vegetation planted will include *Lomandra longifolia* which will provide a natural buffer deterring pedestrian and predatory pest species (i.e., cats and foxes) accessing aquatic habitat. Utilising vegetation as a natural buffer reduces the impacts that installing fencing would incur, and increases natural habitat for the species.

Regular monitoring of the pH level of habitats will ensure the zone is retaining the necessary pH level, particularly as works continue around the zone.

Informative signage will be implemented to engage local communities, stakeholders, and guest of the golf course. This will raise awareness about the importance of biodiversity conservation and encourage participation in habitat restoration activities.

## 6.0 Project Management

Establishment of monitoring and compliance checking of other aspects within this BMP will be the responsibility of the Project Ecologist working with the Civil Contractor.

The Project Ecologist will be responsible for monitoring and reporting on weed management, and Regeneration Approach success.

The works for both developments require staging and various regeneration approaches therefore the BMP provides the general regeneration schedules for each stage.

It is noted that the first step for each stage is the preparation of a detailed regeneration schedule prepared by the Project Ecologist and Staff to ensure the area within the stages meets the required target of naturally regenerating community.

This approach has been taken to ensure all site changes are considered and elevated accurate at the time of commencement and to ensure no future stage impacts the areas already being regenerated. As the works and regeneration will occur over a long time period and condition within the regeneration areas may vary, such as, weed loads and species may change, the climatic conditions may vary (drought or flood) etc. Therefore, to ensure appropriate measures are undertaken at each stage the detailed works plan must be prepared at commencement of each stage.

### 6.1 Staging

For the approved Golf Course upgrades there are four stages for construction to ensure all regeneration works are not impacted by future stages and are completed undertaken the it is proposed that regeneration works are undertaken with each stage (refer to **Appendices E** and **F** for staging plans).

#### 6.1.1 Newcastle Golf Course Upgrades

**Vegetation Clearing stage** – the implementation of Section 3 of the BMP must have been undertaken:

- Site preparation;

- Installation of Nest boxes (for both Developments);
- Clearing in accordance with Section 3.2l; and
- Installation of tree protection measures for retained vegetation.

**Stage 1** – Regeneration works adjoining 1st Hole, 5th Tee, 7th Hole, 15th Hole, 16th Hole, 18th Green and Putting Green must commence. This requires:

- Preparation of detailed regeneration works plan;
- Fencing and signage of retained lands;
- Primary and secondary weeding;
- Planting of varying stratum (refer to Management Zone requirements);
- Watering and mulching;
- Replacement of dead and dying plants;
- Monitoring to commence; and
- Tertiary weeding as required.

**Stage 2** – Regeneration works adjoining 2nd Hole, 3rd Hole, 4th Hole, 5th Green, 6th Hole, 17th Hole, 18th Tee and 19th Hole must commence. This requires:

- Preparation of detailed regeneration works plan;
- Fencing and signage of retained lands;
- Primary and secondary weeding;
- Planting of varying stratum (refer to Management Zone requirements);
- Watering and mulching;
- Replacement of dead and dying plants;
- Monitoring to commence; and
- Tertiary weeding as required.

**Stage 3a** – Regeneration works adjoining 8th Hole, 12th Hole and 13th Hole must commence. This requires:

- Preparation of detailed regeneration works plan;
- Fencing and signage of retained lands;
- Primary and secondary weeding;
- Planting of varying stratum (refer to Management Zone requirements);
- Watering and mulching;
- Replacement of dead and dying plants;
- Monitoring to commence; and
- Tertiary weeding as required.

**Stage 3b** – Regeneration works adjoining 9th Hole, 10th Hole, 11th Hole and 14th Hole must commence. This requires:

- Preparation of detailed regeneration works plan;
- Fencing and signage of retained lands;
- Primary and secondary weeding;
- Planting of varying stratum (refer to Management Zone requirements);
- Watering and mulching;



- Replacement of dead and dying plants;
- Monitoring to commence; and
- Tertiary weeding as required.

**Compensatory Cut and fill** – prior to construction works the only regeneration works that can be undertaken is the installation of fencing and signage of retained lands. The remaining regeneration works required for this area and adjoining management zones must commence with 30 days after civil works are completed. The works regeneration works will require:

- Assessment of the cut area for suitable location for habitat features and identification of each for plantings.
- Preparation of detailed regeneration works plan;
- Fencing and signage of retained lands;
- Installation of habitat features;
- Primary and secondary weeding;
- Planting of varying stratum (refer to Management Zone requirements);
- Watering and mulching;
- Monitoring pH levels in wet areas;
- Replacement of dead and dying plants;
- Monitoring to commence; and
- Tertiary weeding as required.

### 6.1.2 Seniors Living

Regeneration adjoining the northern section of proposed **Stage 4** will be completed above after completion for the compensatory cut and fill. Suitable fencing between the retained lands must be implemented.

**Proposed Stages 1, 2 and 6** – As describe above this are has high cultural heritage values and the regeneration will be prepared and undertaken with the Worimi People. Commencement will occur with the adjoining stages.

At commencement of stage 1 fencing and signage of retained lands must undertaken.

**Stages 4 and 3** - Regeneration works adjoining the eastern section of these proposed stages must commence. This requires:

- Preparation of detailed regeneration works plan;
- Fencing and signage of retained lands;
- Primary and secondary weeding;
- Monitoring to commence; and
- Tertiary weeding as required.

## 6.2 Works Schedule

**Table 5** provides indicative timeline for the required regeneration works within retained lands. On commencement of each stage a detailed regeneration works schedule is to be prepared by the Project Ecologist and Golf Course Staff to ensure all regeneration are undertaken to achieve naturally regenerating lands.

## 6.3 Monitoring

Monitoring will occur on an annual basis detailing:

- Weed control effectiveness;
- Natural Regeneration success;
- Water parameters in the frog pond, in particular pH;
- Diversity and abundance of native and weed species; and evaluation of management effectiveness.

## 6.4 Reporting

A report is to be prepared annually and delivered to the consent authority for the life of the BMP, with a final report prepared at the end of the BMP outlining how the targets of the BMP have been met. Annual monitoring will inform the evaluation of management effectiveness, and recommendations to adapt management in-perpetuity will be made, until the Regeneration Benchmark Targets are met.

As part of adaptive management, the reports will include evaluations and recommendations relating to all areas covered in the monitoring schedule and also address any other problems or deficiencies found during monitoring. Documentary Evidence

In conjunction with the Monitoring and reporting, documentary evidence of the completion of targets and mitigation measures outlined within this BMP will be provided to the Council's Natural Systems Section for approval. Documentary evidence will be provided after the completion of each stage of works and before the commencement of the next stage of works. The works includes:

- Tree protection measures. Implementation of hygiene protocols;
- Planting of vegetation; and
- Nest box replacement/ installation.





