FINANCE, OPERATIONS AND COMMUNITY SERVICES COMMITTEE MEETING

ATTACHMENT UNDER SEPARATE COVER

7.00 PM, TUESDAY 5 APRIL 2022

Waverley Council
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ATTACHMENT

FC/5.3/22.04 Biodiversity Action Plan: Remnant Sites 2022-2031 - Adoption

WAVERLEY
COUNCIL

BIODIVERSITY ACTION PLAN: REMNANT SITES 2022-2031

total earth care

BIODIVERSITY ACTION PLAN: REMNANT SITES 2022-2031

Quality Control	© Total Earth Care Pty Ltd 2022		
Revision/Version No.	Final	**Date of revision**	1 February 2022
Prepared by:	**G Teear, G Barron, T Boreham, K Raines**		
Authorised by:	**W Thurston, G Barron, G Teear**		
Prepared for:	**Waverley Council**		
TEC Job No.	**C11688**		

Cover Photo: *Acacia terminalis* subsp. *Eastern Sydney* at Loombah Rd, Dover Heights

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1 INTRODUCTION

1.1 AIMS

This Biodiversity Action Plan (BAP) has been prepared to guide management actions that aim to:

- Protect remnant vegetation from further loss.
- Improve the condition of remnant vegetation by addressing threatening processes and stimulating natural regeneration.
- Maintain or improve ecological function of remnant vegetation, such as seedling germination, pollination and seed dispersal by natural processes.
- Maintain or increase the number of species in each remnant, and the abundance of each, by addressing threatening processes and stimulating natural regeneration.

These goals and management actions aim to address the Waverley Council Environmental Action Plan Version 4 2018-2030 (EAP4) biodiversity targets:

- *To ensure no loss of remnant vegetation based on 2009 to 2010 figures; and*
- *That 40% of remnant vegetation is of good condition by 2040.*

Protection of the remnants is of priority, but on occasion this is to be achieved via management actions within surrounding planted native vegetation as opposed to within the remnant itself. For example, if there is an area of high weed density adjacent to a patch of good quality remnant vegetation, managing the weeds to prevent encroachment would be a high priority for this area.

Council acknowledges the importance of non-remnant native vegetation, and so additional targets within EAP4 include:

- *Improve and expand areas of revegetation; and*
- *Improve and strengthen existing habitat corridors, enrich known microhabitat habitat patches for specific fauna, and create new habitat connections where possible.*

1.2 ABOUT THIS PLAN

This Plan is the second BAP developed for Waverley LGA and outlines detailed management actions and recommendations relating to weed management, buffer planting, stimulation of natural regeneration of remnants where possible, and fauna habitat creation, retention and enhancement. The period of this Plan is nine years, providing actions up until 2030 – 2031 Financial Year (FY).

Some areas require large investments of resources and funding in management actions to protect, improve or expand areas of remnant revegetation but are vital in protecting remnants from being lost. By fully budgeting for this plan it will, prevent further loss of remnant vegetation, improve the resilience of the remnant bushland to climate change and reduce the future management costs. If all management actions were fully budgeted for and adaptive management continued towards 2040, it is likely that 40% of remnant vegetation could be in good condition by 2040. If the plan can only be partially budgeted, the more resilient areas of remnant vegetation can still be improved. However it is possible smaller fragments of remnant vegetation that require more protection and investment may be lost. Therefore actions have been prioritised to maximise investments and prevent the loss of remnant vegetation.

By improving the remnant vegetation condition it will make the bushland more resilient to climate change, ongoing urban pressures and continue to provide habitat to support a diverse range of native animals. Due to the increasing urban pressures of the area and fragmented nature of the remnant vegetation and climate change, without management it is likely many remnants would be lost and with it the loss of fauna habitat and decline of local native fauna populations.

Maintaining and improving the condition and extent of remnant vegetation and planted native vegetation requires an integrated approach. The Plan is divided up into the 13 main remnant vegetation areas and their supporting planted native vegetation. As biodiversity and climate are ever changing, the management actions proposed need to be continually assessed before and after implementation to ensure effectiveness.

1.3 BACKGROUND

The natural coastline and its native vegetation is an important feature of the geography of the Waverley LGA, due to the aesthetic beauty, natural heritage values and the biodiversity it provides. Just under 6 hectares of remnant vegetation remains in the LGA. The remnant vegetation is supported by planted areas of native flora. Together, these areas of remnant and planted native vegetation create a fragmented, but diverse landscape which supports a wide range of animals. Protection of these areas is critical from an ecological perspective but also to allow for access to green space by current and future generations.

The vegetation within Waverley LGA is both fragmented and small in area, but still holds an incredible amount of diversity and some interesting species if you know where to look!

Within our remnants there are sites such as the Tamarama Marine Drive Remnant, which supports an enormous number (44) of native plant species, despite being surrounded by housing, turfed areas and the coastline. Other remnant areas include the critically endangered ecological community (CEEC) Eastern Suburbs Banksia Scrub (ESBS) at Queens Park and York Road, which is managed in conjunction with Centennial Parklands. Waverley's only population of the threatened plant species, *Acacia terminalis* subsp. *Eastern Sydney* exists within one of our smallest remnant patches. Five years ago the population had dropped to only two individual plants, but now, with active management, there is an established and thriving population. See Map 1-1 for areas of remnant vegetation across the Waverley LGA addressed in this Biodiversity Action Plan (BAP).

A map of the remnant vegetation within the Waverley LGA can also be found here: https://discover.waverley.nsw.gov.au/connect/analyst/mobile/#/main?mapcfg=Environment.

The remnant vegetation and supporting native bushland exists in some of the most visited areas along the Australian coastline. This vegetation has evolved in harsh salty conditions and changing weather and provides the background for tourists and locals alike at Waverley Cemetery, along Bondi to Bronte walk, and the parks of the south-eastern section of the Bondi to Manly walk. These popular walking routes are also the location for the Waverley areas main habitat corridor which the remnant vegetation and adjacent planted native vegetation play a key role in supporting.

The pressures of development, recreation, clearing of vegetation, and weeds, mean that without ongoing management, the remnant vegetation and supporting bushland areas will continually reduce in size, degrade in condition and eventually disappear. Fragmentation also means that there is likely low genetic diversity within plant species, which reduces the resilience and ability of plants to thrive.

1.3.1 Aboriginal Heritage of the Waverley LGA

The Bidjigal and Gadigal people are the traditional custodians of the Waverley LGA. A number of the remnant vegetation sites included in the BAP contain aboriginal heritage sites such as the rock engravings at the Bondi Golf Course and Marks Park. A total of nine known Aboriginal Heritage sites exist within the Waverley LGA. These include rock engravings, shelters with painted art motifs, open campsites and rock shelters with middens.

The ongoing management of the native vegetation within Waverley LGA must maintain and support a balance between human activity and biodiversity whilst providing cultural, social and spiritual learning platforms. It is important that personnel working in areas of known aboriginal heritage sites are aware of their locations to avoid damage or harm to the site. By managing the biodiversity in areas surrounding these sites it will help retain the integrity of the bushland that form part of the aboriginal history of the area. It is recommended that Council engage with the traditional owners for additional input including involvement in cultural burning or education programs to raise community awareness of the importance of biodiversity and the aboriginal history of the area.

1.4 FAUNA HABITAT MANAGEMENT

An incredible 139 fauna species have been recorded within the Waverley LGA since 2010 (Appendix E, AMBS 2011, DPIE 2020). This is significant diversity in a largely urban LGA. Management strategies must also consider fauna habitat for example areas of exposed sandstone, dead logs and branches should be retained as these are important habitat features for a number of fauna species including birds and lizards (AMBS 2011). Where possible, existing patches of vegetation should be joined through connectivity plantings to allow passage for fauna and to extend available habitat.

Weed thickets, particularly Lantana thickets and dense areas of *Coprosma repens* (Mirror Bush) are known to provide shelter and nesting habitat for small birds. As such, the retention of these weeds can also be important where available habitat is limited. Rather than removing these they can be contained and managed as habitat. Where weed thickets are to be removed clearing should be staged to allow replacement habitat to be planted and establish before removing existing habitat. (AMBS 2011)

Additional habitat management may include the retention of logs and reuse of hollows. Species selection for buffer and connectivity is also important to ensure a variety of suitable plant species are used that will provide food or habitat to the fauna likely to use the site (AMBS 2011). Further details on habitat management are provided in Appendix A.

1.5 BIOSECURITY ACT 2015

Under the NSW *Biosecurity Act 2015* Council have a legal obligation to manage the biosecurity risk posed or likely to be posed by reducing the impacts of Priority Weeds on human health, the economy, community and the environment. Council are obligated to control Priority Weeds within Council managed lands. They are also the Local Control Authority to ensure other land owners carry out their obligations to manage the Biosecurity Risk as imposed under the Act by controlling Priority Weeds. The Priority Weeds identified in the Waverley LGA are provided in the *Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022* and detailed in Appendix C.

Management actions have been based on weed management requirements under the *Biosecurity Act 2015* with consideration also given to their importance as fauna habitat.

1.6 ADAPTIVE MANAGEMENT & CLIMATE CHANGE

It is likely that changes in climate, heavy rains or prolonged dry periods may affect the outcomes of management actions. As such, adaptive management is required where changes may be implemented to management actions or priorities may shift. With any management actions implemented, it is essential that results and effectiveness are monitored and adapted where necessary. Monitoring is also important to assess the success of more innovative actions and allow for them to be adapted to improve their outcomes or to utilise them in additional locations.

1.6.1 Natural Regeneration

The management actions in this plan follow basic bush regeneration principals. As such, they allow for the remnant vegetation to self-propagate through their own seed and seed present within the seedbank as a priority over planting or revegetation. Germination from the native seedbank is encouraged through actions including weed management, exposure to light, soil disturbance, smoke and fire. In some cases this may not be successful if no viable seedbank remains. Therefore it is essential to adapt management techniques based on the outcomes of the work overtime.

1.6.2 Climate Change

Climate change is a key threatening process to the ongoing resilience of our local remnant vegetation. Flora and fauna species have evolved over thousands of years in response to the historical climate. Anthropogenic climate change is resulting in rapid shifts in temperatures and changed rainfall patterns including an increased number of extreme weather events. Some native flora species may not adapt at the speed with which the climate is changing, which means that the local remnant vegetation may have reduced resilience and be more vulnerable to weed encroachment. Climate change may reduce the ability of remnants to self generate and it is possible that smaller remnants could be lost if conditions become drier, hotter and with longer summers. It is critical that management strategies are adaptive in the face of climate change with regular monitoring and reporting so that alternative strategies can be provided if required.

It is important to note that in some cases reduced rainfall as a result of climate change may assist in suppressing weeds and allowing native flora species to dominate. This may explain why the 2020 flora survey conducted in drought conditions found a 10% increase in flora species richness when compared to the 2015 survey (SBRC 2020).

1.6.3 Herbicide use

Waverley Council implemented a glyphosate ban in July 2020. Glyphosate is a non-selective herbicide, which has commonly been used in bush regeneration practices to control weeds due to its effectiveness, little to no residual within the soil and its low cost. Alternatives to glyphosate include manual or mechanical weeding techniques (hand weeding, chipping, brush cutting, mulching and mowing), alternative herbicides which are often more potent and pose a higher toxicity to humans, flora and fauna, and organic/non-chemical herbicides. Most alternatives are either less effective and less efficient or more costly. As a result, the glyphosate ban may lead to higher costs for weed management or less work completed within weed management budgets and may impact on achieving the targets set out in the EAP4.

Alternative strategies to the use of Glyphosate which can be used in the LGA include soil seedbank translocation, ecological burning and sandstone capping. These strategies present greater initial costs but can be more cost effective in the long term when compared to traditional bush regeneration techniques. Bush regeneration techniques and alternative strategies are discussed further in Appendix A.

1.7 BEYOND 2031

Given the ongoing pressures of urbanisation and climate change, it is likely these actions will need to be carried through into the future, in order to protect and manage the sparse areas of remnant vegetation. The idea is that the resilience of the vegetation will increase allowing for a decrease in bush regeneration efforts. However, in a highly fragmented landscape, the remaining vegetation will always present new and ongoing management requirements.

In our ever changing environment, these management actions are flexible to being updated with resources reallocated where deemed necessary, as new information and management techniques become available, or where circumstances or conditions change.

1.8 KEY MANAGEMENT ACTIONS FOR THE REMNANT SITES

This Plan includes site specific prioritised actions to improve biodiversity, habitat connectivity and protect remnant vegetation. Integrated weed management methods are recommended for all sites. Methods include hand weeding sensitive areas, species specific herbicide use, staged clearing of high density weed areas and revegetation, delineation of remnant edges,

sandstone capping and more. These weed management methods are detailed in Appendix A along with other weed management options to be considered where glyphosate use is banned. Some areas of remnant and planted vegetation require the management or removal of dominant native species to improve diversity. Additional innovative options have been included in this plan to protect and enhance biodiversity. These include soil seedbank translocation, ecological burning, soil disturbance or scarification to promote regeneration of the seedbank, and direct seeding. These options have been recommended on a site by site basis where suitable. Soil seedbank translocation could be utilised where an area of remnant vegetation is being cleared for development either within the LGA or elsewhere is Sydney. Sites within the Waverley LGA could become recipient sites for a soil seedbank translocation potentially for an Endangered or Critically Endangered Ecological Community such as Eastern Suburbs Banksia Scrub. Further details on these innovative practices are included in Appendix A.

Buffer and connectivity planting are methods currently being used to protect remnant vegetation and additional locations have been identified in the plan for revegetation. When planning buffer and connectivity planting there are a number of factors that need to be considered. These are provided in more detail in Appendix A along with details of recommended fauna habitat creation.

Title: **Waverley LGA Remnant Bushland**

Map No: 1-1
Site: Waverley LGA
Client: Waverley Council
Date: April 2020
Project No: C116688
Author: G Barron

Legend

Local Government Area

Bushland Remnant

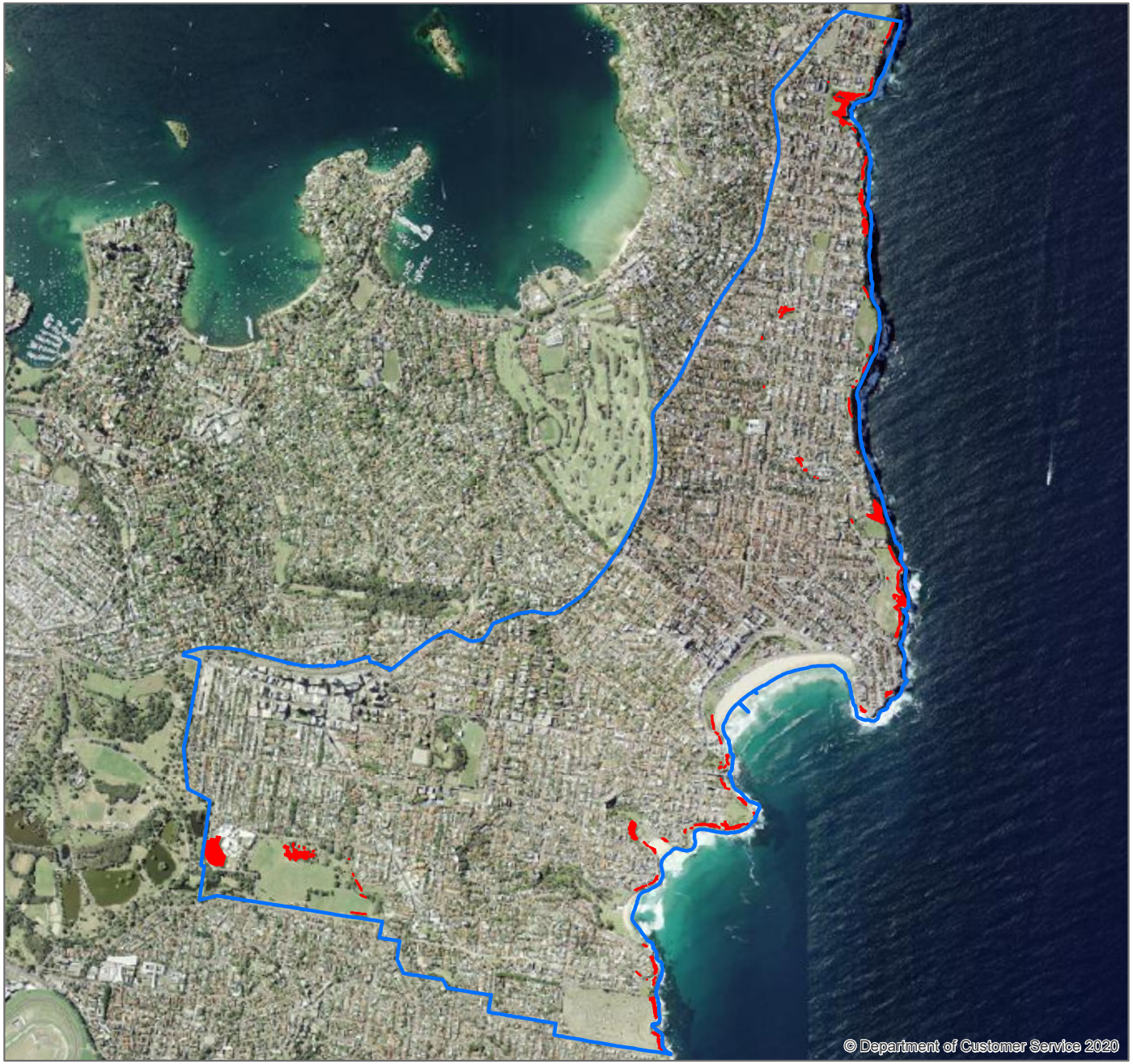
0 250 500 1,000 Meters

N

Data Source:
Total Earth Care
Nearmap
SBRC 2020

Tel: 02 9913 1432 Fax: 02 9913 1434

total earth care



2 NORTH CLIFFTOP REMNANTS – Clarke Reserve, Jensen Avenue, MacDonald Street, Tower Street Reserves, Kimberley Street, Douglas Parade, Bay Street and Sam Fiszman Park

Figure 2-1. Cliff-line below Jensen Avenue

The Clarke Reserve, Jensen Avenue, MacDonald Street and Tower Street Reserves consist of remnant pockets of vegetation adjoining small public parks. Successful buffer planting has been conducted at the Tower Street and Clarke Reserves. The remnant at Kimberley Street consists of a small pocket of vegetation with connectivity to the adjacent vegetation along the cliff line, including that below the Diamond Bay Cliff walk to the north.

The Sam Fiszman Park remnant is located within an area of local heritage significance listed for the natural and scenic coastal landscapes which include the native vegetation and restorative plantings. The Bay Street and Douglas Parade remnants are small, isolated remnant patches adjacent to housing areas.

2.1 FLORA

The North Clifftop remnants are considered to be in in 'very poor' condition primarily due to the presence of weeds including *Stenotaphrum secundatumm, Hydrocotyle bonariensis, Coprosma repens* and *Asparagus aethiopicus* (SBRC 2020). The vegetation communities Sea-cliff Sedgeland and Sea-cliff Heath (SBRC 2020) are present at Clarke Reserve, Jensen Avenue, MacDonald Street, and Tower Street Reserves (Z1, Z2, Z3, D1a), whereas only Sea-cliff Sedgeland (SBRC 2020) is present at Kimberley Street (Z5) and Bay Street (Z18).