**Table 5- Indicative Works Schedule (to commence as per staging plan above)**

Action	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Pathogen and disease controls																				
Primary Weeding																				
Set up Monitoring Plots and Photo Points (collect baseline data)																				
Install appropriate sediment and erosion.																				
Install fencing and signage																				
Installation of nest boxes																				
Installation of ground habitat																				
Planting of trees and shrubs																				
Mulching																				
Feral Animal controls																				
Secondary Weed Control and maintenance																				
Replacement of dead trees and shrubs																				
Tertiary Weed Control and maintenance																				
Monitoring of natural regeneration and weeds controls																				
Monitoring of Fencing, Erosion and sediment controls	These should be checked annually for the life of the BMP and after heavy rainfall events (rainfall >25mm) by Civil Contractors to ensure they are still operational where needed																			
Reporting																				Final Report



Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

## Legend

-  Study Area
-  Cadastre
-  Proposed Retirement Village
-  Approved Golf Course Upgrades



0 300  
metres

Note:  
Boundaries are not survey accurate  
200 per cent scale of this plan



# AEP

Figure 1 - Site Location

Date: January 2025

Location: 4A Vardon Road, Fern Bay, NSW

Client: Principle Living Pty Ltd

AEP Ref: 2399



PROPOSED SCORECARD (LADIES)

SCORECARD					
Hole	Par	Length	Hole	Par	Length
1	5	439	10	4	213
2	3	106	11	5	425
3	4	294	12	4	325
4	5	382	13	4	306
5	4	331	14	3	128
6	4	291	15	4	230
7	3	125	16	5	439
8	4	282	17	4	271
9	5	419	18	4	324
OUT	37	2669	IN	37	2661
			OUT	37	2669
Lengths in metres			TOTAL	74	5330

SCORECARD					
Hole			Hole		
1	5	480	10	4	233
2	3	116	11	5	465
3	4	322	12	4	355
4	5	418	13	4	335
5	4	362	14	3	140
6	4	318	15	4	252
7	3	137	16	5	480
8	4	308	17	4	296
9	5	458	18	4	354
OUT			IN		
37		2919	37		2910
Lengths in yards			OUT		37
			TOTAL		74
					5829

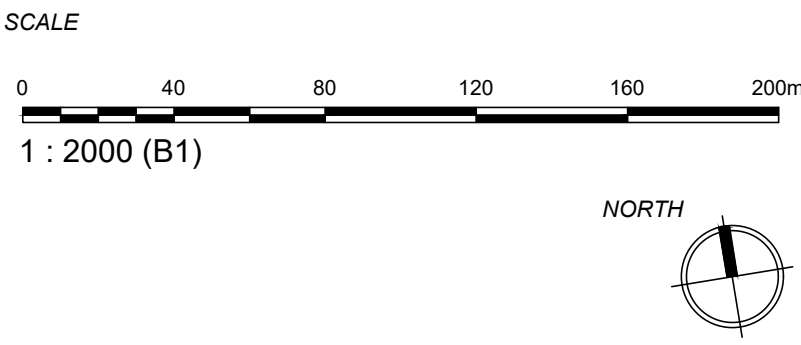
PROPOSED SCORECARD (MENS)

SCORECARD							
Hole	Par	Length	Hole	Par	Length		
1	5	500	10	3	220		
2	3	126	11	5	429		
3	4	351	12	4	368		
4	4	404	13	4	403		
5	4	384	14	3	152		
6	4	321	15	4	298		
7	3	159	16	5	502		
8	4	331	17	4	380		
9	5	493	18	4	365		
OUT		36	3069	IN		36	3117
				OUT		36	3069
Lengths in metres				TOTAL		72	6186

SCORECARD					
Hole	Par	Length	Hole	Par	Length
1	5	547	10	3	241
2	3	138	11	5	469
3	4	384	12	4	402
4	4	442	13	4	441
5	4	420	14	3	166
6	4	351	15	4	326
7	3	174	16	5	549
8	4	362	17	4	416
9	5	539	18	4	399
OUT	36	3356	IN	36	3409
			OUT	36	3356
Lengths in yards			TOTAL	72	6765



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BOB HARRISON  
M: 0419 626 858  
E: bob@harrisingolf.com.au



LEGEND

No.	DATE	REVISION DESCRIPTION
J	16.03.23	REVISIONS TO HOLE 7 TO PROTECT HBT'S
K	04.07.23	REVISIONS TO RETAIN ADDITIONAL HBT'S
L	01.09.23	CONSOLIDATED ISSUE FOR APPROVAL
M	20.09.23	REVISED 6TH HOLE TEES TO RETAIN HBT'S
N	27.09.24	ISSUED FOR TENDER

CLIENT



PROJECT

NEWCASTLE GOLF CLUB  
COURSE IMPROVEMENT WORKS  
DEVELOPMENT APPLICATION

DRAWING

GENERAL LAYOUT PLAN

DRAWING No.

1502.T.01

ISSUE

N

SHEET No.

01 / 10

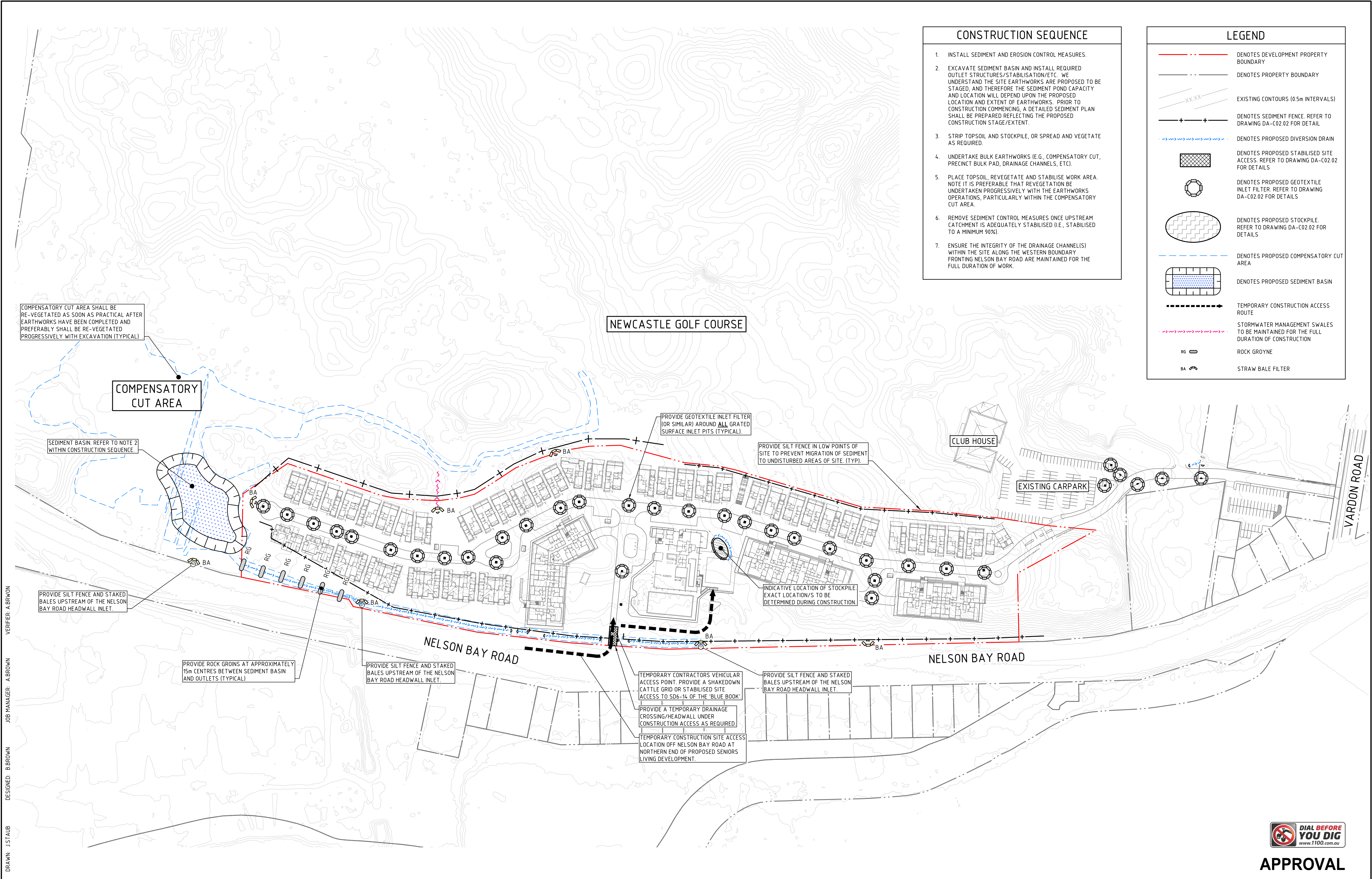
DATE

27.09.24

ISSUED FOR

TENDER





- ### CONSTRUCTION SEQUENCE
1. INSTALL SEDIMENT AND EROSION CONTROL MEASURES.
  2. EXCAVATE SEDIMENT BASIN AND INSTALL REQUIRED OUTLET STRUCTURES/STABILISATION/ETC. WE UNDERSTAND THE SITE EARTHWORKS ARE PROPOSED TO BE STAGED, AND THEREFORE THE SEDIMENT POND CAPACITY AND LOCATION WILL DEPEND UPON THE PROPOSED LOCATION AND EXTENT OF EARTHWORKS. PRIOR TO CONSTRUCTION COMMENCING, A DETAILED SEDIMENT PLAN SHALL BE PREPARED REFLECTING THE PROPOSED CONSTRUCTION STAGE/EXTENT.
  3. STRIP TOPSOIL AND STOCKPILE, OR SPREAD AND VEGETATE AS REQUIRED.
  4. UNDERTAKE BULK EARTHWORKS (E.G., COMPENSATORY CUT, PRECINCT BULK PAD, DRAINAGE CHANNELS, ETC).
  5. PLACE TOPSOIL, REVEGETATE AND STABILISE WORK AREA. NOTE IT IS PREFERABLE THAT REVEGETATION BE UNDERTAKEN PROGRESSIVELY WITH THE EARTHWORKS OPERATIONS, PARTICULARLY WITHIN THE COMPENSATORY CUT AREA.
  6. REMOVE SEDIMENT CONTROL MEASURES ONCE UPSTREAM CATCHMENT IS ADEQUATELY STABILISED (I.E., STABILISED TO A MINIMUM 90%).
  7. ENSURE THE INTEGRITY OF THE DRAINAGE CHANNEL(S) WITHIN THE SITE ALONG THE WESTERN BOUNDARY FRONTING NELSON BAY ROAD ARE MAINTAINED FOR THE FULL DURATION OF WORK.

### LEGEND

- DENOTES DEVELOPMENT PROPERTY BOUNDARY
- - - DENOTES PROPERTY BOUNDARY
- X-X-X- EXISTING CONTOURS (0.5m INTERVALS)
- + + + DENOTES SEDIMENT FENCE. REFER TO DRAWING DA-C02.02 FOR DETAIL
- DENOTES PROPOSED DIVERSION DRAIN
- [Hatched Box] DENOTES PROPOSED STABILISED SITE ACCESS. REFER TO DRAWING DA-C02.02 FOR DETAILS
- [Circular with X] DENOTES PROPOSED GEOTEXTILE INLET FILTER. REFER TO DRAWING DA-C02.02 FOR DETAILS
- [Hatched Oval] DENOTES PROPOSED STOCKPILE. REFER TO DRAWING DA-C02.02 FOR DETAILS
- - - DENOTES PROPOSED COMPENSATORY CUT AREA
- [Rectangular with Dots] DENOTES PROPOSED SEDIMENT BASIN
- DENOTES TEMPORARY CONSTRUCTION ACCESS ROUTE
- DENOTES STORMWATER MANAGEMENT SWALES TO BE MAINTAINED FOR THE FULL DURATION OF CONSTRUCTION
- RG [Symbol] ROCK GROUPE
- BA [Symbol] STRAW BALE FILTER

VERIFIER: A.BROWN  
JOB MANAGER: A.BROWN  
DESIGNED: B.BROWN  
DRAWN: J.STAUB

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
G	ISSUED FOR APPROVAL	JR	AB	JH	22.07.24
H	AMENDED FOR APPROVAL	RG	AB	JH	18.12.24

CLIENT  
**PRINCIPLE LIVING**

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT  
**EJE architecture**

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SCALE 1:2000 @ A1

0 20 40 60 80 100m

**NORTHROP**  
Newcastle  
Level 1, 215 Pacific Hwy, Charlestown NSW 2290  
Ph (02) 4943 1777 Email newcastle@northrop.com.au  
ABN 81 094 433 100

PROJECT  
**APPERLY VILLAGE**  
**NELSON BAY ROAD, FERN BAY. NSW. 2259.**

DRAWING TITLE  
**EROSION AND SEDIMENT CONTROL PLAN**




**APPROVAL**

JOB NUMBER <b>NL166557</b>	
DRAWING NUMBER <b>DA-C02.01</b>	REVISION <b>H</b>
DRAWING SHEET SIZE = A1	




Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.


## Legend

 Lot Boundary (Study Area)


 Cadastre

 Proposed Retirement Village


 Approved Golf Course Upgrades

 MZ8 - Civil Infrastructure (future regeneration)

 PCT 1646

 PCT 1646 - Canopy Only

 PCT 1724

 PCT 1724 - Canopy Only

 PCT 1727

 PCT 771

 Managed Cultiver Garden / Effluent Treatment Works



0 300  
metres

Notes:  
1. Boundaries are not survey accurate.  
2. Do not scale off this plan.



# AEP

Title: Figure 3 - Plant Community Types

Date: March 2025

Location: 4A Vardon Road, Fern Bay, NSW






Client: Principle Living Pty Ltd

AEP Ref: 2399











Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

## Legend

-  Lot Boundary (Study Area)
-  Proposed Retirement Village
-  Area of Works
-  Cadastre
-  Indicative Nest Box Location

## Management Zones

-  MZ1 - Playing Corridor
-  MZ2 - Reconstruction
-  MZ3 - Natural Regeneration (understorey only 1m)
-  MZ4 - Natural Regeneration (canopy only)
-  MZ5 - Natural Regeneration
-  MZ6 - Wallum Froglet Habitat
-  MZ7 - Worimi Regeneration
-  MZ8 - Civil Infrastructure (Future Regeneration)



0 300  
metres

Note:  
1. Boundaries are not survey accurate  
2. Do not scale off this map



# AEP

Figure 4 - Management Zones

Date: March 2025

Location: 4A Vardon Road, Fern Bay, NSW

Client: Principle Living Pty Ltd

AEP Ref: 2399



6,363,500  
 Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

**Legend**

- Lot Boundary (Study Area)
- Clearing Area (Subject Site)
- Cadastre
- Large waterbody
- HBT Survey Track
- Hollow Bearing Tree



Notes:  
 1. Boundaries are not survey accurate  
 2. Do not scale off this plan



Figure 5 - Hollow - bearing Trees

Location: 4A Vardon Road, Fern Bay, NSW

Client: Newcastle Golf Club

Date: March 2024

BOAMS Ref: 14047

AEP Ref: 1440



Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

3

## Legend



Lot Boundary



Area of Works



Key Fauna Corridor

## Hollow Bearing Trees



Retained



Retained (pruned)



Removed



# AEP

Figure 6 - Key Fauna Corridors and HBT Retention

Date: March 2024

Location: 4A Vardon Road, Fern Bay, NSW

Client: Newcastle Golf Club

AEP Ref: 2399



Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

## Legend

-  Study Area
-  Cadastre
-  Proposed Retirement Village
-  Approved Golf Course Upgrades
-  Clearing Direction



0 300  
metres

Note:  
1. Boundaries are not survey accurate  
2. Do not scale off this plan



# AEP

Figure 7 - Clearing Direction

Date: March 2025

Location: 4A Vardon Road, Fern Bay, NSW

Client: Principle Living Pty Ltd

AEP Ref: 2399







Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

## Legend

-  Lot Boundary (Study Area)
-  Proposed Retirement Village
-  Approved Golf Course Upgrade
-  Cadastre

## Management Zones

-  MZ2 Reconstruction
-  MZ5 Natural Regeneration
-  Proposed Koala Feed Tree (52)
-  Impacted Koala Feed Trees (4)



0 300  
metres

Note:  
1. Boundaries are not survey accurate  
2. Do not scale off this plan



# AEP

Figure 8 - Koala Feed Trees

Location: 4A Vardon Road, Fern Bay, NSW

Client: Principle Living Pty Ltd

Date: Mar 2025

AEP Ref: 2399



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Weather:

**March 2025**



## Appendix B – BMP Lands Signage



**NO UNAUTHORISED ENTRY**

# **This is a Vegetation Rehabilitation Area**

- **NO DUMPING or WASTE DISPOSAL**
- **NO ANIMALS, VEHICLES or  
MACHINERY**

**For information – contact Site Manager**



## Appendix C – Species List for Reconstruction



Species List – Densities and species for regeneration.