The Sea-cliff Heath is an open to closed low growing community within 50m of sea cliffs on skeletal sand to sand lenses on sandstone with impeded drainage. Typical remnant species including *Baeckea imbricata*, *Banksia ericifolia*, *Melaleuca armillaris*, *Melaleuca nodosa* and *Westringia fruticosa*. The Sea-cliff Sedgeland is dominant with *Ficinia nodosa* and is located within 20m of the sea cliffs, often on modified soils (SBRC 2020).

Sea-cliff Grassland is present at Sam Fiszman Park (Z9) and Imperata Grassland is present at Douglas Parade (Z8). Sea-cliff Grassland is low to open community dominated *by Paspalum vaginatum, Sporobolus virginicus* and *Zoysia macrantha* and is located on skeletal sands with impeded drainage. Imperata Grassland is an open to closed community dominated by *Imperata cylindrica* and located on deeper, disturbed sandy soils. Imperata Grassland is much more common than most other vegetation communities within the LGA (SBRC 2020).

Due to the small patch sizes and the high weed densities present, these remnants have low resilience and may be lost in the absence of management actions.

Table 2-1 – Native Flora Species of the North Clifftop Remnants (SBRC 2020)

Scientific Name	Common Name	Clarke Reserve, Jensen Ave, MacDonald St & Tower St Reserves	Kimberley Street	Douglas Parade	Sam Fiszman Park	Bay Street
Baeckea imbricata	Heath Myrtle	X				
Machaerina juncea	Bare Twig-rush		X			
Commelina cyanea	Native Wandering Jew	X	X			
Ficinia nodosa	Knobby Club-rush	X	X	X	X	X
Imperata cylindrica	Blady Grass			X		
Isolepis cernua	Nodding Club-rush					
Lachnagrostis billardierei	Coast Blown-grass	X			X	
Lobelia anceps	Angled Lobelia	X				
Melaleuca armillaris	Bracelet Honey-myrtle	X				
Paspalum vaginatum	Salt-water Couch				X	
Sporobolus virginicus	Sand Couch	X				
Westringia fruticosa	Coastal Rosemary	X				

2.2 FAUNA

The low open and closed shrubs present, particularly in the buffer planting areas provide foraging and sheltering resources for birds, reptiles and frogs. Sandstone rock outcrops provide basking habitat for skinks and other reptile species likely to use the sites. The dense native and exotic shrubs along the cliff edge provide suitable nesting habitat for small bird species such as White-browed Scrubwren (*Sericornis frontalis*) and Superb Fairy-wrens (*Malurus cyaneus*). The Lesser Crested Tern (*Thalasseus bengalensis*) was observed utilising the patch near Clarke Reserve during the June 2020 site assessment, demonstrating that it provides suitable habitat for seabirds (SBRC 2020).

2.3 MANAGEMENT ACTIONS

2.3.1 Previous works

Buffer plantings at Clarke Reserve and Tower Street Reserves have been successful, however weed incursions are evident by a number of exotic grass species, Canna Lilies (*Canna x generalis*), *Hydrocotyle bonariensis* and Coastal Morning Glory (*Ipomoea cairica*). Buffer plantings should continue to be maintained and the edges should be delineated to prevent further weed encroachments. There was previously a continuous buffer planted the entire length of Clarke Reserve along the coastal fence. This was planted in 2017, however as a result of local resident lobbying with respect to perceptions that the height of the low growing coastal heath vegetation was impeding ocean views, a large section of the buffer plantings was removed in early 2020 and replaced with turf.

2.3.2 Key management actions

Due to the small size and the low resilience of the remnants at these sites, they are likely to be lost in the coming years if management actions are not taken. However, due to the high weed density of these sites and the location of the remnants along the cliff line, management actions will be costly requiring ropes works or novel techniques such as sandstone capping. In addition, dense weeds present such as *Coprosma repens* provide important habitat for a number of fauna species including birds and so remnant management must be balanced with loss of habitat. As a result, management priority of this site is medium. The management of the buffer plantings is of higher priority than the remnant itself at this site as the buffer plantings would support no-net loss of the remnant, improve habitat connectivity and works in the buffer areas are more achievable and affordable than works in the remnant itself due to the locations on the cliff edge. Therefore, for the conservation of the remnant, it is imperative that the aforementioned removed buffer planting be reinstated. Key management actions generally include:

- **Delineation**: create and maintain an edge between mown lawn and buffer vegetation to ensure no encroachment of exotic grasses into the remnant or the buffer vegetation. This will reduce future maintenance and facilitate reduction of exotic species within the remnant.
- **Connectivity planting**: extend buffer plantings to improve connectivity of fauna habitat. Utilise low growing shrubs in order to maintain residents' views.
- **Retention of logs**: any fallen logs are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.

- **Isolate weeds**: some areas where weeds are difficult to treat ie. cliff edges or have importance as habitat are to be isolated to prevent encroachment on the remnant and retained as habitat, such as Kimberley Street.
- **Ecological monitoring:** using photo points and species counts. Ecological monitoring will be reported annually and provide data to support the meeting of goals.

Innovative management actions such as sandstone capping may be suitable for certain areas within the northern cliff-top remnants, for example at Bay Street, Jensen Avenue Reserve, Clarke Reserve and Tower Street Reserve. Techniques such as sandstone capping present higher up-front costs but in the long term reduce maintenance requirements and can present suitable solutions following the glyphosate ban within Waverley LGA. It is recommended at Bay Street to trial crushed sandstone halos to plant quick establishing species like *Acacia longifolia* subsp. *sophorae* that will also provide habitat while outcompeting exotic grasses and weeds. Alternatively jute mat could be used instead of crushed sandstone. Additionally, sandstone capping and planting of Buffer 3 at Clarke Reserve is recommended to address asbestos in this area.

Jensen Avenue and Tower Street Reserves may be suitable locations of soil seedbank translocations for all or part of the sites. Timing for this would be dependent on when a donor site may require translocation, therefore has not been included in the actions tables. Alternatively these sites could include areas of sandstone capping or mulching and planting.

The weed densities and management actions for the different areas are shown in Map 2-1, Map 2-2 and Map 2-3 and provided in Table 2-2, Table 2-3 and Table 2-4. Detailed methodologies for the recommended management actions are provided in Appendix A.

2.4 PREDICTIONS AND RECOMMENDATIONS FOR ACHIEVING EAP4 OBJECTIVES

The implementation of management at this site is expected to result in significant improvement to the condition of the vegetation. The provision of delineation and maintenance (weeding) is expected to protect the existing remnant vegetation and avoid further encroachment of grasses into the remnant patches and connectivity and buffer plantings.

Due to the high density of weeds and management issues presented as a result of the steep nature of the sites, it is unlikely that the sites will ever be clear of weeds as it will not be cost effective. Instead selective weed control works should be conducted to protect key areas of native vegetation and buffer plantings, for example at Clarke Reserve.

Herbicides are necessary to treat woody weeds on cliff edges as it is not viable to completely remove woody weeds due to erosion and stability on cliff line. However species such as Asparagus can be carefully dug out with minimal disturbance to the soil. With the Glyphosate ban other herbicides will be required to treat woody weeds on clifftops or areas susceptible to erosion. This may be more potent and more expensive.

Management at these sites will improve the existing vegetation and the connectivity of the habitat corridor along the coastline. This will provide more habitat for fauna to utilise and provide protected passage between existing patches of remnant vegetation.

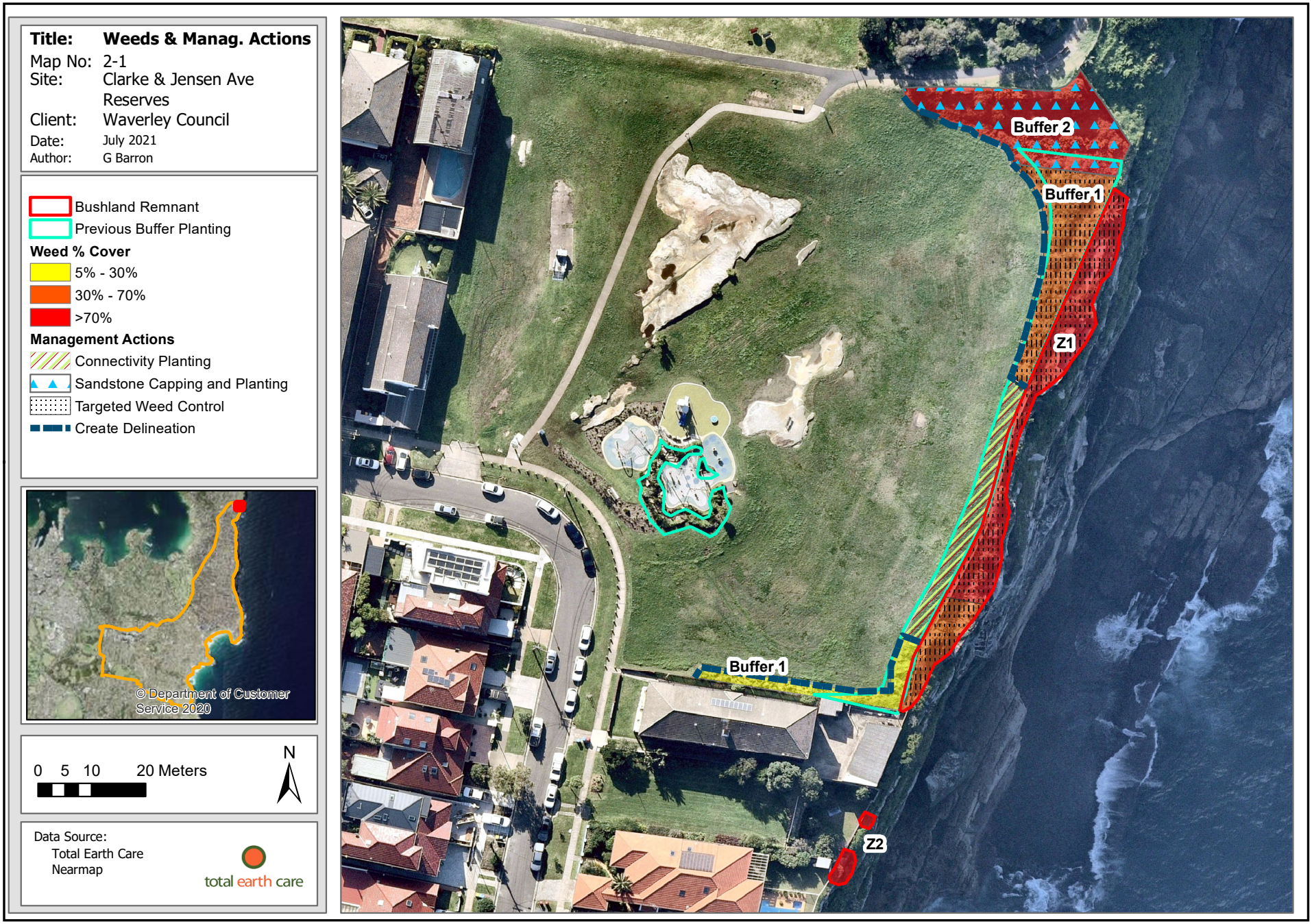

Title: Weeds & Manag. Actions
Map No: 2-1
Site: Clarke & Jensen Ave Reserves
Client: Waverley Council
Date: July 2021
Author: G Barron
Bushland Remnant
Previous Buffer Planting
Weed % Cover
5% - 30%
30% - 70%
>70%
Management Actions
Connectivity Planting
Sandstone Capping and Planting
Targeted Weed Control
Create Delineation
© Department of Customer Service 2020
0 5 10 20 Meters
N
Data Source:
Total Earth Care
Nearmap
total earth care
Buffer 2
Buffer 1
Z1
Buffer 1
Z2

TABLE 2-2 – NORTH CLIFFTOP REMNANTS MANAGEMENT ZONES AND ACTIONS – CLARKE & JENSEN AVENUE RESERVES

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
North Clifftop Remnants – Clarke & Jensen Avenue Reserve							
Buffer 1	High	**Clarke Reserve** Consists of buffer plantings to the west of remnant Z1.	**Create delineation –** create and maintain an edge between mown lawn and buffer vegetation to prevent encroachment of exotic grasses into the remnant. Spray edge recommended with a buffer area of approximately 50 – 200cm sprayed around the buffer patches with a monocot specific herbicide. Other delineation options are provided in Appendix A. Any other non-monocotyledonous weeds should be removed by hand. **Targeted weeding –** target woody weeds, vines and herbaceous perennials including Coastal Morning Glory (*Ipomoea cairica*) and *Canna x generalis*. It is important that woody weeds and vines are targeted to prevent spread into the adjacent remnant. Target annual weeds before seeding to prevent germination. **Connectivity planting –** provide connectivity between existing areas of buffer plantings to improve habitat connections for fauna. Low growing coastal heath shrubs should be installed along the fence which provide habitat whilst maintaining residents' views. Water in and maintain to establish.	Minimum of 12 visits per year during 2022 – 2023 FY FY and 2023 – 2024 FY. Minimum of 6 visits for maintenance years (2024 – 2025 FY to 2030 – 2031 FY).	30-70%	Reduce and maintain weed density at <5% by the end of 2023 – 2024 FY. Maintain at <5% ongoing. Reduced encroachment of exotic grass species. Increased connectivity through established buffer planting. Planting survival rate of >80% 6 months after planting.	**Create delineation & buffer planting** – Parks staff **Targeted weeding** – trained bush regenerators.
Buffer 2	Medium	**Clarke Reserve** Consists of high density weeds and has been reported to contain asbestos. This buffer sloped down towards buffer 2 and is likely to continue to increase weed densities in buffer 2 and potential remnant vegetation if not addresses.	**Sandstone capping and planting** – sandstone capping is a suitable method to cap asbestos whilst also suppressing weeds. The area should be cleared of weeds and about two flushes of weeds allowed to come up and be treated while young. A geotextile layer marker layer must be laid and a minimum of 300mm of crushed sandstone placed on top. Coir logs may be required to manage sandstone on the slope. The sandstone should be planted with native grasses and shrubs that will not penetrate the marker layer with their roots. This area has potential to provide great habitat for birds and small reptiles and improve connectivity along the cliff line when established. All guidelines, precautions and protocols must be followed for working with or around asbestos.	Minimum of 6 visits for maintenance years (2024 – 2025 FY to 2030 – 2031 FY). Ideally planting should be conducted in autumn or spring when conditions are not too dry to reduce watering requirements. Additional watering visits as required depending on weather conditions.	>70%	Planting survival rate of >80% 6 months after planting.	**Sandstone capping** – civil works company trained in asbestos capping. **Planting and maintenance** – Trained parks staff or trained bush regenerators.
Remnant Z1	Medium	**Clarke Reserve** Consists of 477m^2 of Sea-cliff Heath along the cliff line.	**Targeted weeding –** target woody weeds, vines and herbaceous perennials. This remnant displays a high weed density with ***Opuntia stricta***, *Asparagus aethiopicus, Coprosma repens* and *Olea europaea* subsp. *cuspidata*. Ropes	Minimum of 6 times per year.	>70%	No loss of remnant vegetation	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
North Clifftop Remnants – Clarke & Jensen Avenue Reserve							
		Remnant is in poor condition and is hard to access. The vegetation will benefit from established buffer plantings and connectivity.	work is required due to accessibility with the existing fence line. Installation of a new fence line in 2021 may improve access to sections of this remnant. **Ropes work -** target infestations of *Asparagus aethiopicus,* and *Coprosma repens* on the cliff edge. Areas of dense woody weeds, such as *Coprosma repens,* should be removed gradually in patches and concurrently with replacement planting to provide a similar structure of habitat. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. This will also reduce erosion risk along the cliff edge.			<50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing.	
Remnant Z2	Medium	**Jensen Avenue Reserve** Consists of two small remnant patches of Sea-cliff Sedgeland dominant in *Ficinia nodosa.* Patches are largely isolated and have poor access and improvement in condition will be costly. However, if management actions are not conducted these small remnants will likely be lost.	**Ropes work -** target woody weeds, vines and herbaceous perennials including *Asparagus aethiopicus,* and *Coprosma repens.* Areas of dense woody weeds, such as *Coprosma repens,* should be removed gradually in patches and concurrently with replacement planting to provide a similar structure of habitat. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. This will also reduce erosion risk along the cliff edge.	Minimum of 4 times per year.	>70%	No loss of remnant vegetation. <50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing.	Trained bush regenerators.
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish one photo-point in each remnant • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	Trained bush regenerators.

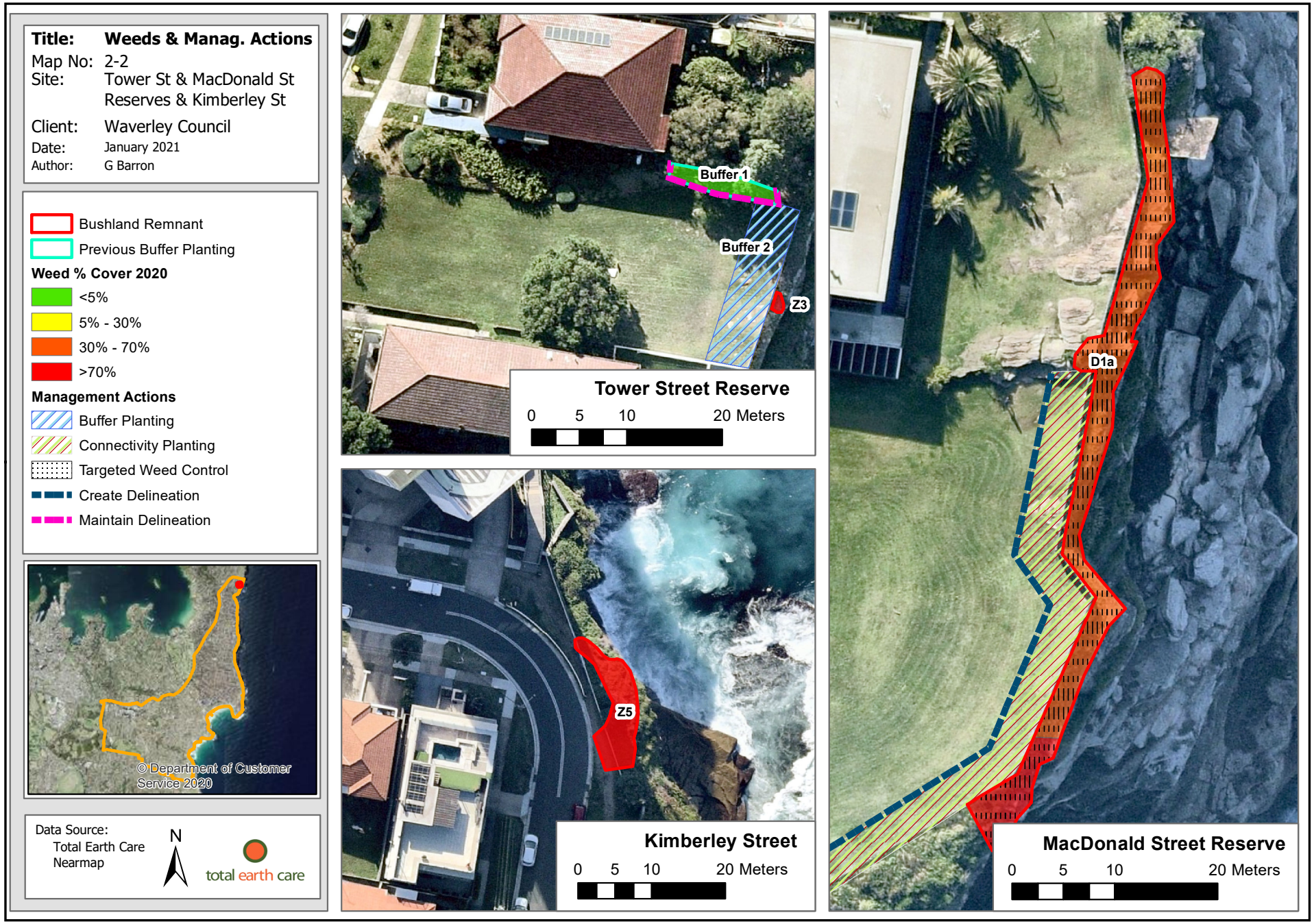

Title: Weeds & Manag. Actions
Map No: 2-2
Site: Tower St & MacDonald St Reserves & Kimberley St
Client: Waverley Council
Date: January 2021
Author: G Barron
Bushland Remnant
Previous Buffer Planting
Weed % Cover 2020
<5%
5% - 30%
30% - 70%
>70%
Management Actions
Buffer Planting
Connectivity Planting
Targeted Weed Control
Create Delineation
Maintain Delineation
© Department of Customer Service 2020
Data Source:
Total Earth Care
Nearmap
N
total earth care
Buffer 1
Buffer 2
Z3
Tower Street Reserve
0 5 10 20 Meters
Z5
Kimberley Street
0 5 10 20 Meters
D1a
MacDonald Street Reserve
0 5 10 20 Meters