Canopy	Density	Shrubs	Density	Ground Cover	Density
PCT 1646 - Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast					
<i>Corymbia gummifera</i> <i>Angophora costata</i> <i>Eucalyptus pilularis</i> <i>Eucalyptus saligna</i> X <i>botryoides</i> <i>Angophora floribunda</i> <i>Eucalyptus robusta</i> <i>Allocasuarina torulosa</i> <i>Eucalyptus punctata</i> <i>Eucalyptus tereticornis</i> <i>Melaleuca quinquenervia</i> <i>Syncarpia glomulifera</i> subsp. <i>glomulifera</i>	1/20 m <sup>2</sup> (minimum of 52 koala feed trees being planted across BMP Lands)	<i>Macrozamia communis</i> <i>Monotoca elliptica</i> <i>Ricinocarpos pinifolius</i> <i>Platysace lanceolata</i> <i>Xanthorrhoea australis</i> <i>Acacia suaveolens</i> <i>Breynia oblongifolia</i> <i>Acacia ulicifolia</i> <i>Gompholobium latifolium</i> <i>Platylobium formosum</i> <i>Bossiaea heterophylla</i> <i>Eriostemon australasius</i> <i>Persoonia levis</i> <i>Xanthorrhoea arborea</i> <i>Podocarpus spinulosus</i> <i>Pultenaea flexilis</i> <i>Comesperma ericinum</i> <i>Leptospermum polygalifolium</i> <i>Acacia longifolia</i> <i>Aotus ericoides</i> <i>Leptospermum trinervium</i> <i>Pittosporum revolutum</i> <i>Bossiaea ensata</i> <i>Dodonaea triquetra</i> <i>Leucopogon ericoides</i> <i>Pimelea linifolia</i> <i>Polyscias sambucifolia</i> <i>Elaeocarpus reticulatus</i> <i>Maytenus silvestris</i> <i>Monotoca scoparia</i> <i>Notelaea longifolia</i> <i>Omalanthus populifolius</i> <i>Pittosporum undulatum</i> <i>Dillwynia glaberrima</i> <i>Xanthorrhoea media</i> <i>Xanthorrhoea resinifera</i> <i>Banksia aemula</i> <i>Dillwynia floribunda</i> <i>Gompholobium grandiflorum</i> <i>Isopogon anemonifolius</i> <i>Leptospermum laevigatum</i>	1/10m <sup>2</sup>	<i>Pomax umbellata</i> <i>Arthropodium minus</i> <i>Amperea xiphoclada</i> <i>Hybanthus monopetalus</i> <i>Phyllanthus hirtellus</i> <i>Correa reflexa</i> <i>Mitrasacme polymorpha</i> <i>Actinotus helianthi</i> <i>Vernonia cinerea</i> var. <i>cinerea</i> <i>Chamaesyce hirta</i> <i>Hibbertia diffusa</i> <i>Xanthosia pilosa</i> <i>Dampiera purpurea</i> <i>Dampiera stricta</i> <i>Goodenia heterophylla</i> <i>Opercularia aspera</i> <i>Poranthera microphylla</i> <i>Pseuderanthemum variabile</i> Grass <i>Themeda australis</i> <i>Imperata cylindrica</i> var. <i>major</i> <i>Entolasia marginata</i> <i>Poa affinis</i> <i>Microlaena stipoides</i> var. <i>stipoides</i> <i>Cymbopogon refractus</i> <i>Entolasia stricta</i> Graminoid <i>Dianella caerulea</i> <i>Lomandra longifolia</i> <i>Lomandra filiformis</i> <i>Patersonia glabrata</i> <i>Patersonia sericea</i>	5 per m <sup>2</sup> or Direct Seeding if natural regeneration has not occurred at the end of year 3.



Canopy	Density	Shrubs	Density	Ground Cover	Density
PCT 1724 - Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast					
<i>Eucalyptus robusta</i> <i>Casuarina glauca</i> <i>Angophora costata</i>	1/20 m <sup>2</sup> (minimum of 52 koala feed trees being planted across BMP Lands)	<i>Melaleuca quinquenervia</i> <i>Acacia irrorata</i> subsp. <i>irrorata</i> <i>Glochidion ferdinandi</i> var. <i>ferdinandi</i> <i>Melaleuca linariifolia</i> Palm <i>Livistona</i> Shrub <i>Omalanthus populifolius</i> <i>Goodenia ovata</i> <i>Acacia longifolia</i> <i>Pultenaea villosa</i> <i>Dodonaea triquetra</i> <i>Durringtonia paludosa</i>	1/10m <sup>2</sup>	<i>Viola hederacea</i> <i>Commelina cyanea</i> <i>Villarsia exaltata</i> <i>Gonocarpus teucroides</i> <i>Atriplex cinerea</i> Fern <i>Blechnum indicum</i> <i>Hypolepis muelleri</i> <i>Pteridium esculentum</i> <i>Blechnum camfieldii</i> <i>Cyclosorus interruptus</i> <i>Gleichenia dicarpa</i> Grass <i>Phragmites australis</i> <i>Hemarthria uncinata</i> var. <i>uncinata</i> <i>Entolasia marginata</i> <i>Oplismenus aemulus</i>	5 per m <sup>2</sup> or Direct Seeding if natural regeneration has not occurred at the end of year 3.
PCT 771 - Coast Banksia - Coast Tea-tree low moist forest on coastal sands and headlands, Sydney Basin Bioregion and South East Corner Bioregion					
<i>Banksia integrifolia</i> subsp. <i>integrifolia</i> ; <i>Leptospermum laevigatum</i> ; <i>Acmena smithii</i> ; <i>Eucalyptus botryoides</i> ; <i>Eucalyptus tereticornis</i> <i>Cupaniopsis anacardioides</i> ;	1/20 m <sup>2</sup> +(minimum of 52 koala feed trees being planted across BMP Lands)	<i>Breynia oblongifolia</i> ; <i>Monotoca elliptica</i> ; <i>Notelaea longifolia</i> ; <i>Acacia longifolia</i> ; <i>Pittosporum undulatum</i> ; <i>Westringia fruticosa</i> ;	1/10m <sup>2</sup>	<i>Lomandra longifolia</i> ; <i>Commelina cyanea</i> ; <i>Hibbertia scandens</i> ; <i>Pteridium esculentum</i> ; <i>Dichondra repens</i> ; <i>Viola hederacea</i> ; <i>Oplismenus imbecillis</i> ; <i>Imperata cylindrica</i> var. <i>major</i> ; <i>Ficinia nodosa</i> ; <i>Pelargonium australe</i> ;	5 per m <sup>2</sup> or Direct Seeding if natural regeneration has not occurred at the end of year 3.

It should be noted that not all of the listed species above are easily obtainable and hence not all will be able to be sourced and used within the BMP Lands.



## **Appendix D – Northrop Consulting Engineering Wallum Froglet Pond Assessment**



Ref: NL166557-00-B08-A  
23 January 2025

Chris Old  
Principle Living

Dear Chris,

**Re: DA 16-2022-413-1 – Habitat Within Flood Compensatory Cut Area RFI Response**

Northrop Consulting Engineers have prepared civil drawings and flood modelling to support the aforementioned DA. We understand Council are requiring some evidence the proposed location of frog habitat will remain wet for extended periods of time. The purpose of this correspondence is to outline the expected hydraulic characteristics of the area and elaborate on the engineering response.

The compensatory cut area that will be the subject of future frog habitat is hydraulically connected to the North Arm of the Hunter River through an existing channel within the subject site, and drainage located within the Nelson Bay Road road reserve and downstream development. The invert level of the channel is currently at approximately 0.3m AHD – refer to an extract of the detailed survey presented below in Figure 1.

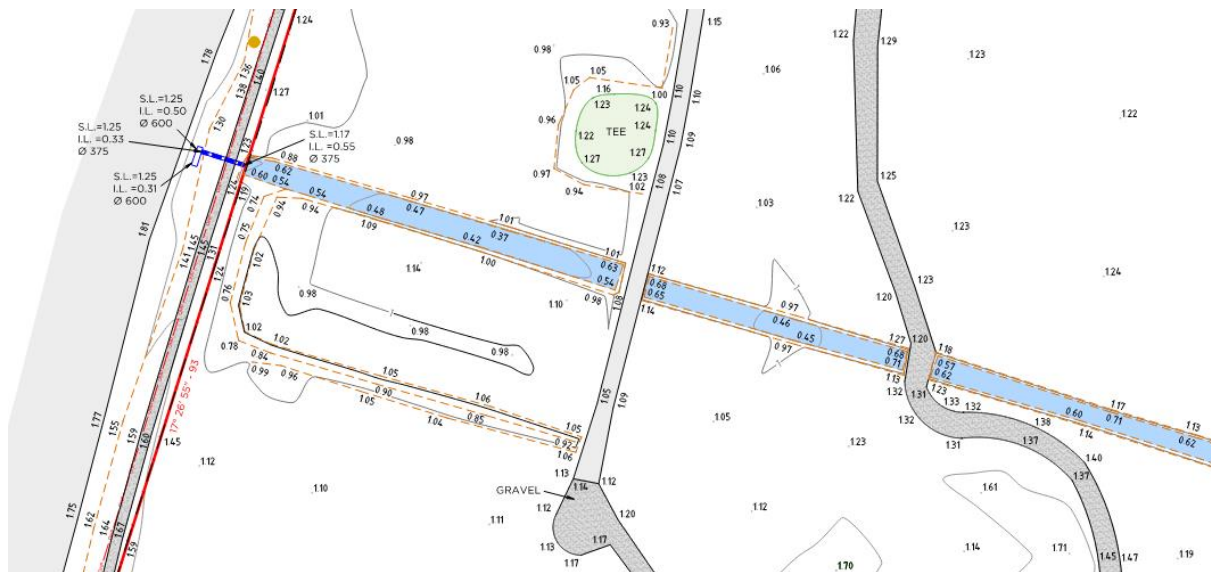


Figure 1 - Existing channel detailed survey (Delfs Lascelles, 2021)

As part of the works a compensatory cut area with an invert of 0.8m AHD is proposed to minimise the flood impacts off-site. The area will also provide a water quality function with further excavation to 0.6m AHD proposed. A section showing this arrangement is included as an attachment to this correspondence.

The Hunter River is subject to tidal influence and a recent plot of water levels from Stockton Bridge are reproduced overleaf in Figure 2. This shows regular and frequent inundation over 0.6m AHD.

Furthermore, a record at the Hexham Bridge between 2014 and 2019 is presented overleaf in Figure 3. This also shows regular inundation above the proposed invert level of the wetland.



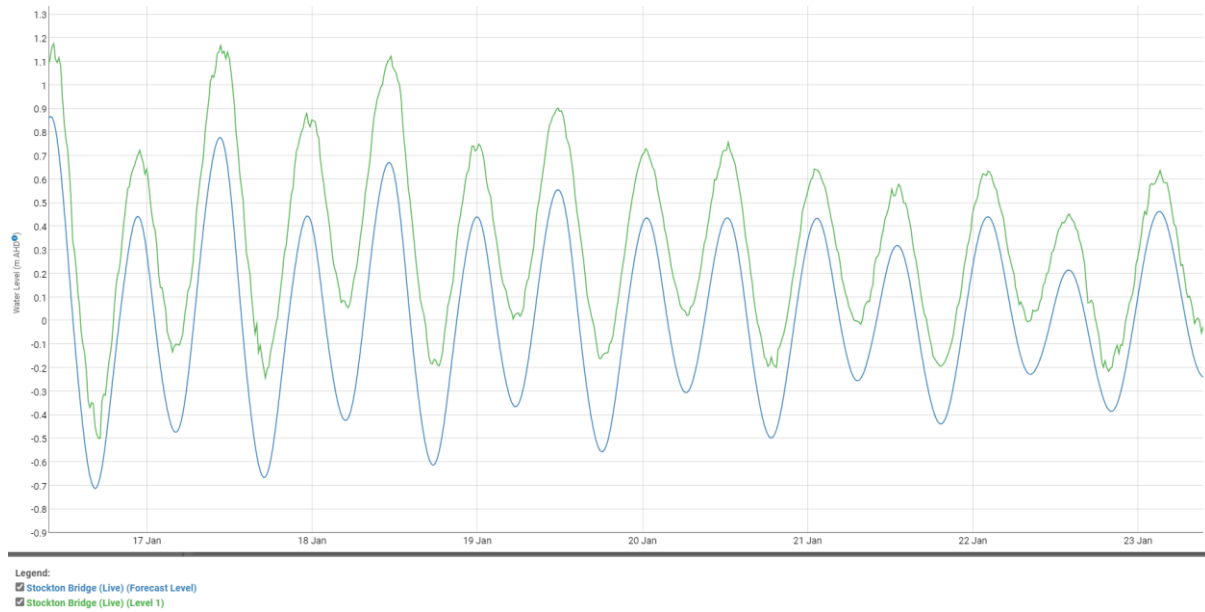


Figure 2 - Stockton bridge water levels (MHL, 2025)

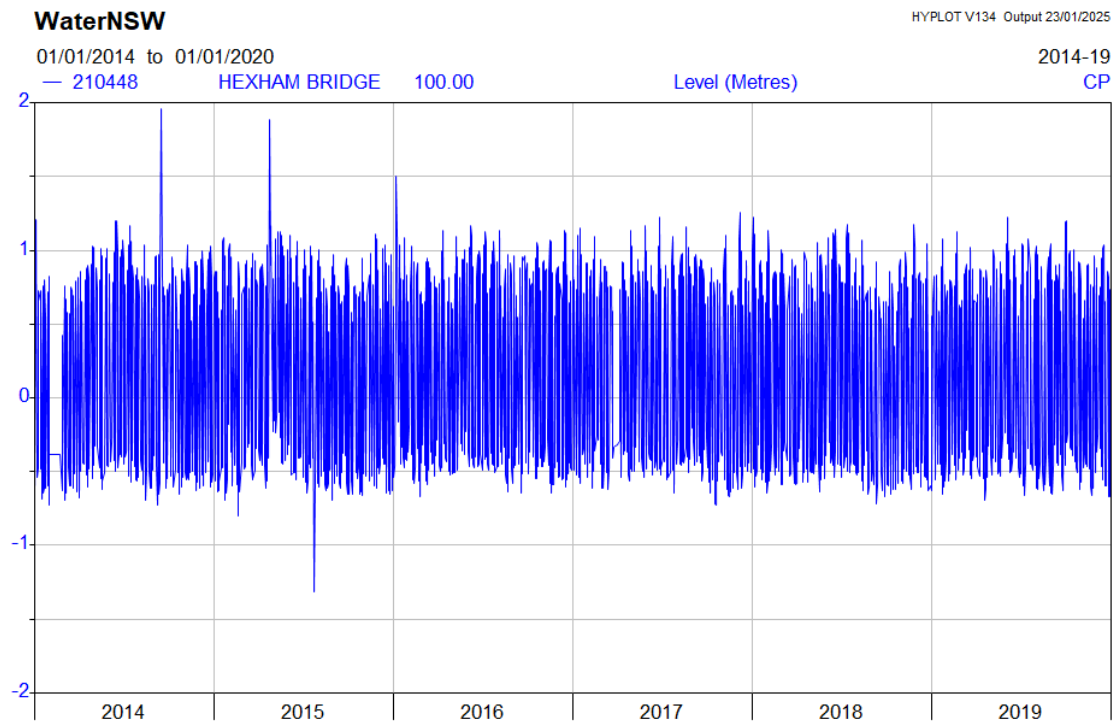


Figure 3 - Hexham bridge level (WaterNSW, 2025)

A review of recent aerial photography also supports regular and frequent inundation of this area. Many of the photos show signs of ponded water outside of the channel at approximately 1m AHD due to preceding heavy rain.