TABLE 2-3 – NORTH CLIFFTOP REMNANTS MANAGEMENT ZONES AND ACTIONS – TOWER STREET AND MACDONALD STREET RESERVES & KIMBERLEY STREET

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
North Clifftop Remnants – Tower Street and MacDonald Street Reserves & Kimberley Street							
Remnant D1a	High	**MacDonald Street Reserve** Consists of thin strip (202m^2) of Sea-cliff Sedgeland dominant in *Ficinia nodosa*. The remnant is hard to access safely as it is on the edge of the cliff. A buffer should be installed to create connectivity to Diamond Bay remnants.	**Ropes work -** target infestations of *Asparagus aethiopicus,* and *Coprosma repens* on the cliff edge. Areas of dense woody weeds, such as *Coprosma repens,* should be removed gradually in patches and concurrently with replacement planting to provide a similar structure of habitat. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. This will also reduce erosion risk along the cliff edge. **Connectivity planting –** west and south of the remnant patch to create a buffer between the turf and the remnant and to create connectivity to the core of the Diamond Bay remnant D1b. This will improve habitat connection for fauna species. **Create delineation –** create and maintain an edge between mown lawn and planted buffer vegetation to prevent encroachment of exotic grasses into the remnant. Could be created by using mulched edge.	Ropes work twice per year. Minimum of 12 site visits per year for the first two years of buffer planting. 6 site visits per year once plantings are established.	30-70%	No loss of remnant vegetation. <50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing. Creation of connectivity through establishment of buffer plantings. Planting survival rate of >80% 6 months after planting.	**Create delineation & buffer planting** – trained bush regenerators. **Ropes work**– trained bush regenerators.
Remnant Z5	Medium	**Kimberley Street** Consists of a 70m^2 patch of Sea-cliff Sedgeland dominant in *Ficinia nodosa.* The patch is largely isolated and has poor access and improvement in condition will be costly. However, if management actions are not conducted this small remnant will likely be lost.	**Targeted weeding –**target woody weeds, vines and herbaceous perennials including *Rumex sagittatus, Opuntia stricta* and *Parietaria judaica*. Ropes work may be required due to accessibility. Areas of dense woody weeds should be removed gradually in stages and concurrently with replacement planting. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. This will also reduce erosion risk along the cliff edge.	Minimum of 6 times per year.	<70%	No loss of remnant vegetation. <50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
North Clifftop Remnants – Tower Street and MacDonald Street Reserves & Kimberley Street							
Buffer 1	Low	**Tower Street Reserve** Consists of a small patch of existing buffer planting	**Maintain delineation –** maintain existing edging between mown lawn and buffer vegetation to prevent encroachment of exotic grasses into the buffer.	Minimum of 4 visits per year.	<5%	Maintain weed density at <5% on going.	Parks staff
Buffer 2	Low	**Tower Street Reserve** Proposed area of buffer planting to create a buffer between turf and remnant if it does still persist.	**Buffer planting –** planting (low growing coastal heath) where feasible around rock outcrop and remove turf to expose rock outcrop.	Minimum 8 visits in first year to ensure establishment of plantings	N/A	Maintain weed density at <5% on going.	Parks staff
Remnant Z3	Low	**Tower Street Reserve** Consists of a small remnant patch that has been described as "too disturbed to discern". The remnant patch is likely to have been outcompeted by exotic turf species and no longer persists.	**N/A no longer exists**				
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish one photo-point in each remnant • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	

Title: **Weeds & Manag. Actions**
Map No: 2-3
Site: Douglas Parade, Bay Street and Sam Fiszman Park
Client: Waverley Council
Date: January 2021
Author: G Barron

Bushland Remnant

Management Actions

Targeted Weed Control

Weed % Cover 2020

<5%

5% - 30%

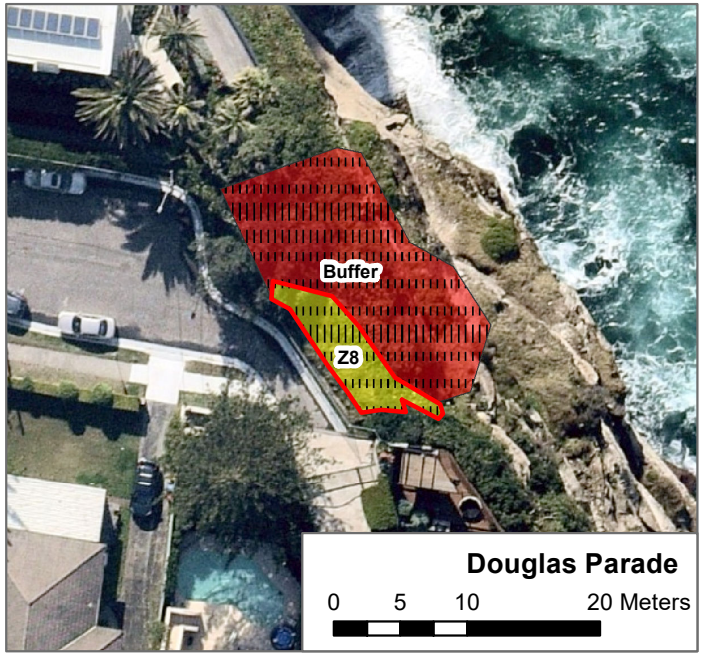
30% - 70%

>70%

Data Source:
Total Earth Care
Nearmap

N

total earth care



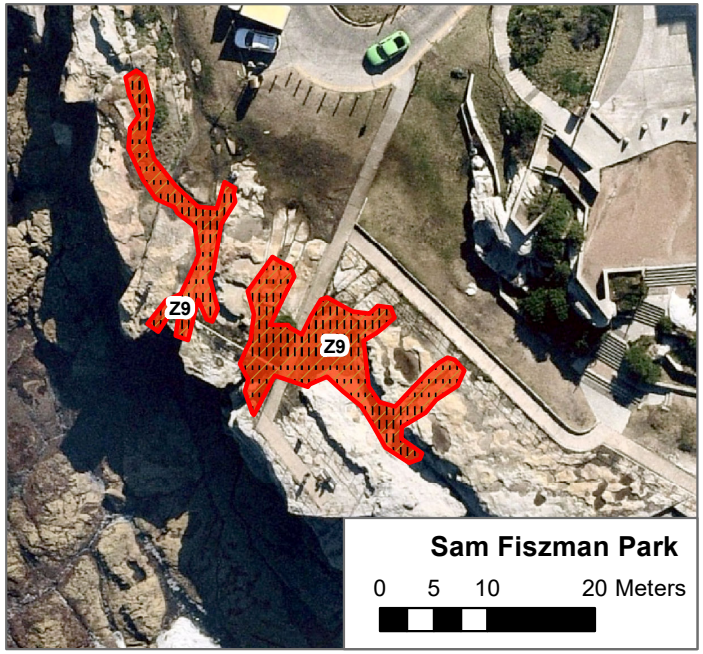


TABLE 2-4 – NORTH CLIFFTOP REMNANTS MANAGEMENT ZONES AND ACTIONS – DOUGLAS PARADE, BAY STREET AND SAM FISZMAN PARK

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed density	Key Performance Indicators (KPIs)	Role
North Clifftop Remnants – Douglas Parade, Bay Street and Sam Fiszman Park							
Remnant Z8	Medium	**Douglas Parade** Consists of a remnant patch of Imperata Grassland. Patch is isolated by dense exotics, and houses, however has high resilience and will need frequent maintenance.	**Targeted weeding –**control WONS and priority weeds such as *Lantana camara, Asparagus aethiopicus* and *Anredera cordifolia.* Areas of dense woody weeds should be removed gradually in patches and concurrently with replacement planting. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. This will also reduce erosion risk along the cliff edge. Target annual weeds before seeding to prevent germination. Primary works to target *Strelitzia spp.* in Z8 buffer unlikely due to access, erosion and public interest.	Minimum of 4 visits per year.	5-30%	No reduction in remnant patches. Natural regeneration. Maintain weed density in core of remnant to <5%.	Trained bush regenerators
Remnant Z18	Medium	**Bay Street** Consists of a remnant patch of Sea-cliff Grassland dominant in *Ficinia nodosa*. The patch is completely isolated and with a high density of exotic grasses. Without management actions, the remnant may be lost due to being overrun by weeds.	**Targeted weeding –** control woody weeds such as *Coprosma repens* and herbaceous weeds such as *Parietaria judaica.* Areas of dense woody weeds, such as *Coprosma repens,* should be removed gradually in patches and concurrently with replacement planting to provide a similar structure of habitat. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. This will also reduce erosion risk along the cliff edge. Target annual weeds before seeding to prevent germination. **Alternative management** – potential alternative management actions at this site are sandstone capping in halos and planting, jute matting sections and planting or clearing the present weeds to expose the rock platform below. This method protects the remnant from weed incursions but will result in a temporary loss of fauna habitat. Staged sandstone capping in halos and planting allows for the maintenance and gradual replacement of weedy habitat with habitat provided by native species.	Minimum of 3 site visits in 2022 – 2023 FY and 2 per year for the following years.	>70%	Reduction of woody weeds. Containment.	Trained bush regenerators
Remnant Z9	Medium	**Sam Fiszman Park** Consists of a remnant patch of Sea-cliff Grassland. The patch is completely isolated and with a high density of exotic grasses. Without management	**Targeted weeding –** control woody weeds such as *Coprosma repens* and herbaceous weeds such as *Gazania tomentosa.* Target annual weeds before seeding to prevent germination.	Minimum of 3 site visits in 2022 – 2023 FY and 2 per year for the following years (2024 – 2025 FY to 2030 – 2031 FY).	30-70%	Reduce and maintain at <30%. Natural regeneration. No reduction in remnant patches.	Trained bush regenerators

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed density	Key Performance Indicators (KPIs)	Role
North Clifftop Remnants – Douglas Parade, Bay Street and Sam Fiszman Park							
		actions, the remnant may be lost due to being overrun by weeds.					
Z8 Buffer	Low	**Douglas Parade** Dense exotics and weeds adjacent the Z8 remnant. Priority is to contain this area to ensure no encroachment into the remnant.	**Containment –** establish an edge between remnant core and surrounding exotics. Prevent further encroachment of WONS and priority weeds. **Primary weeding –** primary works to target *Strelitzia spp.,* although this is difficult due to access, erosion and public interest. Works to also target the edge of the remnant and slowly extend into the denser weeds to allow for natural regeneration to extend the current extent of the remnant. It is recommended Council install a gate to improve access for contractors.	Minimum of 4 visits per year.	>70%	Increased area of adjacent remnant patch Z8.	Trained bush regenerators
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish at least one photo-point in each remnant • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	Trained bush regenerators.

3 DIAMOND BAY RESERVE

Figure 3-1. Rosa Gully, Diamond Bay Reserve

The Diamond Bay Reserve is an open grassed park bound by remnant vegetation that provides dramatic views over the sandstone cliff edge at over 80m above sea level. The remnant vegetation comprises seven patches of Sea-Cliffs Sedgeland and Sea-cliff Heath. These remnants are vitally important in the LGA as together they cover about 8000m^2, which is the largest area of vegetation covered in this Action Plan.

The site is of local heritage significance listed for its natural landscape escarpment and its considerable scenic value which contributes to the character of Sydney's eastern beaches and foreshore. It is also an area of Aboriginal heritage significance as there is a rock engraving site located on the cliff edge.

3.1 FLORA

The Sea-cliff Heath is located in patches to the east of the open park and in the north of the site (D1b, D2a, D2b and D3a). This community is an open to closed low growing community within 50m of sea cliffs on skeletal sand to sand lenses on sandstone with impeded drainage. Typical remnant species including *Baeckea imbricata, Banksia ericifolia, Melaleuca armillaris, Melaleuca nodosa* and *Westringia fruticosa.* The patches of this vegetation are along the centre and north of the site and are mostly in "very poor" condition due to the prevalence of weed species. The protected core is considered to be 'fair' condition (SBRC 2020).

The Sea-cliff Sedgeland patches are positioned at the south of the site (D1c and D3b). This community is dominant with *Ficinia nodosa* and *Machaerina juncea* and is located within 20m of the sea cliffs. It is an open canopy growing on skeletal sand to sand lenses on sandstone, often on modified soils (SBRC 2020). The encroachment of species such as *Stenotaphrum secundatumm, Asparagus aethiopicus, Lantana camara* and *Asparagus aethiopicus* is problematic.

Table 3-1 – Native Flora Species of the Diamond Bay Reserve Bushland Remnants (SBRC 2020)

Scientific Name	Common Name	Scientific Name	Common Name
Acacia longifolia	Coastal Wattle	*Juncus pallidus*	Pale Rush
Acacia suaveolens	Sweet Wattle	*Juncus planifolius*	Broadleaf Rush
Adiantum aethiopicum	Common Maidenhair	*Lachnagrostis billardierei*	Coast Blown-grass
Baeckea imbricata	Heath Myrtle	*Lobelia anceps*	Angled Lobelia
Banksia ericifolia	Heath-leaved Banksia	*Lomandra longifolia*	Spiny-headed Mat-rush
Machaerina juncea	Bare Twig-rush	*Melaleuca armillaris*	Bracelet Honey-myrtle
Carpobrotus glaucescens	Pigface	*Melaleuca nodosa*	Prickly-leaved Paperbark
Commelina cyanea	Native Wandering Jew	*Monotoca elliptica*	Tree Broom-heath
Cyperus polystachyos	Bunchy Sedge	*Olearia tomentosa*	Toothed Daisy-bush
Deyeuxia quadriseta	Reed Bent-grass	*Opercularia aspera*	Coarse Stinkweed
Dianella congesta	Beach Flax-lily	*Paspalidium distans*	Spreading Panic
Dichelachne crinita	Longhair Plumegrass	*Pittosporum undulatum*	Sweet Pittosporum
Doodia caudata	Small Rasp Fern	*Rytidosperma spp.*	Wallaby Grass

Scientific Name	Common Name	Scientific Name	Common Name
Entolasia stricta	Wiry Panic	*Smilax glyciphylla*	Sweet Sarsparilla
Epacris longiflora	Fuchsia Heath	*Themeda triandra*	Kangaroo Grass
Ficinia nodosa	Knobby Club-rush	*Typha orientalis*	Broad-leaved Cumbungi
Gahnia sieberiana	Red-fruit Saw-sedge	*Westringia fruticosa*	Coastal Rosemary
Gleichenia rupestris	Coral Fern	*Xanthosia pilosa*	Woolly Xanthosia
Isolepis cernua	Nodding Club-rush	*Zoysia macrantha*	Prickly Couch
Juncus kraussii	Sea Rush		

3.2 FAUNA

The Sea-cliff Heath vegetation provides foraging and sheltering resources for reptiles and birds including species such as White-browed Scrubwren (*Sericornis frontalis*) and Superb Fairy-wrens (*Malurus cyaneus*). The areas of Sea-cliff Sedgeland and Rosa Gully also provide moist breeding habitat for frog species (AMBS 2010). Sandstone rock outcrops provide basking habitat for skinks and other reptile species including Dark-flecked Garden Sunskink (*Lampropholis delicata*) and the Cream-striped Shinning-skink (*Cryptoblepharus virgatus*). Bird species commonly heard include the Eastern Koel (*Eudynamys orientalis*) and the Channel-billed Cuckoo (*Scythrops novaehollandiae*) which is the world's largest cuckoo.

3.3 MANAGEMENT ACTIONS

3.3.1 Previous works

Management has been generally successful with near total eradication of *Opuntia stricta* from zones D1b and D2b, where the cliffs and near cliff edges were heavily infested. *Salpicrhoa originafolia* has also been nearly entirely eliminated from most buffer planting areas (Apunga 2018b). Management in the Sea-cliff Sedgeland (D3b) has focused on *Hydrocotyle bonariensis, Parietaria judaica, Asparagus aethiopicus, Sonchus sp*. and *Ipomoea cairica.* Maintenance works successfully controlled herbaceous and grass weeds within disturbed and planted areas. However, works within the sedgeland did not see a notable reduction in *Hydrocotyle bonariensis* (Dragonfly Environmental 2020). A sediment fence was installed above the *Machaerina juncea* sedgeland to prevent future incursions from exotic weed species.

3.3.2 Key management actions

Management priority of this site is high due to the large size of the remnants with high resilience. The boardwalk is expected to be replaced around late 2021 or mid-2022. If this will affect access for management work, site visits should be timed prior to construction works and soon after to manage any impacts from the work. Key management actions generally include:

- **Delineation**: create and maintain an edge between mown lawn and buffer vegetation to prevent encroachment of exotic grasses into the remnant. This will reduce future maintenance and facilitate reduction of exotic species within the remnant. Protection of the remnant will ensure conservation of fauna habitat.
- **Buffer and connectivity planting**: extend buffer plantings to improve connectivity of fauna habitat and enhance the resilience of the remnant vegetation. Sandstone capping and planting or mulching and planting could be used in these areas.
- **Management of dominant natives:** *Banksia integrifolia* can be manage to promote recruitment of the native seedbank where intact soils remain.
- **Targeted weeding:** to target woody weeds, vines, herbaceous perennials within remnants and adjacent areas in order to stay on top of any reshooting weeds across the site. Areas of high density weeds such as Rosa Gully should be retained as these provide important fauna habitat and would be very costly to restore to native vegetation.
- **Ecological monitoring:** using photo points and species counts. Ecological monitoring will be reported annually and provide data to support the meeting of goals.

Alternative management actions for this site may include flame weeding of remnant bushland or areas where there is likely to be a native seedbank remaining. The management of *Hydrocotyle bonariensis* at this site has been an ongoing issue. Alternative treatment methods including application of iron-sulphate and crunch spraying should be trialled in plots. See Appendix A.

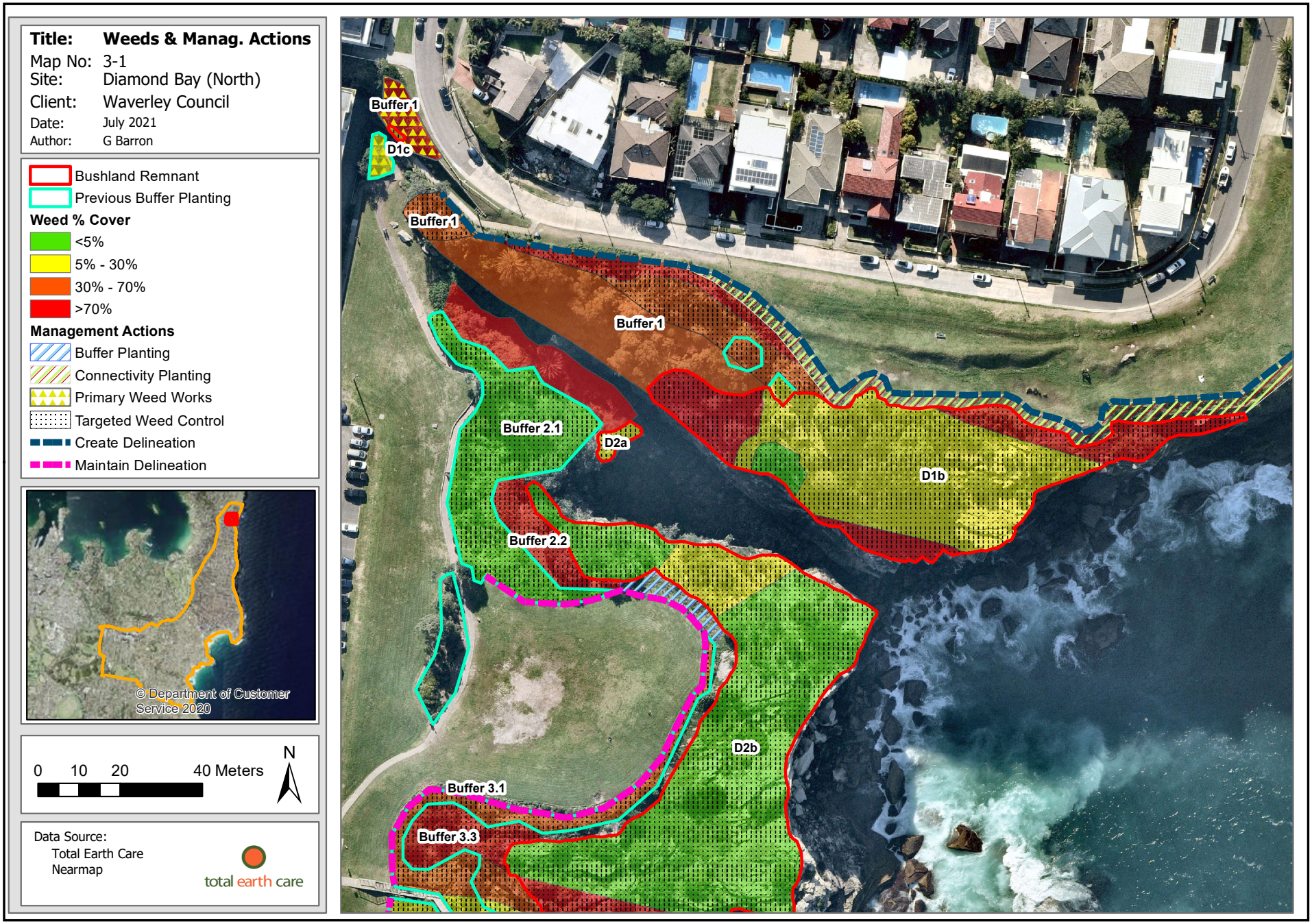
The weed densities and management actions for the different areas are shown in Map 3-1 and Map 3-2 and provided in Table 3-2. Detailed methodologies for the recommended management actions are provided in Appendix A.

3.4 PREDICTIONS AND RECOMMENDATIONS FOR ACHIEVING EAP4 OBJECTIVES

The implementation of management at this site is expected to result in a significant improvement to the condition of the vegetation as the large patches have high resilience. The provision of connectivity and buffer plantings and delineation of the mown edges is expected to protect the existing remnant vegetation and avoid further encroachment of grasses into the patches.

Patches D1b, D2a, D2b, D3a and D3c will likely be able to be restored to 'good' condition by 2040. The extension and management of the buffer and connectivity plantings would be important in managing the condition of the remnants.

Management at this site will improve the existing vegetation and the connectivity of the habitat corridor along the coastline by improving vegetation condition and widening the large remnant patch. This site is integral in the connectivity of the northern section of the coastline as it provides a large tract of habitat amongst the small remnants of the northern clifftops.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Map No: 3-1
Site: Diamond Bay (North)
Client: Waverley Council
Date: July 2021
Author: G Barron
Bushland Remnant
Previous Buffer Planting
Weed % Cover
<5%
5% - 30%
30% - 70%
>70%
Management Actions
Buffer Planting
Connectivity Planting
Primary Weed Works
Targeted Weed Control
Create Delineation
Maintain Delineation
© Department of Customer Service 2020
0 10 20 40 Meters
N
Data Source:
Total Earth Care
Nearmap
total earth care
Buffer 1
D1c
Buffer 1
Buffer 1
Buffer 2.1
D2a
D1b
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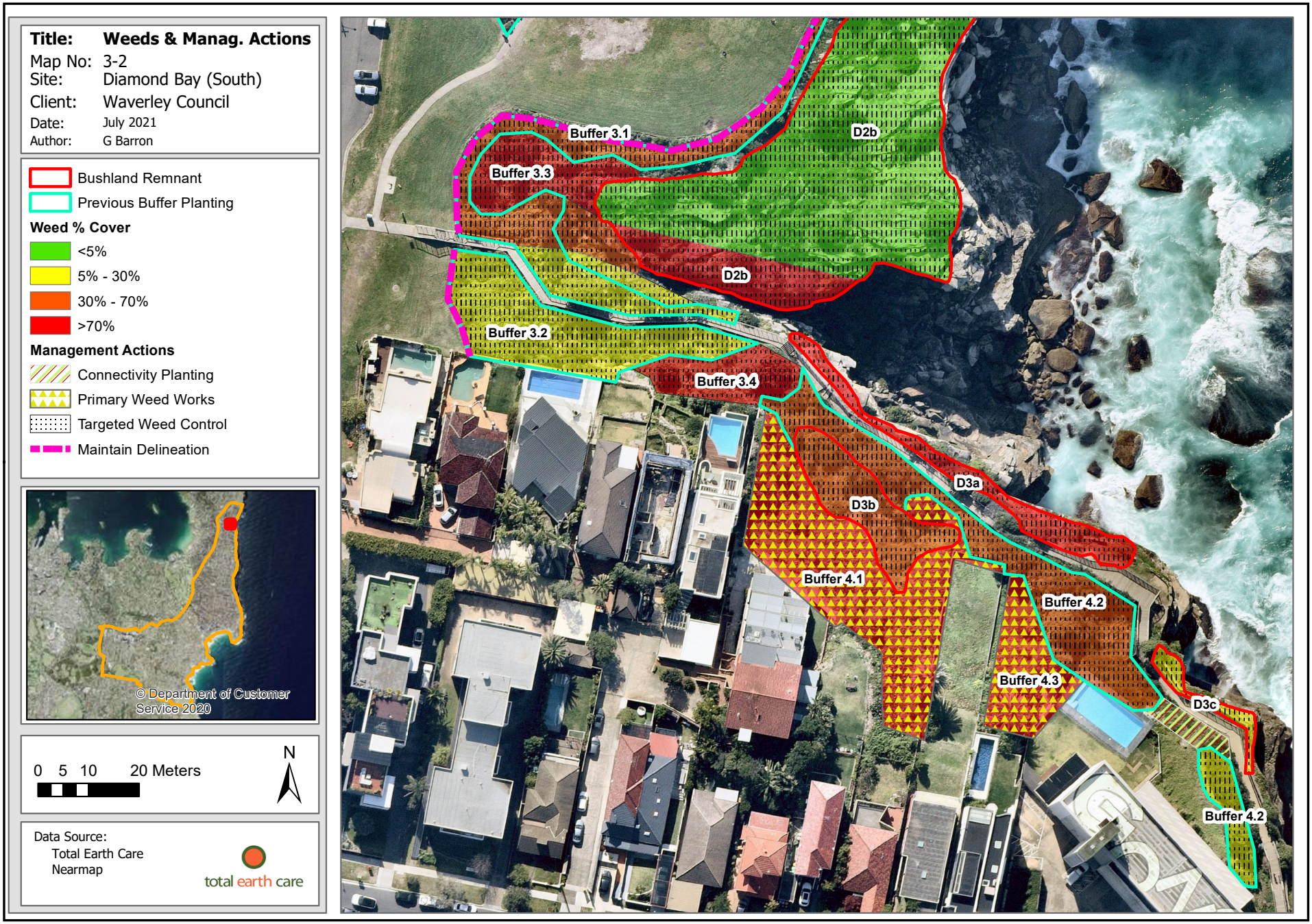
Buffer 3.1
Buffer 3.3


Title: Weeds & Manag. Actions
Map No: 3-2
Site: Diamond Bay (South)
Client: Waverley Council
Date: July 2021
Author: G Barron
Bushland Remnant
Previous Buffer Planting
Weed % Cover
<5%
5% - 30%
30% - 70%
>70%
Management Actions
Connectivity Planting
Primary Weed Works
Targeted Weed Control
Maintain Delineation
© Department of Customer Service 2020
0 5 10 20 Meters
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Data Source:
Total Earth Care
Nearmap
total earth care
Buffer 3.1
D2b
Buffer 3.3
D2b
Buffer 3.2
Buffer 3.4
D3a
D3b
Buffer 4.1
Buffer 4.2
Buffer 4.3
D3c
Buffer 4.2

TABLE 3-2 – DIAMOND BAY REMNANTS MANAGEMENT ZONES AND ACTIONS

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Diamond Bay							
Remnant D1b **Core**	High	The D1b remnant consists of Sea-cliff Heath. The core of the remnant is dominated displays high resilience and is in good condition. The southern edge of the remnant vegetation is in poorer condition as it is harder to access.	**Targeted weeding –** to target woody weeds, vines and herbaceous perennials. If any dense thickets are present, removal should be staged to preserve fauna habitat and the next stage shouldn't commence until replacement plantings provide sufficient habitat. **Maintenance weeding -** target annual weeds before seeding to prevent germination. **Ropes work –** to target *Asparagus aethiopicus* and woody weeds on cliff edge. **Buffer planting –** Planting is to be conducted on the northern edge of the remnant, extending buffer 1 to connect to remnant D1b. This protects the remnant from edge effects and improves habitat connectivity for fauna. A gap can be left between the planted areas and remnant edge to allow for natural regeneration and extension of the remnant. However, if this approach is to be taken more resources will be required to manage weeds in between the plantings and remnant in order to protect the condition of the remnant. Plantings should include a diversity of species. **Create delineation –** Following buffer plantings the edge should be delineated between the mown lawn and planted vegetation to ensure no encroachment of exotic grasses. A sandstone edge or mulch edge could be used here if sandstone capping or mulching is used. Maintenance of the edges will be required. **Manage overabundant natives** – Trim and manage *Banksia integrifolia* where intact soils remain. **Promote native regeneration –** scarify or till soils below the main sandstone outcrop where soils remain intact. **Creation of habitat piles and retention of logs –** where appropriate any fallen logs should be retained and habitat piles created using dead branches and rocks as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.	Ropes work four times per year. 10 site visits per year.	5-30%	Reduce and maintain weed density at <5% by the end of 2023 – 2024 FY. Maintain at <5% ongoing. Regeneration of native species.	**Create delineation**– parks staff **Targeted weeding, maintenance weeding and ropes work** – trained bush regenerators.
Remnant D1b **East**	High	The D1b remnant consists of Sea-cliff Heath.	**Targeted weeding –** to target woody weeds, vines and herbaceous perennials.	12 site visits per year.	30-70%	Reduce and maintain weed density at <5% by the end of	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Diamond Bay							
		The eastern edge of the remnant is dominated by weed species such as *Lantana camara* and *Asparagus aethiopicus.*	**Containment –** ensure no encroachment of the weedy edge into the higher quality core of the remnant. **Creation of piles of branches and rocks and retention of logs –** where appropriate any fallen logs are to be retained and piles of sticks and rocks are to be created as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.			2023 – 2024 FY. Maintain at <5% ongoing.	
Buffer 2.1	High	Consists of established buffer plantings. There is potential to expand this buffer to better protect remnants D2a and D2b.	**Targeted weeding –** as the weed density in this remnant is low all woody weeds, vines and herbaceous perennials should be targeted in order to stay on top of any reshooting weeds. This will serve to protect planted areas and maintain fauna habitat connectivity. **Containment –** contain high density weeds within the gully north of the buffer. **Maintain delineation –** maintain existing edge between mown lawn and remnant vegetation to prevent encroachment of exotic grasses into the buffer plantings and provide protection to the remnants. **Control of dominant natives -** target and remove *Wollastonia uniflora* as it is dominant and smothering other natives. Replace with small shrub species. See Appendix F for recommended species. **Maintenance weeding -** Target annual weeds before seeding to prevent germination.	Minimum of 8 site visits per year.	<5%	Maintain weed density at <5% ongoing. Control of *Wollastonia uniflora.* Natural native regeneration.	**Maintain delineation**– parks staff **Targeted weeding, maintenance weeding, control of dominant natives and containment of weeds** – trained bush regenerators.
Buffer 2.2	High	Consists of high weed density vegetation between the Buffer 2.1 and the remnant vegetation D2b. Dominant weed species include *Lantana camera* and *Ipomoea spp.*	**Containment –** ensure no encroachment of the weedy edge into the higher quality core of the remnant. Isolate *Lantana camara.* This will serve to prevent encroachments into the remnant, protecting the remnant quality and conserving associated fauna habitat. **Targeted weeding –** clearing of dominant weeds such as *Coprosma repens, Lantana camara, Ipomoea spp.* and *Asparagus aethiopicus.* Removal of dense woody weeds should be staged to preserve fauna habitat and the next stage shouldn't commence until replacement plantings provide sufficient habitat. By removing weeds in this area it will connect remnant and buffer 2.1 which have low weed densities. This will improve the resilience of these areas and reduce future maintenance. **Buffer planting –** buffer planting may be necessary between Buffer 2.2 and remnant D2b if natural native regeneration is low to enhance the	Minimum of 8 site visits per year.	>70%%	Reduce and maintain weed density at <5% by the end of 2023 – 2024 FY. Maintain at <5% ongoing. Natural native regeneration.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Diamond Bay							
			resilience of the remnant vegetation and protect it from weed incursions. This will also improve fauna habitat.				
Buffer 3.1	High	Consists of established buffer plantings west of remnant D2b closest to the managed lawn	**Targeted weeding –** target woody weeds, vines, herbaceous perennials and stay on top of any reshooting weeds. Removal of dense woody weeds should be staged to preserve fauna habitat and the next stage shouldn't commence until replacement plantings provide sufficient habitat. **Control of dominant natives -** target and remove *Wollastonia uniflora* as it is dominant and smothering other natives. Replace with small shrub species. See Appendix F for recommended species. **Maintenance weeding -** target annual weeds before seeding to prevent germination. **Maintain delineation –** maintain existing edging between mown lawn and remnant vegetation to ensure no encroachment of exotic grasses into the remnant. Leave a gap between the buffer edge and remnant edge as natural regeneration beyond the remnant edge was observed during the 2020 site assessment.	Minimum of 8 site visits per year.	30-70%	Reduce to weed density to <5% by the end of 2023 – 2024 FY. Maintain at <5% ongoing. Natural native regeneration.	**Maintain delineation**– parks staff **Targeted weeding, maintenance weeding and control of dominant natives** – trained bush regenerators.
Buffer 3.3	High	Consists of native and weeds species immediately west of remnant D2b	**Targeted weeding –** target woody weeds, vines, herbaceous perennials and stay on top of any reshooting weeds. Removal of dense woody weeds should be staged to preserve fauna habitat and the next stage shouldn't commence until replacement plantings provide sufficient habitat. **Control of dominant natives -** target and remove *Wollastonia uniflora* as it is dominant and smothering other natives. Replace with small shrub species. See Appendix F for recommended species. **Maintenance weeding -** target annual weeds before seeding to prevent germination. **Maintain delineation –** maintain existing edging between mown lawn and remnant vegetation to ensure no encroachment of exotic grasses into the remnant. Leave a gap between the buffer edge and remnant edge as natural regeneration beyond the remnant edge was observed during the 2020 site assessment.	Minimum of 8 site visits per year.	30 - >70%	Reduce to weed density to <20% by the end of 2023 – 2024 FY and 5% by 2023-2024. Maintain at <5% ongoing. Natural native regeneration.	**Targeted weeding, maintenance weeding and control of dominant natives** – trained bush regenerators.
Remnant D2b	High	Consists of a large (3,986m^2) remnant patch of Sea-cliff Heath.	**Targeted weeding –** target woody weeds, vines, herbaceous perennials and stay on top of any reshooting weeds. If any dense thickets are present, removal should be staged to preserve fauna	Minimum of 12 site visits per year.	5-30%	Reduce and maintain weed density at <5% ongoing.	**Maintain delineation**– parks staff