All photos show the date of capture and rainfall depth from the Williamstown gauge for the preceding seven days.





Figure 4 - Aerial 24/05/2024 rainfall in the preceding seven days 65mm



Figure 5 - Aerial 10/09/2023 rainfall in the preceding seven days 9mm





Figure 6 - Aerial 19/07/2019 rainfall in the preceding seven days 0mm

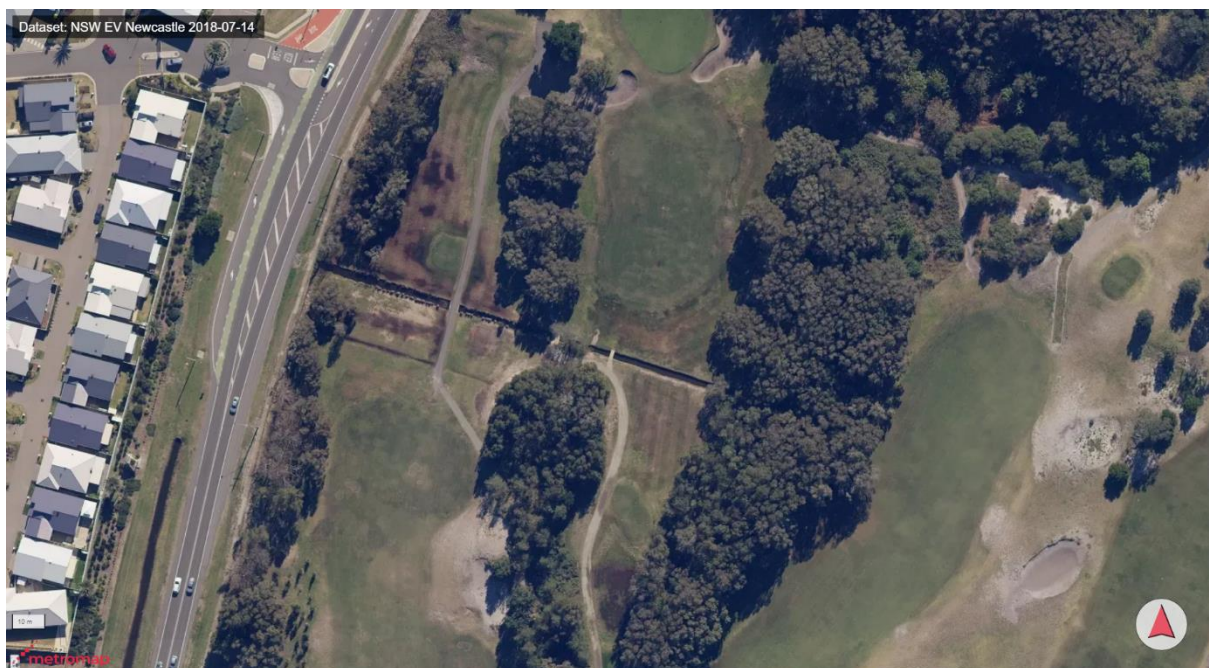


Figure 7 - Aerial 14/07/2018 rainfall in the preceding seven days 0mm





Figure 8 - Aerial 15/05/2015 rainfall in the preceding seven days 0mm

From the above presented information, it is our opinion the area proposed for frog habitat will remain wet for extended periods of time.

We trust this is what you require. Should you have any queries please contact the undersigned on 0413 358 531.

Yours faithfully,



**Angus Brien**  
Principal | Senior Flood Engineer

On behalf of Northrop Consulting Engineers Pty Ltd



### **Limitation Statement**

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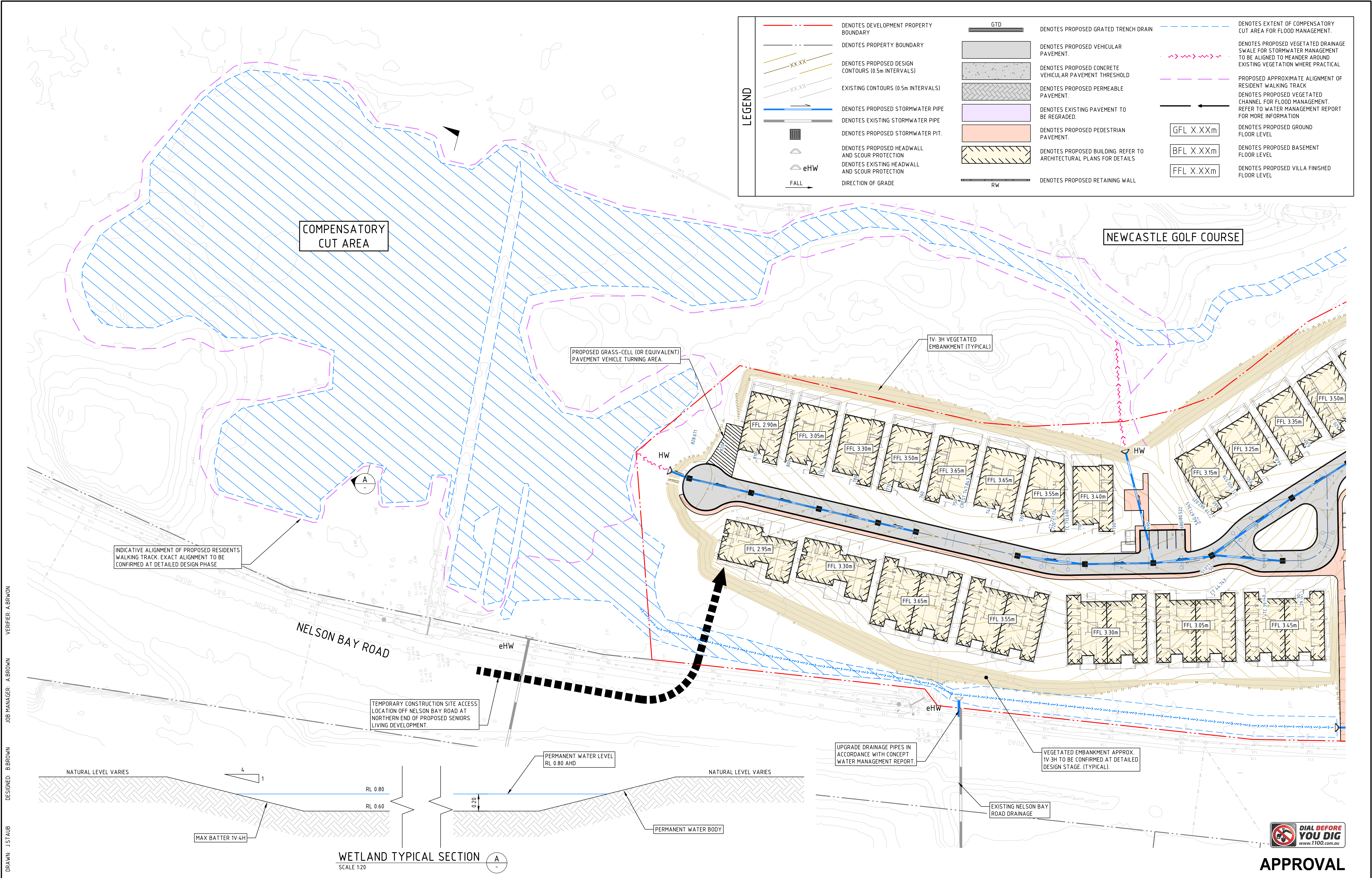
## Attachments

Civil section



## Attachment A





VERIFIER: A.BROWN  
JOB MANAGER: A.BROWN  
DESIGNED: B.BROWN  
DRAWN: J.STAUB

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	BD		TVK	23.01.25

PRINCIPLE  
LIVING

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ARCHITECT

EJE  
architecture

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SCALE 1:20@A1  
SCALE 1:500@A1