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Diamond Bay							
		The remnant has high resilience and suffers only from minor weed infestations from species such as *Asparagus aethiopicus.* The southern edge has denser weed infestations and should be targeted.	habitat and the next stage shouldn't commence until replacement plantings provide sufficient habitat. **Maintenance weeding -** target annual weeds before seeding to prevent germination. **Maintain delineation –** maintain existing edging between mown lawn and remnant vegetation to ensure no encroachment of exotic grasses into the remnant. Leave a gap between the delineated edges and remnant edge as natural regeneration beyond the remnant edge was observed during the 2020 site assessment. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species.			Natural native regeneration.	**Targeted weeding and maintenance weeding** – trained bush regenerators.
Remnant D3b	High	Consists of a 356m^2 patch of Sea-cliff Sedgeland. The remnant patch will benefit from primary works and buffer plantings installed above.	**Targeted weeding -** target woody weeds, vines and herbaceous perennials. If any dense thickets are present, removal should be staged to preserve fauna habitat and the next stage shouldn't commence until replacement plantings provide sufficient habitat. **Trial other methods to target *Hydrocotyle bonariensis* –**continue to set up plots to research methods most successful in the reduction of *Hydrocotyle bonariensis* and natural regeneration of sedges. Methodology to be applied through other zones once established. Ensure monitoring and reporting is conducted on trial plots at every site visit. See Appendix A for other recommended treatment methods to be trialed. Target annual weeds before seeding to prevent germination.	Minimum of 12 site visits per year.	30-70%	Reduce and maintain density to <10% by end of 2021 - 2022 FY. Reduce weeds to <5% by the end of 2023 – 2024 FY. Maintain at <5% on going. Reduction in *Hydrocotyle bonariensis.* Natural native regeneration.	Trained bush regenerators.
Buffer 4.3	Medium	Consists of highly weed infested vegetation upslope from Buffer 4.2.	**Primary weeding –** mosaic clearing of dominant weeds such as *Coprosma repens, Lantana camara, Ipomoea spp.* and *Asparagus aethiopicus.* Removal of dense woody weeds should be staged to preserve fauna habitat and the next stage shouldn't commence until replacement plantings provide sufficient habitat. **Buffer planting –** buffer planting above to enhance connectivity to Buffer 4.2 below. **Targeted weeding –** target woody weeds, vines, herbaceous perennials and stay on top of any reshooting weeds.	Mosaic clearing and revegetation every 2 years, working from patches of higher quality vegetation to lower quality vegetation. Minimum of 12 site visits per year.	>70%	Increased connectivity through buffer. Establishment of buffer planting. Planting survival rate of >80% 6 months after planting.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Diamond Bay							
Remnant D1b **West**	Medium	The D1b remnant consists of Sea-cliff Heath. The western edge of the remnant is infested weed species such as *Lantana camara* and *Asparagus aethiopicus.* The remnant will benefit from works taking place above and the creation of a buffer.	**Containment –** ensure no encroachment of the weedy western area into the higher quality core of the remnant. This will ensure protection of the resilient area maintaining fauna habitat. **Targeted weeding –** over time gradual staged weed removal works can occur adjacent to the good condition core area of bushland in order to expand the area of the remnant that is in good condition. Woody weeds, vines and herbaceous perennials should be targeted. Subsequent removals shouldn't be conducted until replacement plantings have grown and provide a similar level of habitat structure for fauna species such as birds which utilise the area.	8 site visits per year.	>70%	<50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing.	Trained bush regenerators.
Remnant D2a	Medium	Consists of a 51m^2 patch of Sea-cliff Heath. The remnant is hard to access, therefore will benefit from occasional maintenance weeding and ropes work. Works should focus on increasing the condition of the buffer above. Due to the small size of the remnant it may be lost if works are not done in the adjacent buffer area to support it.	**Targeted weeding –**target sprouting woody weeds, vines and herbaceous perennials within the remnant to maintain resilience and low weed density of the remnant. If any dense thickets are present, removal should be staged to preserve fauna habitat and the next stage shouldn't commence until replacement plantings provide sufficient habitat. **Maintenance weeding -** target annual weeds before seeding to prevent germination.	Ropes work four times per year.	5-30%	Decrease and maintain weed density at <5% by the end of 2021 - 2022 FY. Recruitment of native seedbank.	Trained bush regenerators.
Buffer 3.4	Medium	Consists of a mix of natives and weed species.	**Targeted weeding –**target woody weeds, vines, herbaceous perennials and stay on top of any reshooting weeds. Removal of weed species, including woody weeds, in this area will prevent expansion to the east and potential encroachments on the D3b remnant. If any dense thickets are present, removal should be staged to preserve fauna habitat and the next stage shouldn't commence until replacement plantings provide sufficient habitat. **Maintenance weeding -** target annual weeds before seeding to prevent germination. **Maintain delineation –** maintain existing edge between mown lawn and vegetation on the western end of the buffer to ensure no encroachment of exotic grasses into the buffer plantings.	Minimum of 8 site visits per year.	>70%	Reduce and maintain density to <20% by the end of 2022 – 2023 FY. Reduce weeds to <5% by the end of 2023 – 2024 FY. Maintain at <5% ongoing. Natural native regeneration.	**Targeted weeding, maintenance weeding and control of dominant natives** – trained bush regenerators. **Maintain delineation**– parks staff

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Diamond Bay							
Buffer 3.2	Medium	Consists of established buffer plantings west of remnant D2b.	**Targeted weeding –**target woody weeds, vines, herbaceous perennials and stay on top of any reshooting weeds. Removal of weed species, including woody weeds, in this area will prevent expansion to the east and potential encroachments on the D3b remnant. If any dense thickets are present, removal should be staged to preserve fauna habitat and the next stage shouldn't commence until replacement plantings provide sufficient habitat. **Control of dominant natives -** target and remove *Wollastonia uniflora* as it is dominant and smothering other natives. Replace with small shrub species. See Appendix F for recommended species. **Maintenance weeding -** target annual weeds before seeding to prevent germination. **Maintain delineation –** maintain existing edge between mown lawn and vegetation on the western end of the buffer to ensure no encroachment of exotic grasses into the buffer plantings.	Minimum of 8 site visits per year.	5-30%	Reduce and maintain weed density at <5%. Natural native regeneration.	**Maintain delineation**– parks staff **Targeted weeding, maintenance weeding and control of dominant natives** – trained bush regenerators.
Buffer 4.2	Medium	Established buffer plantings located between remnants D3a, D3b and D3c.	**Targeted weeding -** target woody weeds, vines and herbaceous perennials. Woody weeds should be targeted to prevent encroachments into the adjacent remnant patches to both the north and south. This protects the remnant patches, maintaining both their condition and fauna habitat. Target annual weeds before seeding to prevent germination. **Connectivity planting –** extend buffer to join north and south buffers to increase resilience of remnant and to improve fauna habitat connectivity**.**	Minimum of 8 site visits per year.	5-30%	Reduce and maintain <5% weed density by the end of 2021 - 2022 FY. Increased connectivity through establishment of buffer planting. Planting survival rate of >80% 6 months after planting.	Trained bush regenerators.
Remnant D3a	Medium	Consists of a remnant patch of Sea-cliff Heath.	**Targeted weeding –** target woody weeds, vines and herbaceous perennials. Problematic weeds include *Hydrocotyle bonariensis, Coprosma repens, Lantana camara, Ipomoea spp.* and *Asparagus aethiopicus.* Removal of dense woody weeds should be staged to preserve fauna habitat and the next stage shouldn't commence until replacement plantings provide sufficient habitat.	Minimum of 12 site visits per year.	>70%	Reduce and maintain density to <20% by the end of 2022 – 2023 FY. Reduce weeds to <5% by the end of 2023 – 2024 FY. Maintain at <5% ongoing. Reduction in *Hydrocotyle bonariensis.* Natural native regeneration.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Diamond Bay							
Remnant D3c	Medium	Consists of a remnant patch of Sea-cliff Sedgeland dominant in *Ficinia nodosa*	**Targeted weeding –** Target annual weeds before seeding to prevent germination. Problematic weeds include *Hydrocotyle bonariensis, Coprosma repens, Lantana camara, Ipomoea spp.* and *Asparagus aethiopicus.* **Trial new recommended methods for Hydrocotyle treatment -** see Appendix A. Set up plots to research methods most successful in the reduction of *Hydrocotyle bonariensis* and natural regeneration of sedges. Methodology to be applied through other zones once established.	Minimum of 12 site visits per year.	5-30%	Reduce and maintain <5% weed density. Reduction in *Hydrocotyle bonariensis.* Natural native regeneration.	Trained bush regenerators.
Remnant D1c	Low	Consists of a 6m^2 patch of Sea-cliff Sedgeland dominant in *Ficinia nodosa* and surrounding buffer. Remnant patch is isolated and works should target the adjacent buffer in order to improve these areas and protect the remnant from weed encroachment and potential loss.	**Targeted weeding –** target woody weeds, vines and herbaceous perennials. Woody weeds should be targeted to prevent encroachment into the adjacent remnant patch. Removal of dense woody weeds should be staged to preserve fauna habitat and the next stage shouldn't commence until replacement plantings provide sufficient habitat. **Buffer planting –** extend buffer plantings to increase resilience of remnant.	Ropes work twice per year. 10 site visits per year.	5-30%	Decrease and maintain weed density at <5%. Planting survival rate of >80% 6 months after planting. Increase in resilience.	Trained bush regenerators.
Buffer 1	Low	Consists of small patches of buffer plantings and high density weeds above Rosa Gully. Rosa Gully has a very high weed density and would be very costly to treat and result in the removal of a large amount of fauna habitat. This should be a low priority long term goal, with the weeds treated gradually and the area planted to minimise loss of habitat.	**Containment –** of the high density weeds within the gully below to ensure no encroachment of the weedy edge into the higher quality core of the remnant. Isolate *Lantana camara.* This ensures protection of the remnant, maintaining fauna habitat. **Targeted weeding –** target woody weeds, vines, herbaceous perennials in order to stay on top of any reshooting weeds above the gully such as *Coprosma repens, Lantana camara, Ipomoea spp.* and *Asparagus aethiopicus.* Areas of dense woody weeds, such as *Coprosma repens* and *Lantana camara,* should be removed gradually in stages, concurrently with replacement planting to provide a similar structure of habitat. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. This will also reduce erosion risk along the cliff edge. Woody weeds within Rosa Gully should not be targeted due to the habitat provided and costs required to restore this area. **Connectivity planting –** extend buffer planting along D1b remnant to enhance connectivity for fauna to D1a remnant and improve the	Minimum of 12 site visits per year.	30-70%	Containment of high density weed edge. Establishment of buffer plantings. Planting survival rate of >80% 6 months after planting.	**Create delineation**– parks staff Most of the western patch, not abutting remnant vegetation to be handed to Parks staff. **Targeted weeding, connectivity planting and containment** – trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Diamond Bay							
			resilience of the remnant vegetation. A gap can be left between the planted areas and remnant edge to allow for natural regeneration and extension of the remnant. However, if this approach is to be taken more resources will be required to manage weeds in between the plantings and remnant in order to protect the condition of the remnant. Plantings should include a diversity of species in order to provide fauna habitat. **Create delineation** – create and maintain an edge between mown lawn and remnant vegetation to ensure no encroachment of exotic grasses into the remnant.				
Buffer 4.1	Low	Consists of highly weed infested vegetation above the D3b remnant. Primary works and buffer plantings are necessary to conserve the remnants down slope. Due to the high density weeds present this area will be resource intensive to treat.	**Containment –** ensure no encroachment of the weedy edge into the D3b remnant below. **Primary weeding –** mosaic clearing of dominant weeds such as *Coprosma repens, Lantana camara, Ipomoea spp.* and *Asparagus aethiopicus.* Removal of dense woody weeds should be staged to preserve fauna habitat. Successive stages should not be commenced until plantings in initial stages provide sufficient habitat. **Buffer planting –** buffer planting above to enhance connectivity and to protect the remnant below. Buffer plantings should provide suitable fauna habitat including flora species which generate leaf litter for lizards and provide foraging and roosting resources for birds. **Targeted weeding –**target woody weeds, vines, herbaceous perennials and to stay on top of any reshooting weeds.	Mosaic clearing and revegetation every 2 years, working from patches of higher quality vegetation to lower quality vegetation. Minimum of 12 site visits per year.	>70%	Increased connectivity through buffer. Decreased weed density in in remnant vegetation below. Establishment of buffer planting. Planting survival rate of >80% 6 months after planting.	Trained bush regenerators.
All Zones	Required	Ecological monitoring across all zones	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish one photo-point in each zone. • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. • Establish methodology, plots (including a control plot) and monitoring quadrats for best practice for control and reduction of *Hydrocotyle bonariensis.*	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Diamond Bay							
			Provide annual reports detailing monitoring data and summarising outcomes to Waverley Council.				

4 EASTERN RESERVE

Figure 4-1. Steps leading to Eastern Reserve, Dover Heights

Eastern Reserve is a long open park with cliff-top views over the ocean which is a popular location for whale watching. Eastern Reserve has four patches of remnant Sea-Cliffs Sedgeland and Sea-cliff Heath vegetation that is positioned along the cliff edge. The patches provide a strip of connected vegetation along the east of the Reserve. The Reserve is of local and Aboriginal heritage significance due to its natural landscape escarpment and its considerable scenic value which contributes to the character of Sydney's eastern beaches and foreshore.

4.1 FLORA

The two patches of Sea-cliff Sedgeland are positioned at the north of the site. This community is dominant with *Ficinia nodosa* and is located within 20m of the sea cliffs. It is characterised by an open canopy growing on skeletal sand to sand lenses on sandstone, often on modified soils. The condition of these patches is 'very low' in the north of the site (Ea, Eb) with many exotic grasses and ground covers including *Stenotaphrum secundatumm* and *Gazania spp.* (SBRC 2020). Native biodiversity is low, comprising mostly of *Ficinia nodosa, Dianella spp.* and some *Westringia fruiticosa* (Apunga, 2019a).

The two patches of Sea-cliff Heath are positioned to the south of the site (Ec, Ed). This community is an open to closed low growing community within 50m of sea cliffs on skeletal sand to sand lenses on sandstone with impeded drainage. Typical remnant species include *Baeckea imbricata, Banksia ericifolia, Melaleuca armillaris, Melaleuca* nodosa and *Westringia fruticosa.* This patch is in 'good' condition in the core (Ed) with a surrounding buffer of 'very poor' condition, which is abundant with *Ipomoea spp.* and *Passiflora spp.* (SBRC 2020). The southern section of remnant Ed contains what is most likely Waverley LGA's oldest *Banksia ericifolia.* Anecdotal evidence over many years has found that that this location has a higher species richness of birds than any other site within the Waverley LGA.

Table 4-1 – Native Flora Species of the Eastern Reserve Remnants (SBRC 2020)

Scientific Name	Common Name	Scientific Name	Common Name
Acacia longfolia	Coastal Wattle	*Hakea teretifolia*	Needlebush
Acacia suaveolens	Sweet Wattle	*Isolepis cernua*	Nodding Club-rush
Baeckea imbricata	Heath Myrtle	*Lachnagrostis billardierei*	Coast Blown-grass
Banksia ericifolia	Heath-leaved Banksia	*Lachnagrostis filiformis*	Blown Grass
Machaerina juncea	Bare Twig-rush	*Lobelia anceps*	Angled Lobelia
Carpobrotus glaucescens	Pigface	*Melaleuca armillaris*	Bracelet Honey-myrtle
Commelina cyanea	Native Wandering Jew	*Melaleuca nodosa*	Prickly-leaved Paperbark
Cyperus polystachyos	Bunchy Sedge	*Pittosporum undulatum*	Sweet Pittosporum
Deyeuxia quadriseta	Reed Bent-grass	*Samolus repens*	Creeping Brookweed
Dichelachne crinita	Longhair Plumegrass	*Westringia fruticosa*	Coastal Rosemary
Ficinia nodosa	Knobby Club-rush	*Zoysia macrantha*	Prickly Couch
Gleichenia rupestris	Coral Fern		

4.2 FAUNA

This site provides a consistent connectivity corridor along the coastline. The Sea-cliff Heath vegetation provides essential foraging and sheltering resources for reptiles and bird species including small insectivorous bird species such as White-browed Scrubwren (*Sericornis frontalis*) and Superb Fairy-wrens (*Malurus cyaneus*). The Sea-cliff Sedgeland also provides moist habitat for frog species. Sandstone rock outcrops provide basking habitat for skinks and other reptile species including Dark-flecked Garden Sunskink (*Lampropholis delicate*) and the Cream-striped Shinning-skink (*Cryptoblepharus virgatus*). Birds of prey are commonly seen utilising this area (Apunga, 2019a). The site most likely provides habitat for their prey species.

4.3 MANAGEMENT ACTIONS

4.3.1 Previous works

New buffer plantings have been established to the east of the remnants Ec and Ea. Consistent hand weeding and spraying in the past few years has resulted in a reduction in the weed seedbank across the site and remnant zones that were heavily infested *with Ipomea indica* and *Passiflora edulis* have shown a reduction in weed density. The area near George Street has finally been able to stabilise after the construction work completed there, which has allowed it to return to its previous state, and rope work has been invaluable in treating the vine infestations in all areas along the cliff edge.

4.3.2 Key management actions

Management priority of this site is moderate due to some areas of remnants demonstrating resilience with low weed densities. Some of the smaller low condition patches may be difficult to manage and be resource extensive. The boardwalk is expected to be replaced around late 2021 or mid-2022. If this will affect access to complete management work, site visits should be timed prior to construction works and soon after to manage any impacts from the work. Key management actions generally include:

- **Targeted weeding:** Target annual weeds before seeding to prevent germination. Target reoccurring weeds such as *Hydrocotyle bonariensis*, *Gazania spp.* and *Stenotaphrum secundatum, Ipomoea spp.* and garden exotics.
- **Containment:** There are several high density weed areas within this site, including buffer 5. It is important that these areas are contained in order to prevent degradation of adjacent remnants. Buffer 5 is currently delineated from remnant Ec by a sediment fence which is effectively excluding weed species. Containment measures must be maintained and installed where required across the Reserve.
- **Infill planting:** Infill planting should be considered in the remnant and buffer patches to increase diversity. Continue buffer/infill planting within the existing buffers plantings where necessary.
- **Preserve rocky areas** – There is a large number of rocky sandstone areas across this site. It is important that these are maintained as they provide basking opportunities and habitat for a number of reptile species. Weeds should be prevented from overgrowing rocky outcrops and platforms (AMBS 2011).
- **Retention of logs –** any fallen logs are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species (AMBS 2011).
- **Ecological monitoring:** using photo points and species counts. Ecological monitoring will be reported annually and provide data to support the meeting of goals.

The weed densities and management actions for the different areas are shown in Map 4-1 and Map 4-2 and provided in Table 4-2. Detailed methodologies for the recommended management actions are provided in Appendix A.

Additionally, alternative management actions including direct seeding could be used in the southern area of the reserve in the area designated for buffer planting (see Map 4-2). Infill planting may not be viable in some areas due to shallow soils, direct seeding of local provenance seeds within clifftop remnants could be beneficial. This aims to increase diversity thus improve resilience to disturbance.

4.4 PREDICTIONS AND RECOMMENDATIONS FOR ACHIEVING EAP4 OBJECTIVES

The remnants at this site should be managed differently depending on their resilience and current condition. It is expected that the management of the higher quality patches (Ea, Eb North) would result in significant improvement to the condition of the vegetation. Management of the poor condition patches (Ec, Eb South and Buffer 5) should focus on their containment and primary weeding.

Patches Ea, Eb North, Ec South and Ed) will likely be able to be restored to ‘good’ condition by 2040 especially with the implementation of infill planting (where relevant) to increase diversity. It is not expected that the poor condition patches (Ec, Eb South, and Buffer 5) would be able to be managed to ‘good’ condition without extensive management.

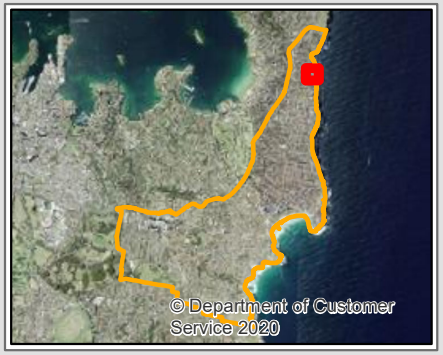
This site provides a significant habitat corridor with notable width and connected patches across the site. The further extension of buffer plantings will provide more habitat for fauna to utilise and provide protected passage between existing patches of remnant vegetation. Infill plantings will also provide more complex vegetation.

Title: **Weeds & Manag. Actions**
Map No: 4-1
Site: Eastern Reserve (North)
Client: Waverley Council
Date: January 2021
Author: G Barron

Bushland Remnant
Previous Buffer Planting

Weed % Cover
<5%
5% - 30%
>70%

Management Actions
Targeted Weed Control
Create Delineation
Maintain Delineation



0 12.5 25 50 Meters
N

Data Source:
Total Earth Care
Nearmap

total earth care

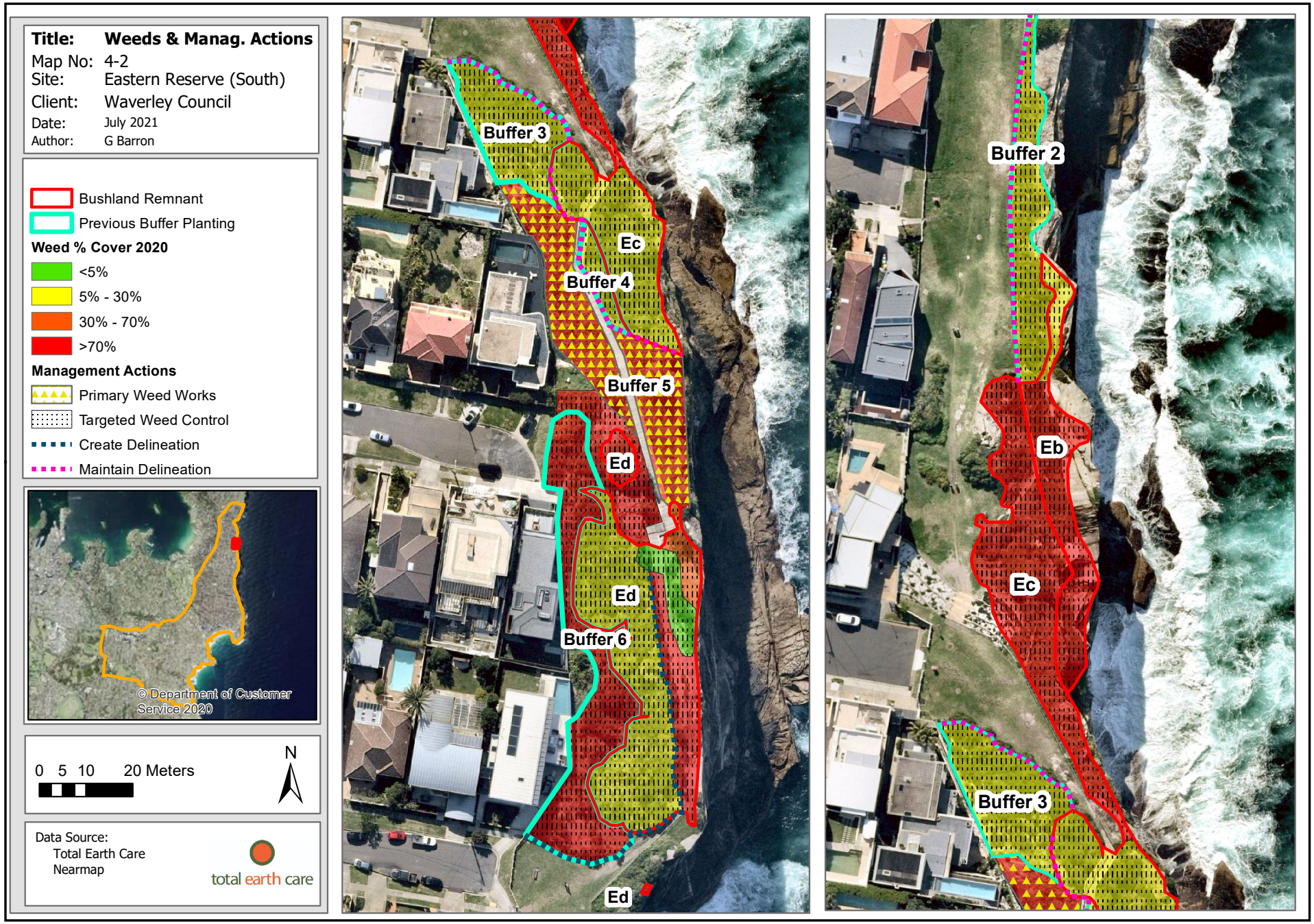

Title: Weeds & Manag. Actions
Map No: 4-2
Site: Eastern Reserve (South)
Client: Waverley Council
Date: July 2021
Author: G Barron
Bushland Remnant
Previous Buffer Planting
Weed % Cover 2020
<5%
5% - 30%
30% - 70%
>70%
Management Actions
Primary Weed Works
Targeted Weed Control
Create Delineation
Maintain Delineation
© Department of Customer Service 2020
0 5 10 20 Meters
N
Data Source:
Total Earth Care
Nearmap
total earth care
Buffer 3
Ec
Buffer 4
Buffer 5
Ed
Ed
Buffer 6
Ed
Buffer 2
Eb
Ec
Buffer 3

TABLE 4-2 – EASTERN RESERVE MANAGEMENT ZONES AND ACTIONS

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Eastern Reserve							
Remnant Ea	High	**Oceanview Avenue** Consists of 684m² of remnant Sea-cliff Sedgeland dominant in *Ficinia nodosa*. Whilst the remnant is in a stable condition displaying low weed density, the diversity in zone remains low, consisting mainly of *Ficinia nodosa* and is unlikely to increase in diversity naturally due to the shallow soils.	**Targeted weeding -** target annual weeds before seeding to prevent germination. Target reoccurring weeds such as *Hydrocotyle bonariensis*, *Gazania spp.* and *Stenotaphrum secundatumm.* **Ropes work –** to target *Asparagus aethiopicus* vines, root systems of *Hydrocotyle bonariensis*, and woody weeds on cliff edge. Woody weeds should be targeted in order to prevent encroachment into the good condition remnant. **Infill planting -** this remnant exhibits high resilience but is suffering from low diversity. Attempts could be made to plant suitable sedge and rush species of local provenance, or propagated from local species to increase the diversity of the remnant, whilst still retaining the genetic value. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species.	Ropes work 4 times per year. 6 site visits per year.	5-30%	Reduce and maintain weed density at <5% by the end of 2023 – 2024 FY. Maintain at <5% ongoing. No net loss of remnant. Increase of diversity through infill planting of local species.	Trained bush regenerators.
Buffer 2	High	**Eastern Avenue** Consist of established buffer plantings between the turf and the Ea and Eb remnants. Delineation of the turf edge has benefited the plantings with little grass encroachment. There has been significant growth of *Hydrocotyle bonariensis*, but most of this has been able to be treated by removing the root systems in between the plantings.	**Maintain delineation –** maintain existing fence and delineation with turf edge. **Targeted weeding -** target annual weeds before seeding to prevent germination. Target reoccurring weeds such as *Hydrocotyle bonariensis*, *Gazania spp.* and *Stenotaphrum secundatumm.* Continue hand removal of *Hydrocotyle bonariensis*. **Buffer planting –** continue buffer/infill planting where necessary. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species.	Minimum of 8 site visits per year.	5-30%	Reduce and maintain weed density at <5% by the end of 2023 – 2024 FY. Maintain at <5% ongoing. Maintained delineation. Natural native regeneration. Planting survival rate of >80% 6 months after planting.	**Maintain delineation**– parks staff **Targeted weeding and buffer planting** – trained bush regenerators.
Remnant Eb North	High	**Eastern Avenue**	**Targeted weeding -** target annual weeds before seeding to prevent germination. Target reoccurring weeds such	Minimum of 8 site visit per year.	5-30%	Reduce and maintain weed density at <5% by the end	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Eastern Reserve							
		Consists of 432m^2 of remnant Sea-cliff Sedgeland dominant in *Ficinia nodosa.* Whilst the remnant is in a stable condition displaying low weed density, the diversity in zone remains low, consisting mainly of *Ficinia nodosa, Dianella spp.* and *Westringia fruiticosa* and is unlikely to increase in diversity naturally due to the shallow soils.	as *Hydrocotyle bonariensis*, *Gazania spp.* and *Stenotaphrum secundatumm.* **Promote native regeneration –** soil scarification or tilling of intact soils to promote recruitment from the native seedbank. **Infill planting -** this remnant exhibits high resilience but is suffering from low diversity. Attempts could be made to plant suitable sedge and rush species of local provenance, or propagated from local species to increase the diversity of the remnant, whilst still retaining the genetic value.			of 2023 – 2024 FY. Maintain at <5% ongoing. No net loss of remnant. Regeneration of native species. Increase of diversity through natural regeneration or infill planting of local species.	
Remnant Ec South	High	**Bulga Road** Consists of 1173m^2 of Sea-cliff heath. The vegetation falls within the SEPP 19. Previous works have targeted this remnant which has seen growth and stabilisation over the past year, with the native shrubs and grasses filling out leaving most annuals no room to germinate.	**Targeted weeding -** target annual weeds before seeding to prevent germination. Target reoccurring weeds such as *Ipomoea spp.* to prevent them from becoming established. **Ropes work –** to target *Asparagus aethiopicus* vines, root systems of *Hydrocotyle bonariensis*, and woody weeds on cliff edge. Woody weeds can provide critical fauna habitat and should only be removed in staged manner. It is critical that the woody weeds are controlled along the cliff edge to prevent encroachment into the good condition remnant. **Maintain delineation –** maintenance of sediment fence to reduce weed encroachment from Buffer 5 upslope.	Ropes works 4 times per year. Minimum of 10 visits per year.	5-30%	Reduce and maintain weed density at <5% by the end of 2023 – 2024 FY. Maintain at <5% ongoing. Regeneration of native species. Increased resilience.	Trained bush regenerators.
Buffer 4	High	**Bulga Road** Consists of established buffer plantings displaying high resilience.	**Maintenance weeding -** target annual weeds before seeding to prevent germination. Target reoccurring weeds such as *Ipomoea spp.* to prevent them from becoming established.	Minimum of 6 site visits per year.	5-30%	Maintain weed density at <5% by the end of 2022 – 2023 FY. Maintain at <5% weeds on going.	Trained bush regenerators.
Buffer 6	High	**George street and Lancaster Street** Consists of a large strip of poor quality vegetation and buffer plantings between the residential buildings and the remnant bushland. The buffer vegetation has been subject to disturbance through	**Targeted weeding -** target annual weeds before seeding to prevent germination. Target reoccurring weeds such as *Ipomoea spp., Passiflora spp.* and garden exotics. **Buffer planting –** Some clearing of shrubs and groundcover species is evident towards the south of this zone, possibly by residents to maintain views. Buffer planting should be conducted to restore vegetation	Minimum of 12 site visits per year.	>70%	Reduce weed density to <20% by the end of 2022 – 2023 FY, <10% by the end of 2023 – 2024 FY and <5% within by the end of 2024 – 2025 FY. Maintain at <5% ongoing.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Eastern Reserve							
		construction and clearing by local residents to maintain views.	structure as this patch provides important habitat for a number of fauna species, including small birds. **Retention of logs –** any fallen logs are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.			Increased connectivity through buffer planting. Planting survival rate of >80% 6 months after planting. Regeneration of native species.	
Remnant Ed **Core**	High	**Northern Part of Lancaster Remnant** The core of the Sea-cliff Heath remnant displays high resilience. The remnant vegetation will benefit from works targeting Buffer 6 to prevent weed encroachment from above and to create connectivity. The vegetation falls within the SEPP 19.	**Targeted weeding -** target annual weeds before seeding to prevent germination. Target reoccurring weeds such as *Ipomoea spp., Passiflora spp.* and garden exotics. **Delineation –** create temporary delineation from poorer quality buffer vegetation to decrease encroachment of invasive species into the remnant bushland. Sediment fencing should be used. **Promote native regeneration –** soil scarification or tilling of intact soils to promote recruitment from the native seedbank. **Retention of logs –** any fallen logs are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.	Minimum 8 site visits per year.	5-30%	Reduce and maintain weed density at <5% by the end of 2022 – 2023 FY. Increased resilience. Regeneration of native species.	Trained bush regenerators.
Buffer 5	High	**George Street** Consists of a highly weed infested vegetation on the cliff edge between remnants Ec and Ed to the east and west of the boardwalk. Containment of these areas is a high priority to prevent weed encroachment into the adjacent remnants to the north and south. In the long term the patches could be controlled but this will require a large investment of resources and money including rope work. The native seedbank in these areas is also likely	**Containment (high priority) –** due to the severely poor condition of the vegetation, the priority is to contain this area to ensure no encroachment into remnants. The sediment fence at the boundary with remnant Ec to the north, must be maintained. **Primary weeding (low priority) –** mosaic clearing of dominant weeds such as *Coprosma repens, Lantana camara, Ipomoea spp.* and *Asparagus aethiopicus.* Areas of dense woody weeds should be removed gradually in patches and concurrently with replacement planting. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. This will also reduce erosion risk along the cliff edge. If woody weeds are not controlled the remnant is at risk of being lost due to the thin nature of the strip.	Monitor sediment fencing and maintain as required. Mosaic clearing and revegetation every 2 years, working from patches of higher quality vegetation to lower quality vegetation. Minimum of 12 site visits per year.	>70%	Sediment fence is functioning correctly and weed encroachments are not entering the remnant. <50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Eastern Reserve							
		entirely depleted and so planting will be required. Restoration of this zone is of low priority but containment is a high priority.	**Ropes work (low priority) –** to target *Asparagus aethiopicus* vines, root systems of *Hydrocotyle bonariensis*, and woody weeds on cliff edge. Care should be taken when treating woody weeds along the cliff edge as these may be providing stabilisation and preventing erosion. Weeds should be managed at the remnant boundaries to prevent encroachment. **Buffer planting (low priority) –** to be undertaken once primary works and ropes works are undertaken. The zone will benefit from a buffer of heathy shrubs and ground covers, of low growing species to not obstruct the public view whilst still providing fauna habitat. Buffer plantings will be necessary to control erosion and stability. Install terracing or coir logs along the length of the slopes.			Establishment of buffer planting to increase connectivity and stability. Planting survival rate of >80% 6 months after planting.	
Remnant Ec North	Medium	**Bulga Road** Consists of 1173m^2 of Sea-cliff heath. The northern section of the remnant is in poor condition. This zone will need to be contained from the higher quality remnant vegetation to the south, whilst efforts target problematic weed species such as *Lantana camara, Coprosma repens, Asparagus aethiopicus* and *Ipomoea spp.*	**Containment –** due to the severely poor condition of the vegetation, the priority is to contain this area in order to ensure no encroachment into the better condition area to the south. **Primary weeding –** mosaic clearing of weeds such as *Coprosma repens, Lantana camara, Ipomoea spp.* and *Asparagus aethiopicus.* Areas of dense woody weeds should be removed gradually in patches and concurrently with replacement planting. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. **Infill planting –** if natural regeneration of native heath and ground cover species are not successful after primary works take place, infill planting may be required. Plantings should be locally sourced species, or propagated from remnant species. This will increase the resilience of the remnant and create habitat complexity and connectivity, whilst still maintaining the genetic integrity of the remnant.	Mosaic clearing and revegetation every 2 years, working from patches of higher quality vegetation to lower quality vegetation. Minimum of 12 site visits per year.	>70%	<50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing. Natural regeneration and/or infill planting if required to increased connectivity and habitat complexity. Increase in remnant condition.	Trained bush regenerators.
Buffer 1	Medium	**Oceanview Avenue**	**Create delineation –** create and maintain delineation between buffer plantings and turf to control encroachment of exotic grasses. Spray edge or a	Minimum of 6 site visits per year.	<5%	Maintain weed density at <5%.	Parks staff.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Eastern Reserve							
		Consists of established buffer plantings which display low weed density and high resilience.	combination with permanent edging is recommended. For spray edge create a buffer area of approximately 50 – 200cm sprayed around the buffer patches with a monocot specific herbicide. Any other non-monocotyledonous weeds should be removed by hand. **Targeted weeding -** target annual weeds before seeding to prevent germination. Target reoccurring weeds such as *Hydrocotyle bonariensis*, *Gazania spp.* and *Stenotaphrum secundatumm.* **Buffer planting –** continue buffer/infill planting where necessary.			Maintained delineation. Regeneration of native species. Planting survival rate of >80% 6 months after planting.	
Buffer 3	Medium	**Bulga Road** Consists of established buffer plantings displaying high resilience.	**Maintain delineation –** maintain existing delineation with turf edge. **Maintenance weeding -** target annual weeds before seeding to prevent germination. Target reoccurring weeds such as *Ipomoea spp.*	Minimum of 6 site visits per year.	5-30%	Maintain weed density at <5%.	**Maintain delineation –** parks staff. **Maintenance weeding** - trained bush regenerators.
Remnant Ed North	Medium	**Northern Part of Lancaster Remnant** Consists of a small isolated patch of remnant Sea-cliff Heath. The remnant will benefit from works targeting Buffer 6 to prevent weed encroachment from above and to create connectivity.	**Targeted weeding -** target annual weeds before seeding to prevent germination. Target reoccurring weeds such as *Ipomoea spp.* and garden exotics. Due to the small size of this patch of the Ed remnant may be lost if management of weeds, including woody weeds, is not undertaken. **Promote native regeneration –** soil scarification or tilling of intact soils to promote recruitment from the native seedbank.	Minimum of 6 site visits per year.	>70%	<50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <5% weed cover by end of 2026 – 2027 FY. Maintained at <5% weed cover ongoing. Regeneration of native species.	Trained bush regenerators.
Remnant Ed East	Medium	**Northern Part of Lancaster Remnant** The eastern edge of the remnant is predominantly in poorer condition, with some lower weed density patches in the north.	**Targeted weeding -** target annual weeds before seeding to prevent germination. Target reoccurring weeds such as *Hydrocotyle bonariensis*, *Gazania spp.* and *Stenotaphrum secundatumm.* Targeted weeding should focus on the higher quality remnant in the northern section of this zone. **Ropes work –** to target *Asparagus aethiopicus* vines, root systems of *Hydrocotyle bonariensis*, and woody weeds on	Ropes work 4 times per year. Minimum 8 site visits per year.	>70%	<50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Eastern Reserve							
		Works should focus on the higher quality remnant in the north and work southward.	cliff edge. Care should be taken when treating woody weeds along the cliff edge as these may be providing stabilisation and preventing erosion, however if they aren't managed gradually over time the remnant will decline in condition.			Maintained at <10% weed cover ongoing. Regeneration of native species.	
Remnant Eb South	Low	**Eastern Avenue** Consists of 432m^2 of remnant Sea-cliff Sedgeland dominant in *Ficinia nodosa.* This zone will need to be contained from the higher quality remnant vegetation south, whilst efforts target problematic weed species such as *Lantana camara, Coprosma repens, Asparagus aethiopicus* and *Ipomoea spp.*	**Containment –** due to the severely poor condition of the vegetation, the priority is to contain this area to ensure no encroachment into the better condition remnant vegetation to the north and south. Sediment fences are an effective method of containment. **Primary weeding –** mosaic clearing of dominant weeds such as *Coprosma repens, Lantana camara, Ipomoea spp.* and *Asparagus aethiopicus.* Areas of dense woody weeds should be removed gradually in patches and concurrently with replacement planting. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. **Infill planting –** if natural regeneration of native heath and ground cover species are not successful after primary works take place, infill planting may be required. Plantings should be locally sourced species, or propagated from remnant species. This will increase the resilience of the remnant and create habitat complexity and connectivity, whilst still maintaining the genetic integrity of the remnant. Habitat creation should be considered during species selection.	Mosaic clearing and revegetation every 2 years, working from patches of higher quality vegetation to lower quality vegetation. Minimum of 12 site visits per year.	>70%	<50% weed cover by end of 2025 – 2026 FY. <30% weed cover by end of 2026 – 2027 FY. <10% weed cover by end of 2027 – 2028 FY. Natural regeneration/ or infill planting if required to increased connectivity and habitat complexity. Increase in remnant condition.	Trained bush regenerators.
Remnant Ed South	Low	**Lancaster Street** Consists of small 2m^2 patch of remnant Sea-cliff Heath on the edge of the cliff. Due to accessibility issues and isolation of this remnant, it is of low priority. Works should focus on the surrounding vegetation to create connectivity and ensure no net loss of remnant.	**Targeted weeding -** Target annual weeds before seeding to prevent germination. Target reoccurring weeds such as *Hydrocotyle bonariensis*, *Gazania spp.* and *Stenotaphrum secundatumm.* Weed works should be focused on the surrounding vegetation to connect the southern Ed remnant patch to the core of the Ed remnant patch. **Ropes work –** to target *Asparagus aethiopicus* vines, root systems of *Hydrocotyle bonariensis*, and woody weeds on cliff edge. . Care should be taken when treating woody weeds along the cliff edge as these may be providing	Ropes work 2 times per year. Minimum 4 site visits per year.	>70%	No loss of remnant vegetation. Increased connectivity.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Eastern Reserve							
			stabilisation and preventing erosion, however if they aren't managed gradually over time this remnant patch is likely to be lost due to its small size and isolated position.				
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish one photo-point in each zone and two photo-monitoring points in each primary work zone • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	Trained bush regenerators.