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ABN 81 094 433 100

PROJECT

**APPERLY VILLAGE**  
**NELSON BAY ROAD, FERN  
BAY. NSW. 2259.**

DRAWING TITLE

**STORMWATER MANAGEMENT AND  
LEVELS PLAN**

DRAWING NUMBER

**CSK25.01**

REVISION

**1**

DRAWING SHEET SIZE = A1



## **Appendix E – Staging Plan for the Approved Newcastle Golf Course Upgrades**



## Stage 1

1<sup>st</sup> Hole

5<sup>th</sup> Tee

7<sup>th</sup> Hole

15<sup>th</sup> Hole

16<sup>th</sup> Hole

18<sup>th</sup> Green

Putting Green





## Stage 2

2<sup>nd</sup> Hole

3<sup>rd</sup> Hole

4<sup>th</sup> Hole

5<sup>th</sup> Green

6<sup>th</sup> Hole

17<sup>th</sup> Hole

18<sup>th</sup> Tee

19<sup>th</sup> Hole





## Stage 3A

8<sup>th</sup> Hole

12<sup>th</sup> Hole

13<sup>th</sup> Hole





### Stage 3B

## 9<sup>th</sup> Hole

## 10<sup>th</sup> Hole

## 11<sup>th</sup> Hole

## 14<sup>th</sup> Hole





01 (1:1000 @ B1)

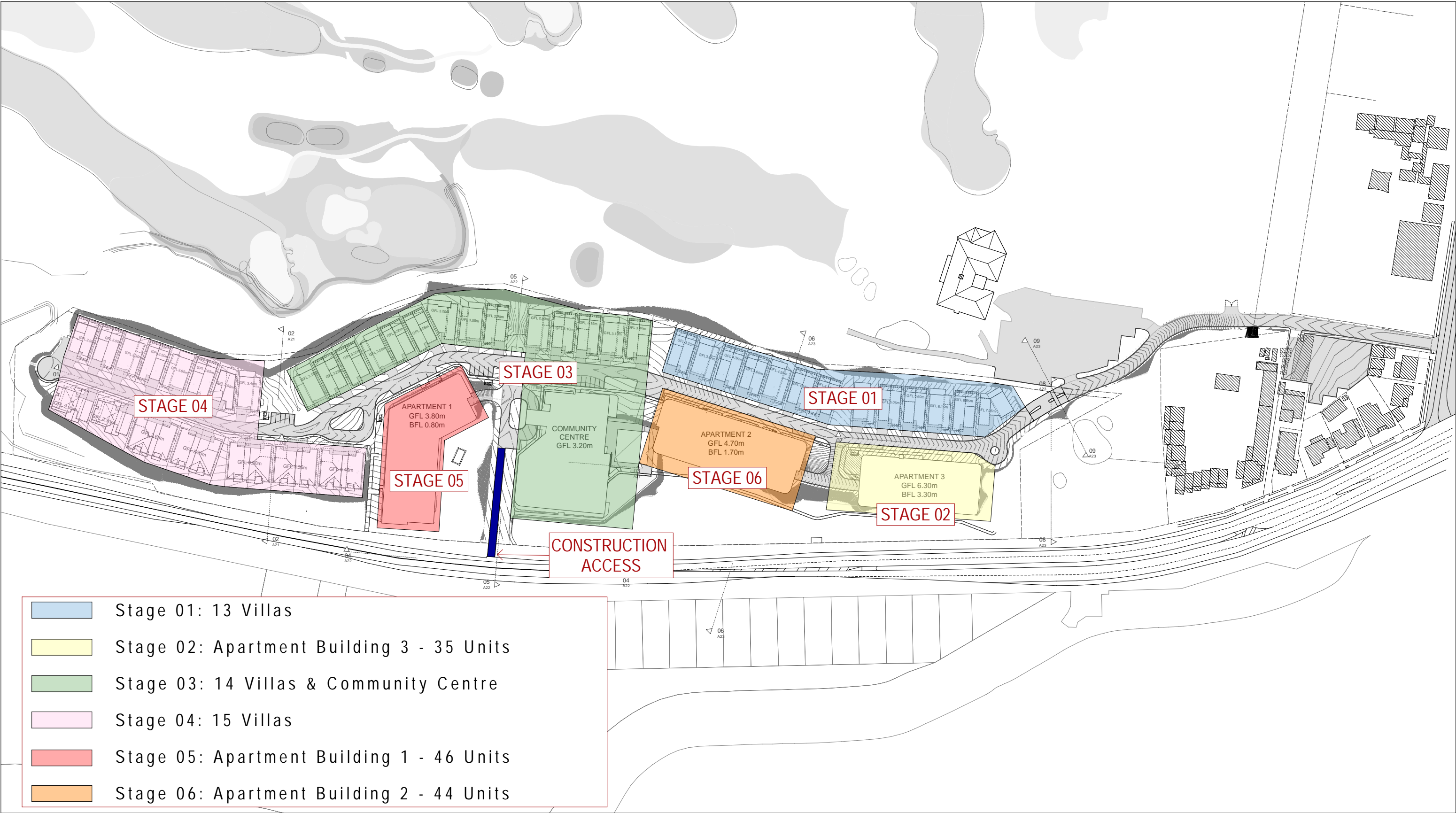




## **Appendix F – Staging Plan for Proposed Seniors Living**



<div><div></div><div></div></div>		AC ACP AFL AHD AL ALB ALS DAL AS BF BG BIN BLK BRK BOL CBG CFC		AIR CONDITIONING - REFER TO MECHANICAL DOCUMENTATION ALUMINIUM COMPOSITE PANEL AUSTRALIAN HEIGHT DATUM ALUMINIUM LOUVRE ALUMINIUM BATTEN VERTICAL ALUMINIUM SCREEN AUSTRALIAN STANDARD BALUSTRADE BI-FOLD DOOR BOX GUTTER GARBAGE BIN CONCRETE BLOCKWORK BRICKWORK BOLLARD COLOUR-BACKED GLASS COMPRESSED FIBRE CEMENT	CLD CLS COL CONC CDS CPC CR CW DP EDB EG EJ EQ FAN FB FC FFL	CLADDING CLOTHESLINE COLUMN - REFER TO STRUCTURAL DOCUMENTATION CONCRETE CONFIRM ON SITE COLOURBOND PARAPET CAPPING CEMENT RENDER COLD WATER DRAINPIPE - REFER TO HYDRAULIC DOCUMENTATION ELECTRICAL DISTRIBUTION BOARD - REFER TO ELECTRICAL DOCUMENT EAVES GUTTER - REFER TO HYDRAULIC DOCUMENTATION EXPANSION JOINT EQUAL SPACING CEILING FAN FACE BRICK FIBRE CEMENT SHEETING FINISHED FLOOR LEVEL	FG FH FHR FIP FR FT FW G GD GL GRD GP GW HB HD HR HYD	FIXED GLASS FIRE HYDRANT - REFER TO HYDRAULIC DOCUMENTATION FIRE HOSE REEL - REFER TO HYDRAULIC DOCUMENTATION FIRE INDICATOR PANEL TO CONSULTANTS REQUIREMENTS FIRE RESISTANCE FLOOR TILES FLOOR WASTE GLASS GRADED DRAIN GLASS LOUVRES GARAGE DOOR GRATED PIT - REFER TO HYDRAULIC DOCUMENTATION GLASS WINDOW HAND BASIN HINGED DOOR HANDRAIL HYDRAULIC	HYD LB LDL LTB LVR LWL MC MECH MIRROR MRS MW MWS OG OPW PAV PC PCT	HYDRAULIC LINING BOARDS DOWNLIGHT LETTERBOX LOUVRE WALL LIGHT MECHANICAL METAL CLADDING METAL ROOF SHEETING MATWELL METAL WALL SHEETING OPAQUE GLASS OPERABLE WALL EXTERNAL PAVING POLYCARBONATE SHEETING POWDERCOAT	PD PS PT PTD RC RL RS RWT SC SD SKL SMP SP SS SSL ST SV	PIVOT DOOR POST - TIMBER PAINT FINISH PAPER TOWEL DISPENSER REINFORCED CONCRETE REDUCED LEVEL ROLLER SHUTTER RAINWATER TANK STONE CLADDING SLIDING DOOR SKYLIGHT RAIN WATER SUMP SPANDREL PANEL STAINLESS STEEL STRUCTURAL SLAB LEVEL STONE STACK VENT - REFER TO HYDRAULIC DOCUMENTATION	SWR TB TBR TC TCSI TL TS TSC TV TYP UIS WB WC WIR WS	SEWER PIPE - REFER TO HYDRAULIC DOCUMENTATION TIMBER BEAM TIMBER TIMBER CLADDING TACTILE GROUND SURFACE INDICATORS TILE TIMBER SOFFIT TIMBER SCREEN TIMBER VENEER TYPICAL UNDERSIDE WEATHERBOARDS WATER CLOSET WALK IN ROBE WHEEL STOP	# No. DENOTES TYPE AS SCHEDULED
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



