5 CAFFYN PARK

Figure 5-1. Remnant F5 at Caffyn Park

The Caffyn Park is positioned on an elevated on a sandstone plateau with views of Sydney Harbour. It provides an open grassed area for recreational activities and children's playground. The north-west edge of Caffyn Park runs along a sandstone ledge containing remnants of Sandstone Moist Heath.

The park is of local heritage significance which is listed for its inter-war heritage value including a semi-circular layout of Canary Island Palms. Caffyn Park consists of three patches of remnant vegetation on either side of Victory Street. These vegetation communities comprise Sandstone Dry Scrub and Sandstone Moist Heath.

5.1 FLORA

The natural sandstone ledge that runs along the southern side of Victory Street to the west and north to the park provides a small cliff-soak habitat of Sandstone Moist Heath (F5). Sandstone Moist Heath is a low open growing community with sun-loving tolerate species which occurs within 50m of sea cliffs on sandstone slopes and ledges. It typically includes *Banksia ericifolia, Callistemon citrinus* and *Callistemon linearis*. This area specifically comprises a diverse mix of herbs, grass, sedge and fern species and has a shrub canopy dominated by Tick Bush (*Kunzea ambigua*). This section of remnant vegetation is considered to be 'poor' and 'fair' condition (SBRC 2020), however with recent management, the current weed density (<5%) the reserve is in good condition.

To the north and south of Victory Street (F1, F6) the Sandstone Dry Scrub community is present. This community typically comprises dense low growing dry vegetation including *Acacia longifolia, Monotoca elliptica* and *Kunzea ambigua.* This patch is considered to be in 'very poor' condition (SBRC 2020) and contains a mixture of exotic and native species including several Coastal banksias (*Banksia integrifolia)*.

Table 5-1 – Caffyn Park Native Flora Species (SBRC 2020)

Scientific Name	Common Name	Scientific Name	Common Name
Acacia longifolia	Coastal Wattle	*Juncus planifolius*	Broadleaf Rush
Adiantum aethiopicum	Common Maidenhair	*Kunzea ambigua*	Tick Bush
Callistemon rigidus	Stiff Bottlebrush	*Lachnagrostis filiformis*	Blown Grass
Commelina cyanea	Native Wandering Jew	*Leptospermum squarrosum*	Peach Blossom Tea-tree
Cyperus polystachyos	Bunchy Sedge	*Lobelia anceps*	Angled Lobelia
Dianella caerulea	Blue Flax-lily	*Lomandra glauca*	Pale Mat-rush
Dianella revoluta	Blueberry Lily	*Monotoca elliptica*	Tree Broom-heath
Dichelachne crinita	Longhair Plumegrass	*Opercularia aspera*	Coarse Stinkweed
Eragrostis brownii	Brown's Lovegrass	*Psilotum nudum*	Skeleton Fork-Fern
Gleichenia dicarpa	Pouched Coral Fern	*Schoenus apogon*	Fluke Bogrush
Histiopteris incisa	Bat's Wing Fern	*Schoenus brevifolius*	Zig-zag Bog-rush
Juncus continuus	Juncus continuus	*Wahlenbergia gracilis*	Australian Bluebell

5.2 FAUNA

Caffyn Park contains isolated patches of habitat with little connectivity to other vegetation. As such, it would provide limited habitat to mammals and reptiles and is most likely to serve as refuge for more common urban bird species such as Noisy Minors (*Manorina melanocephala*) and Australian Magpies (*Cracticus tibicen*) Flowering Coastal Banksias provide an important foraging resource for many nectarivorous and urban bird species as well as the Grey-headed Flying-fox (*Pteropus poliocephalus*) (Vulnerable under the BC Act and EPBC Act) which has been recently recorded at Rodney Reserve (DPIE 2020) to the west. Additionally, the small moist rock outcrops provide microhabitats for small reptile species.

5.3 MANAGEMENT ACTIONS

5.3.1 Previous works

Weed management has focused on the infestations of *Hydrocotyle* across the site, particularly in the Sandstone Moist Heath (F5). Turbation of the soil profile in the Sandstone Dry Scrub (F6) to expose a possible seedbank and encourage native regeneration, has achieved limited results, with some germination of native grasses. Further control of the *Hydrocotyle* will be limited to hand weeding only as these areas are now evincing native regeneration.

5.3.2 Key management actions

Management priority of this site is moderate due to the resilient patches of Sandstone Dry Scrub (F1) and Sandstone Moist Heath (F5). Key management actions generally include:

- **Delineation:** Establish a No Mow Zone to encompass the south eastern remnants (F6, Buffer 1)
- **Maintenance weeding:** Target annual weeds before seeding to prevent germination across the site and maintain the current low weed density.
- **Retention of logs**: any fallen logs are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.
- **Preservation of Sandstone Moist Heath and management of dominant natives:** Selective pruning of Kunzea and Acacias to encourage light to the understory to promote native regeneration and improve diversity. Do not remove too many Kunzeas or Acacias as these are important to the remnant and are helping keep weeds at bay. They are unlikely to be impacting the water received to the Sandstone Moist Heath Manage and trim ferns along footpath for pedestrian access. Infill planting bare areas is the Sandstone Moist Heath where no native regeneration is occurring will help improve the condition and diversity of the plant community.
- **Preserve rocky areas** – The escarpment provides important habitat in the form of rocks, crevices, and rock shelves. It is important that these are maintained as they provide basking opportunities and habitat for a number of reptile species. Weeds and exotic grasses should be prevented from overgrowing rocky outcrops and platforms.
- **Ecological monitoring:** using photo points and species counts. Ecological monitoring will be reported annually and provide data to support the meeting of goals.

As an alternative method, tilling the sand within 5m of the cliff is recommended to promote regeneration of natives from the seed bank.

The weed densities and management actions for the different areas are shown in Map 5-1 and provided in Table 5-2. Detailed methodologies for the recommended management actions are provided in Appendix A.

5.4 PREDICTIONS AND RECOMMENDATIONS FOR ACHIEVING EAP4 OBJECTIVES

Management at this site is expected to easily maintain the condition of the existing vegetation in F1 and F5 as both currently display a low prevalence of weeds. Particular attention must be paid to the Sandstone Moist Heath and cliff edge present in remnant F5 as this is vegetation community has only been recorded at two sites within the LGA (SBRC 2020). The implementation of the no-mow zone at the F6 patches will prevent encroachment of exotic grasses into the remnant patches.

It is expected that the patches F1, F5 and F6 will be able to be restored to 'good' condition by 2040, partially with the implementation of infill planting to increase diversity. Management at this site will not increase connectivity as the site is located about 200m to the west of the nearest site (Rodney Reserve). However, the maintenance of the condition of the patches provides an important island of vegetation for fauna.

Title: **Weeds & Manag. Actions**
Map No: 5-1
Site: Caffyn Park
Client: Waverley Council
Date: January 2021
Author: G Barron

Bushland Remnant
Previous Buffer Planting

Weed % Cover 2020
<5%
5% - 30%

Management Actions
Infill Planting
No Mow Zone
Targeted Weed Control
Create Delineation
Maintain Delineation

0 3.75 7.5 15 Meters

N

Data Source:
Total Earth Care
Nearmap

total earth care

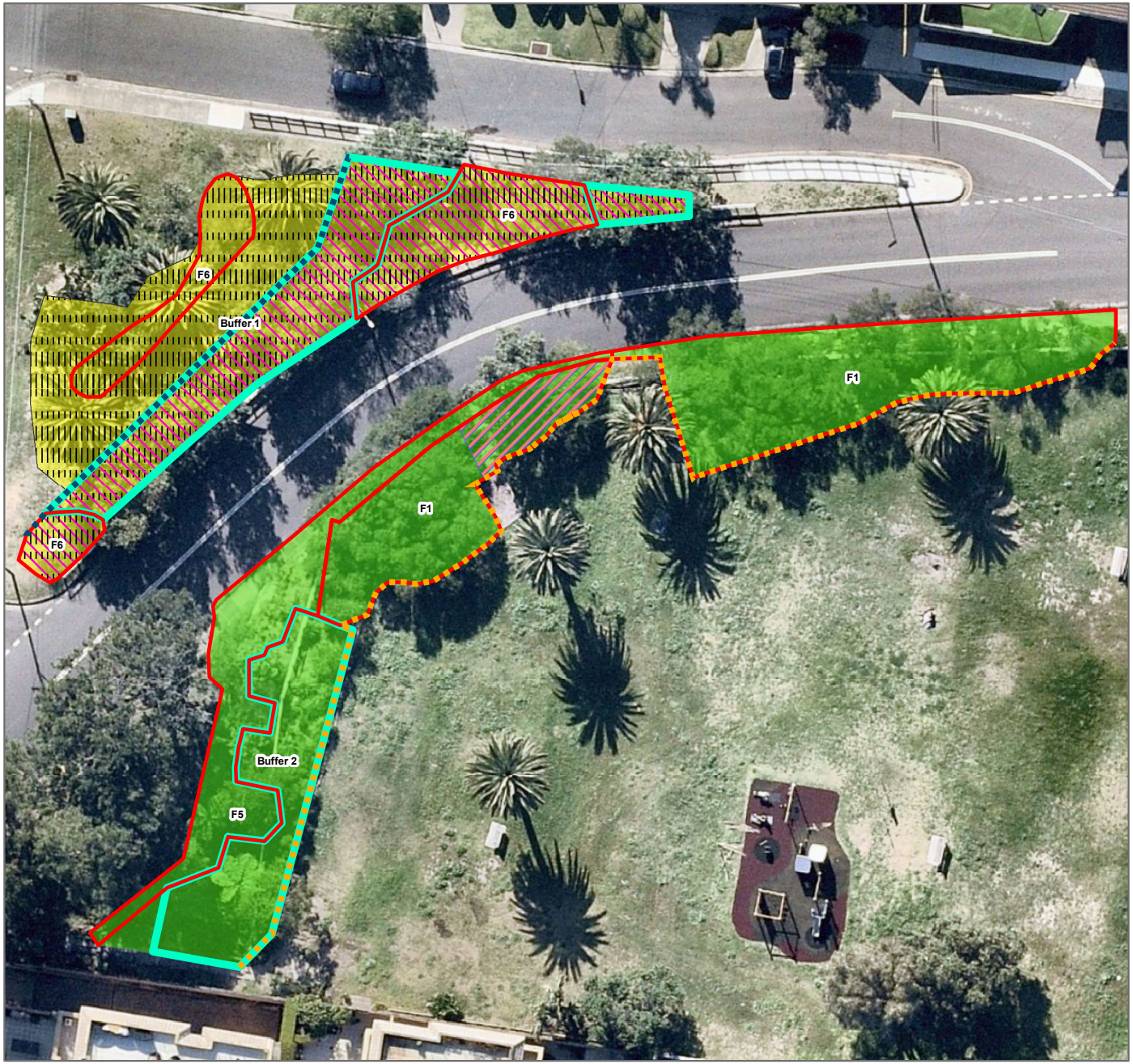


TABLE 5-2 – CAFFYN PARK MANAGEMENT ZONES AND ACTIONS

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Caffyn Park							
Remnant F1 West	High	Remnant vegetation consisting of Sandstone Dry Scrub, located between Caffyn Park and Victory Street. The vegetation display low weed density and high resilience, however some patches of bare ground will benefit from infill planting.	**Infill planting –** of low shrubs and ground covers to increase diversity within area of bare ground displayed on Map 5-1. **Maintenance weeding -** target annual weeds before seeding to prevent germination. **Maintain delineation –** maintain existing delineation between mown lawn and native vegetation to prevent encroachment into the remnant. The current wooden sleepers are effectively excluding exotic grasses. **Control of dominant natives** – selective trimming of *Kunzea ambigua* and Acacias. Trim ferns to allow pedestrian access along footpath. **Promote native regeneration** – by trialing tilling of sandy soil within 5m of the top of the cliff. **Retention of logs –** any fallen logs and branches are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species.	8 visits per year to establish infill planting. 6 visits per year in the following year. 4 visits per year in the subsequent years.	<5%	Maintain weed density at <5% ongoing. Establishment of buffer plantings. Planting survival rate of >80% 6 months after planting. Regeneration of native species.	**Maintain delineation** – Parks staff **Maintenance weeding, control of dominant natives, retention of habitat and infill planting** – trained bush regenerators.
Remnant F6	High	Consists of three Sandstone Dry Scrub remnant patches, located north west of Victory Street. The vegetation display low weed density and high resilience but is suffering from loss through mowing and turf maintenance.	**Targeted weeding –** to control dominant weed species such as *Lantana camara* and *Strelitzia spp.* **Maintenance weeding –** target annual weeds before seeding to prevent germination. **Create delineation –** establish a No Mow Zone to encompass the two remnants adjacent to Victory Street and buffer 1. Maintain delineation between mown lawn and native vegetation to ensure no encroachment into the remnant patches. Delineation can be in the form of a spray edge or physical	12 visits per year in initial years. Extend No Mow Zone further north west after 6 years to incorporate all remnant patches. 6 visits per year for maintenance weeding.	5-30%	Establishment of buffer plantings. Natural native regeneration and increased diversity through supplementary planting. Decreased erosion through planting.	**Create delineation** – Parks staff **Maintenance and targeted weeding, infill planting and control of dominant natives** – trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Caffyn Park							
			delineation in the form of edging or wooden sleepers as per remnant F1. In approximately 6 years once the remnant patches and buffer 1 are established the no mow zone should be extended to include the remnant patch within the centre of the mown area. The extension of the no mow zone will require intensive initial weeding and infill planting and so sufficient resources for these activities must be sourced prior to commencing work. **Infill planting –** plantings of ground cover species to increase diversity, to be installed once a No Mow Zone has been established. **Control of dominant natives (Low priority) –** control of northern NSW *Hibiscus tiliaceus,* any seedlings should be removed. Removed native vegetation should be piled on site to provide fauna habitat. All dead branches and fallen logs should also be left for the same reason. **Retention of logs –** any fallen logs and branches are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.			Weed density <5% by the end of 2022 – 2023 FY. Maintain weed density at <5% on going. Planting survival rate of >80% 6 months after planting.	
Buffer 1	High	Consists of the buffer vegetation between remnants F6. This zone has potential to be extended north west once a No Mow Zone has been established, to better encompass the F6 remnants.	**Targeted weeding –** to control dominant weed species such as *Lantana camara,* and *Strelitzia spp.* **Control of dominant natives –** control of northern NSW *Hibiscus tiliaceus,* any seedlings should be removed. Removed native vegetation should be piled on site to provide fauna habitat. All dead branches and fallen logs should also be left for the same reason. **Maintenance weeding -** target annual weeds before seeding to prevent germination. **Create delineation –** establish a No Mow Zone to encompass the south eastern remnants. **Maintain delineations** between mown lawn and native	12 visits per year in initial years. Extend No Mow Zone further north west after 6 years to incorporate all remnant patches. 6 visits per year for maintenance weeding.	5-30%	Establishment of buffer plantings. Natural native regeneration and increased diversity through supplementary planting. Decreased erosion through planting. Weed density <5% by the end of 2022 – 2023 FY. Maintain weed density at <5% on going.	**Create delineation** – Parks staff **Maintenance and targeted weeding, buffer planting and control of dominant natives** – trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Caffyn Park							
			vegetation to ensure no encroachment into the remnant and native vegetation within Buffer 1. Delineation can be in the form of a spray edge or physical delineation in the form of edging or wooden sleepers as per remnant F1. **Buffer planting –** if little native regeneration, infill planting where required (low priority). In the long term, the buffer should be extended to connect the isolated remnant within the centre of the turf to the north-west. In-fill planting may be required at this stage to improve connectivity. Habitat creation should be consider during species selection. Myrtaceae species provide nectar for birds such as New Holland Honeyeater (*Phylidonyris novaehollandiae*) and groundcover species provide habitat for reptiles. **Retention of logs –** any fallen logs and branches are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.				
Remnant F5	High	Remnant vegetation consisting of Sandstone Moist Heath, located on the western and northern edge of Caffyn Park adjacent to Victory Street. This remnant also includes the cliff edge along the Victory Street footpath. The vegetation displays low weed density and high resilience. This remnant should be prioritised for maintenance weeding to prevent the loss of the Sandstone Moist Heath. *Please note that the full extent of remnant F5 is not shown in the map. It extends along the cutting below remnant F1 and is only accessible from the footpath.	**Maintenance weeding -** target annual weeds before seeding to prevent germination. **Preserve rocky areas** – prevent weeds overgrowing the cliff edge as this area can provide basking opportunities and habitat for a number of reptile species. **Infill planting -** in bare areas where no regeneration is occurring. **Promote regeneration** – by managing dominant natives such as *Commelina cyanea*.	4 visits per year.	<5%	Maintain weed density at <5% on going.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Caffyn Park							
Remnant F1 East	Medium	Remnant vegetation consisting of Sandstone Dry Scrub, located between Caffyn Park and Victory Street. The vegetation display low weed density and high resilience.	**Maintenance weeding -** target annual weeds before seeding to prevent germination. **Manage dominant natives** – trim and manage ferns along walkway to allow pedestrian access. Selectively prune Kunzeas and Acacias. **Maintain delineation –** maintain delineations between mown lawn and native vegetation to ensure no encroachment into the remnant. **Retention of logs –** any fallen logs and branches are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.	Minimum of 4 visits per year.	<5%	Maintain weed density at <5% ongoing.	**Maintain delineation –** parks staff. **Maintenance weeding, habitat retention –** trained bush regenerators.
Buffer 2	Low	Consists of the buffer vegetation between Caffyn Park and remnant F5.	**Maintenance weeding -** target annual weeds before seeding to prevent germination. **Maintain delineation –** maintain delineations between mown lawn and native vegetation to ensure no encroachment into the remnant.	4 visits per year.	<5%	Maintain weed density at <5% ongoing.	**Maintain delineation –** parks staff. **Maintenance weeding –** trained bush regenerators.
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish one photo-point in each zone. • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	Trained bush regenerators.

6 RALEIGH, RODNEY & WEONGA RESERVES

Figure 6-1. Raleigh, Rodney and Weonga Reserves with remnant vegetation along the cliff edge

Raleigh, Rodney and Weonga Reserves together provide a long open grassed park with expansive cliff-top views over the ocean. The Reserves have a large sports field, a children's playground and off leash dog areas.

The Reserves have five patches of remnant Sea-Cliffs Sedgeland and Sea-cliff Heath vegetation that is positioned along the cliff edge. The vegetated strip along the cliff, including the patches of remnant vegetation, is of local heritage significance due to its natural landscape escarpment and its considerable scenic value which contributes to the character of Sydney's eastern beaches and foreshore. The remains of the base of one of the instruments mounted by CSIRO for astronomical observations in the 1950's is present at the east of the playing fields at Rodney Reserve, however is inaccessible due to the fencing.

6.1 FLORA

The three patches of Sea-cliff Heath are located to the north (Z7) and south (Z6, R2) of the playing fields. This vegetation community is an open to closed low growing community within 50m of sea cliffs on skeletal sand to sand lenses on sandstone with impeded drainage. Typical remnant species including *Baeckea imbricata, Banksia ericifolia, Melaleuca armillaris, Melaleuca* nodosa and *Westringia fruticosa.* The Sea-cliff Sedgeland patches are positioned at the south of the site (R1). This community is dominant with *Ficinia nodosa* and is located within 20m of the sea cliffs. It is an open canopy growing on skeletal sand to sand lenses on sandstone, often on modified soils.