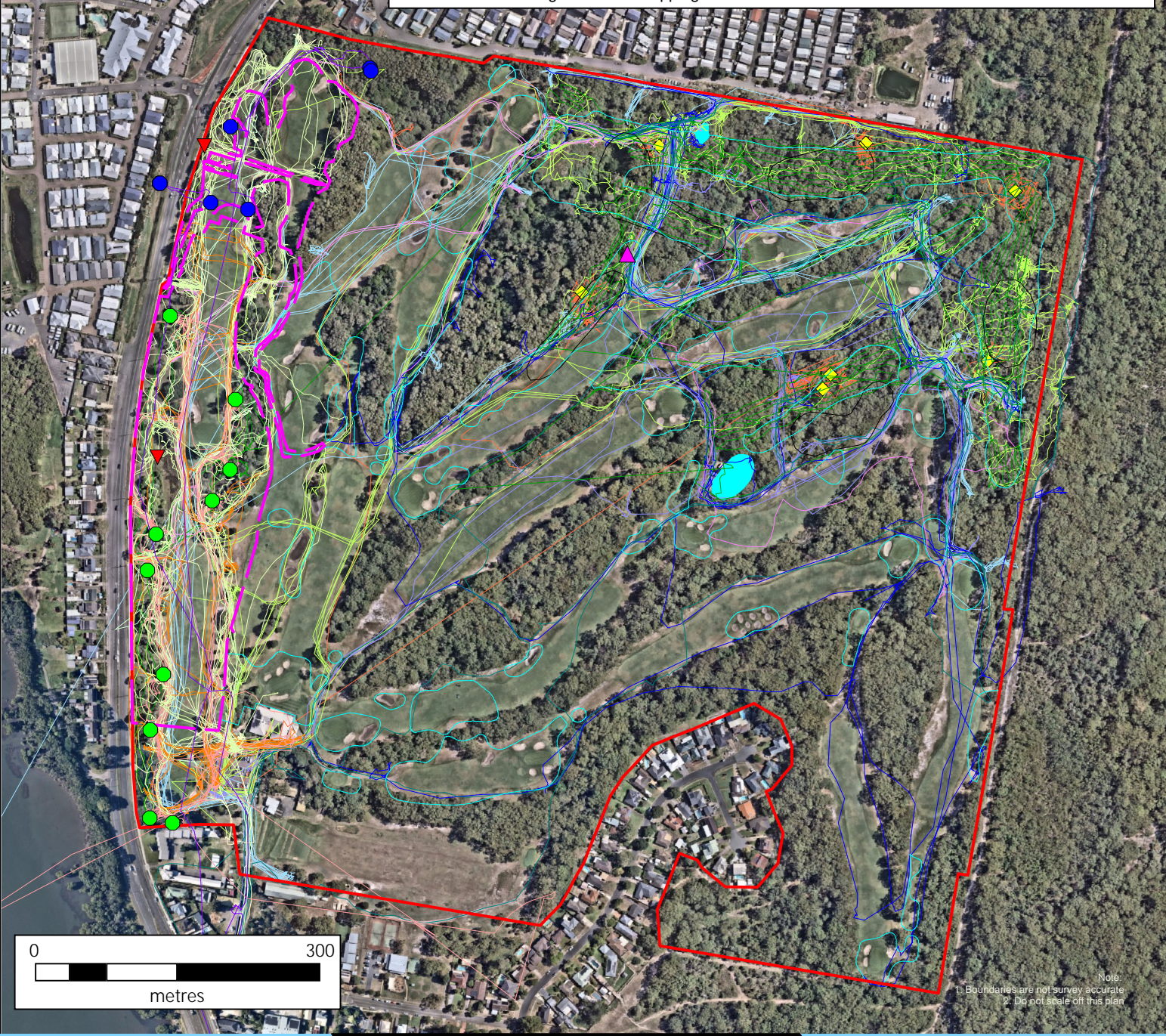
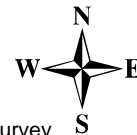


## **Appendix G – Survey Effort (Extracted from AEP BDAR, 2025)**



## Legend

- |   |   |   |   |
|---|---|---|---|
|  | Study Area  |  | August 2022 - Nocturnal Survey            |
|  | Subject Site  |  | March 2023 - Frog Survey                  |
|  | Clearing Area   |  | March 2023 - Nocturnal Survey             |
|  | Southern Myotis suitable waterbody                      |  | March 2023 - Reptile Survey               |
|  | March 2019 - Frog survey                                |  | May 2024 HBT and Forest Owl Survey        |
|  | August 2019 - Nocturnal survey                          |  | March 2025 - Frog Survey                  |
|  | August 2019 - Diurnal survey                            |  | March 2025 - Reptile Survey (Elliot Trap) |
|  | November 2019 - SAT central tree                        |  | March 2025 - Water Quality Survey         |
|  | November 2019 - SAT survey track                        |  | March 2025 - Water Quality Point          |
|  | November 2019 - Microbat survey                         |  | March 2025 - Elliot Trap                  |
|  | December 2019 - Diurnal survey                          |  | March 2025 - Call Playback - Frog         |
|  | February 2021 - Brush-tailed Phascogale camera trapping |  | March 2025 - Songmeter                    |



0 300  
metres

Note:  
1. Boundaries are not survey accurate.  
2. Do not scale off this plan.



# AEP

Figure 7 - Fauna Survey Tracks

Location: 4A Vardon Road, Fern Bay, NSW

Client: Principal Living

Date: Mar 2025

BOAMS Ref: 25373

AEP Ref: 2313.02



## Appendix H – CVs

The fieldwork/ data analysis and reporting writing for the BMP was undertaken by:

Staff	Title/Qualification	Tasks
Craig Anderson	Director BAppSc (EAM) BAAS: 17002	Technical Review
Natalie Black	Senior Environmental Manager BSc (Hons), Master Planning, Cert IV (TA) BAAS: 19076	Technical Review
Edouard Loisanec	Leads Ecology Works Manager MMgt & Dip Cons & Land Mgmt	Report review and GIS
Yann Buissiere	Senior Ecologist BEnvMgt & Dip Cons & Land Mgmt	BAM Plots, Habitat Assessment, Flora Transects
Kathleen Bushell	Ecologist BSc (Marine Biology & Hons EnvScMgt)	Wallum Frog Pond (internal frog expert)
Frances O’Brien	Senior Ecologist BEnv LLB MEL	Flora Transect, Habitat Assessment, Fauna Assessment
Lucy Knutson	Ecologist BEnvSc&Mgt	BAM Plots, Habitat Assessment, Flora Transects, SATs
Bonni Yare	Ecologist/ Botanist BSci (NRM), Cert 3 Cons&LandMgt	Habitat assessment, threatened flora searches, BAM Plots
Emma O’Dwyer-Hall	Ecologist BEnvSc Wildl & Cons Bio (Hons)	Report review
Cat Scobie	GIS officer	Mapping