The patches of both vegetation types are 'very poor' due to a high prevalence of shrub and groundcover weeds including *Ipomoea cairica*, *Lagunaria patersonia*, *Lantana camara* and *Asparagus aethiopicus* except for some small areas of Sea-cliff Heath near Lyons Street. Although highly weedy, the biodiversity is moderate with 32 native flora species recorded across the reserves (SBRC 2020).

Table 6-1 – Raleigh, Rodney and Weonga Reserves Native Flora Species (SBRC 2020)

Scientific Name	Common Name	Scientific Name	Common Name
Acacia suaveolens	Sweet Wattle	*Juncus pallidus*	Pale Rush
Adiantum aethiopicum	Common Maidenhair	*Lachnagrostis filiformis*	Blown Grass
Baeckea imbricata	Heath Myrtle	*Lepidosperma concavum*	Sandhill Sword-sedge
Machaerina juncea	Bare Twig-rush	*Lobelia anceps*	Angled Lobelia
Cassytha pubescens	Downy Dodder-laurel	*Lomandra longifolia*	Spiny-headed Mat-rush
Centrolepis strigosa	Hairy centrolepis	*Melaleuca armillaris*	Bracelet Honey-myrtle
Commelina cyanea	Native Wandering Jew	*Melaleuca nodosa*	Prickly-leaved Paperbark
Dianella caerulea	Blue Flax-lily	*Olearia tomentosa*	Toothed Daisy-bush
Dianella congesta	Beach Flax-lily	*Opercularia aspera*	Coarse Stinkweed
Entolasia stricta	Wiry Panic	*Paspalidium distans*	Spreading Panic
Epacris longiflora	Fuchsia Heath	*Pimelea linifolia*	Slender Rice Flower
Epaltes australis	Spreading Nut-heads	*Pittosporum undulatum*	Sweet Pittosporum
Ficinia nodosa	Knobby Club-rush	*Pteris vittata*	Chinese Brake
Gleichenia rupestris	Coral Fern	*Smilax glyciphylla*	Sweet Sarsparilla
Histiopteris incisa	Bat's Wing Fern	*Westringia fruticosa*	Coastal Rosemary
Isolepis cernua	Nodding Club-rush	*Xanthosia pilosa*	Woolly Xanthosia

6.2 FAUNA

The dense native and exotic shrub layers of both the bushland remnants and the buffer plantings provide foraging and sheltering habitat for small reptile and bird species such as White-browed Scrubwren (*Sericornis frontalis*) and Superb Fairy-wrens (*Malurus cyaneus*). Flowering native plants such as the *Baeckea spp., Melaleuca spp.,* and *Banksia spp.* attract pollinators and provide abundant foraging resources for many nectarivorous and insectivorous species including the New Holland Honeyeater (*Phylidonyris novaehollandiae*) and the Grey-headed Flying-fox (*Pteropus poliocephalus*) (Vulnerable under the BC Act and EPBC Act) which has been recently recorded at Rodney Reserve (DPIE 2020). The long strip of vegetation, both natives and exotic species, provide a considerable patch of habitat for fauna that is rare within the surrounding suburb.

6.3 MANAGEMENT ACTIONS

6.3.1 Previous works

Buffer plantings (Buffer 1.2 and Buffer 2) have become well established and have resulted in less weeds germinating in these areas, although continued management is required. Efforts to eradicate *Ipomoea* and *Rumex* have been a focus, using rope work to access and treat the root systems and tubers on the cliff edge. *Melaleuca nodosa* and *Leptospermum laevigatum* have been planted in exposed spots (in Z6) and when established and at a sufficient height, will be able to slowly replace the *Olea europaea*. (Apunga, 2018a, 2019d). In the south of the site, the remnant patch (R3) is significantly weedy dominated by *Pennisetum clandestinum* and *Asparagus aethiopicus* which has been managed primarily by hand weeding and rope work. *Salpichroa organifolia* has been successfully treated at numerous spots throughout the site, however is present in high densities in remnant Z7.

6.3.2 Key management actions

Management priority of this site is moderate. Additional buffer areas (Buffer 3 and Buffer 4) are to be established to provide connectivity between remnant patches. However, as access to the remnants is difficult, it is more practical and resourceful to focus on the buffer areas to provide protection for the remnants from weed encroachments. Key management actions generally include:

- **Delineation:** Create and maintain delineations between mown lawn and native vegetation to ensure no encroachment into the remnants (Buffer 1.1, Buffer 1.2).
- **Targeted weeding:** Target woody weeds, vines and annual weeds before seeding to prevent germination. Targeted weeding is required across most of the site. Care should be taken when treating woody weeds along the cliff edge as these may be providing stabilisation and preventing erosion, however if they aren't managed small isolated or narrow remnants may be lost.
- **Ropes work:** Ropes work to access the core of the R2 remnant is of high priority as this patch has a high proportion of established natives and displays high resilience.
- **Primary Weeding / Buffer Planting:** Implementation of new buffer plantings (Buffers 3, 4.1 and 4.2) to connect the remnants of Z6, Z7, R1 and R2.
- **Ecological monitoring:** using photo points and species counts. Ecological monitoring will be reported annually and provide data to support the meeting of goals.

The weed densities and management actions for the different areas are shown in Map 6-1 and Map 6-2 and provided in Table 6-2. Detailed methodologies for the recommended management actions are provided in Appendix A.

6.4 PREDICTIONS AND RECOMMENDATIONS FOR ACHIEVING EAP4 OBJECTIVES

The management and implementation of buffer plantings is an important feature at this site. It is expected that the implementation of new buffer plantings (Buffers 3, 4.1 and 4.2) would protect the remnants from loss. Extensive primary weed works would be required in these areas before buffer planting can be undertaken.

The remnant vegetation cannot be thoroughly assessed without ropes access, however is likely to improve in condition and regenerate throughout the length of the management plan, contributing to meeting the objectives of the EAP4.

The implementation of the new buffer areas would improve and expand the habitat connectivity of the site. In particular, Buffer 3 would provide a new connection between four remnant patches (Z6, Z7, R1, R2). As well as provided new habitat for fauna, the buffer planting will provide protection for the remnant patches to ensure no loss of the small and vulnerable patches.


Title: Weeds & Manag. Actions
Map No: 6-1
Site: Raleigh, Rodney & Weonga Reserves (North)
Client: Waverley Council
Date: January 2021
Author: G Barron
Previous Buffer Planting
Bushland Remnant
Weed % Cover 2020
<5%
5% - 30%
30% - 70%
>70%
Management Actions
Targeted Weed Control
Create Delineation
Maintain Delineation
© Department of Customer Service 2020
0 20 40 80 Meters
N
Data Source:
Total Earth Care
Nearmap
total earth care
Z6
Buffer 1.1
Z6
Buffer 1.2
Buffer 3
Buffer 2
Z7
Buffer 4.1
R1

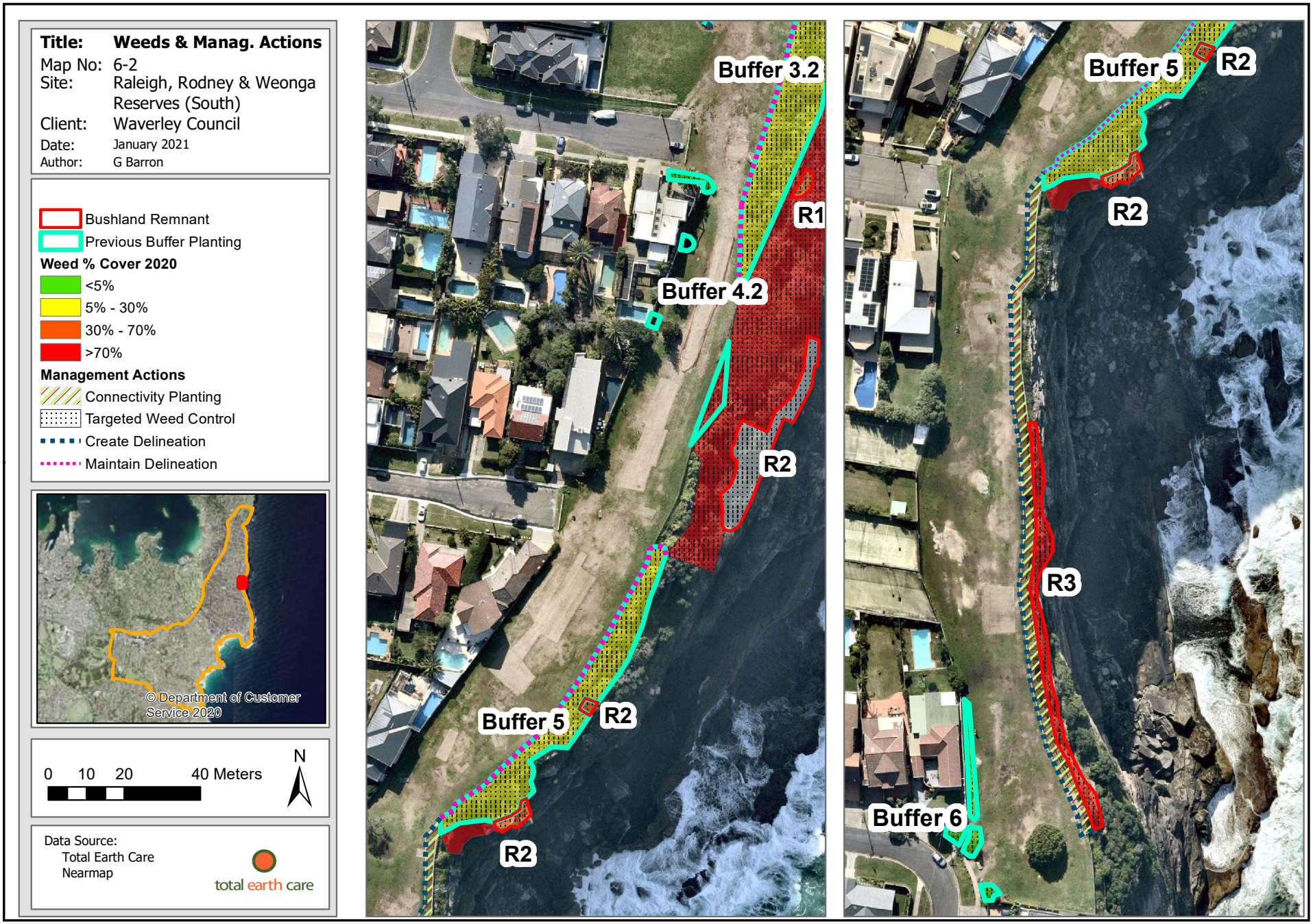

Title: Weeds & Manag. Actions
Map No: 6-2
Site: Raleigh, Rodney & Weonga Reserves (South)
Client: Waverley Council
Date: January 2021
Author: G Barron
Bushland Remnant
Previous Buffer Planting
Weed % Cover 2020
<5%
5% - 30%
30% - 70%
>70%
Management Actions
Connectivity Planting
Targeted Weed Control
Create Delineation
Maintain Delineation
© Department of Customer Service 2020
0 10 20 40 Meters
N
Data Source:
Total Earth Care
Nearmap
total earth care
Buffer 3.2
R1
Buffer 4.2
R2
Buffer 5
R2
R2
Buffer 5
R2
R3
Buffer 6

TABLE 6-2 – RALEIGH, RODNEY AND WEONGA RESERVES MANAGEMENT ZONES AND ACTIONS

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Raleigh, Rodney and Weonga Reserves							
Buffer 1.1	High	**Weonga Reserve** Consist of a stretch of established planted buffer between the recreation park and the clifftop remnant. This buffer extends beyond the plantings and is highly weed infested. A large portion of the buffer is fenced off for safety issues and will need ropes to access and ensure no encroachment of invasive weed species onto remnant patches. Access beyond the fence is of priority.	**Maintain delineation –** maintain existing delineation between mown lawn and native vegetation to ensure no encroachment into the buffer and adjacent remnant R6. Current spray edge combined with plastic edging is effectively preventing weed incursions. **Targeted weeding -** target woody and vines. Areas of dense woody weeds should be removed gradually in patches and concurrently with replacement planting. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. Woody weeds should be targeted in the long term to prevent spread into the adjacent remnant Z6. Target annual weeds before seeding to prevent germination. Target weeds include *Ambrosia psilostachya, Rumex sagittatus, Olea europaea subsp. cuspidata,* and *Ipomoea spp.* **Maintenance weeding -** target annual weeds before seeding to prevent germination, particularly focusing on resilient vegetation within the buffer. **Creation of piles of sticks and rocks and retention of logs –** where appropriate any fallen logs and dead branches are to be retained and piles of sticks and rocks are to be created as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.	A minimum of 8 site visits per year. Ropes work 6 times year.	30-70%	Control of dominant weeds and turf encroachment. Reduce weed density to<10% by end of 2022 – 2023 FY and <5% by 2023 – 2024 FY. Maintain weed density at <5% on going. Recruitment of native species.	**Maintain delineation** – parks staff. **Targeted and maintenance weeding** – trained bush regenerators.
Remnant R1	High	**Rodney Reserve** Consists of a small Sea-cliff Sedgeland dominant in *Ficinia nodosa*. Remnant patch is located beyond the fence line and access is of priority. If weeds are not controlled this small remnant is at risk of being lost.	**Targeted weeding –** targeting dominant weeds and vines, and extending works beyond the remnant patch to ensure no loss of remnant. Areas of dense woody weeds should be removed gradually in patches and concurrently with replacement planting. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. This will also reduce erosion risk along the cliff edge. If woody weeds are not controlled the remnant is at risk of being lost due to the thin nature of the strip.	A minimum of 8 site visits per year.	30-70%	<50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintain weed density at 10% ongoing.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Raleigh, Rodney and Weonga Reserves							
						No loss or reduction or remnant. Natural native regeneration.	
Buffer 4.2	High	**Rodney Reserve** Highly weed invaded bushland above the R2 remnants. This site is of high priority to protect the remnant below and to extend the bushland corridor. This area should be worked in order to continue the connectivity along the sea-cliff working in areas of higher quality vegetation surrounding the existing buffers and remnants patches.	**Primary weeding –** mosaic clearing of dominant weeds further east beyond the fence. Target weeds include *Coprosma repens, Lantana camara, Ipomoea spp.* and *Asparagus aethiopicus.* Large *Erythrina crista-galli* to be targeted. Primary weeding to prioritise and work outwards from patches of higher quality vegetation. Areas of dense woody weeds should be removed gradually in patches and concurrently with replacement planting. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. This will also reduce erosion risk along the cliff edge. If woody weeds are not controlled the remnant is at risk of being lost due to the thin nature of the strip. **Buffer planting –** extend buffer planting east to widen the corridor and protect the remnants R1 and R2 from weed incursions. This will also increase the habitat area available for fauna species.	Mosaic clearing and revegetation every 2 years, working from patches of higher quality vegetation to lower quality vegetation. Minimum of 16 site visits per year.	>70%	Gradual decrease of weed infestation. Reduce weed density to <10% within year 1 of weed treatment and <5% within year 2. Maintain weed density at <5% on going. Establishment of buffer plantings and increased connectivity. Planting survival rate of >80% 6 months after planting.	Trained bush regenerators.
Remnant R2	High	**Rodney Reserve** Consists of a large patch of remnant Sea-cliff Heathland. The remnant patch appears to be in fair condition with high resilience. Access to the core of this remnant is priority.	**Targeted weeding –** targeting dominant weeds and vines. Target annual weeds before seeding to prevent germination. **Ropes work -** to target woody weeds, vines and herbaceous weeds such as *Lantana camara, Ipomoea spp.* and *Asparagus aethiopicus.* Areas of dense woody weeds should be removed gradually in patches and concurrently with replacement planting. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. This will also reduce erosion risk along the cliff edge. If woody weeds are not controlled the remnant is at risk of being lost due to the narrow width of the strip. **Promote native regeneration –** soil scarification or tilling of intact soils to promote recruitment from the native seedbank. **Buffer planting –** create buffer plantings upslope (west and south up to R3) of the remnant vegetation to protect and widen the	A minimum of 8 visits per year, ropes work is likely necessary to access remnant vegetation safely.	30-70%	<50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintain weed density at 10% ongoing. Regeneration of native species. Establishment of buffer plantings west of remnant. Planting survival rate of >80% within first 6 months.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Raleigh, Rodney and Weonga Reserves							
			corridor. These buffer plantings will also improve the connectivity of the vegetation and subsequently of the fauna habitat.				
Buffer 3	High	**Rodney Reserve** Consists of a highly weed infested patch of connectivity planting between remnants Z6 and Z7. *Salpichroa organifolia* has been an issue in this zone, invading and smothering previous buffer plantings under previous BAP. Containment of *Salpichroa organifolia* in this zone is a priority to prevent spread into adjacent areas.	**Containment –** due to the severely poor condition of the vegetation, the priority is to contain this area to ensure no encroachment into remnants and buffer plantings. **Control of *Salpichroa origanifolia* –** Contain by delineating from areas that are mown or slashed. Mowing or slashing will encourage vegetative growth of this species. Communicate with Parks staff that no mowing and slashing should encroach on areas of *Salpichroa origanifolia.* Fruit must be cut and bagged. Contain edges using a foliar spray once a year.	Yearly visit.	>70%	Containment of *Salpichroa origanifolia*	Trained bush regenerators and parks staff.
Remnant R3	Medium	**Raleigh Reserve** Consists of a thin strip of Sea-cliff Heath on the edge of the cliff. The remnant is hard to access and in poor condition, but could improve from some targeted weeding.	**Targeted weeding –** targeting dominant weeds and vines. Priority weeds include *Olea europaea* subsp. *cuspidata*, *Asparagus aethiopicus, Hydrocotyle bonariensis* and *Parietaria judaica.* Target annual weeds before seeding to prevent germination. **Ropes work -** to target woody weeds, vines and herbaceous weeds such as *Lantana camara, Ipomoea spp.* and *Asparagus aethiopicus.* Areas of dense woody weeds should be removed gradually in patches and concurrently with replacement planting. The adjacent areas should not be removed until planted species have grown to provide sufficient fauna habitat. This will also reduce erosion risk along the cliff edge. If woody weeds are not controlled areas of the remnant are at risk of being lost due to the narrow width of the strip. **Connectivity planting –** create buffer plantings upslope (west and north up to R2) of the remnant vegetation, within the current turf area adjacent to the fence, to protect and widen the corridor. These buffer plantings will also improve the connectivity of the vegetation. **Create delineation –** create and maintain delineation between new buffer plantings and turf. Spray edge or a combination with permanent edging for example plastic as per other areas within	Minimum of 6 site visits per year. Ropes work 4 times per year.	>70%	Recruitment of native species. Establishment of buffer plantings west of remnant. Planting survival rate of >80% within first 6 months.	**Create delineation and buffer planting** – parks staff. **Targeted weeding and ropes work** – trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Raleigh, Rodney and Weonga Reserves							
			the site is recommended. For spray edge create a buffer area of approximately 50 – 200cm sprayed around the buffer patches with a monocot specific herbicide. Any other non-monocotyledonous weeds should be removed by hand.				
Buffer 4.1	Medium	**Rodney Reserve** Established buffer plantings between the park and remnants Z7 and R1. The buffer needs to extend east into the previously unworked buffer 3.	**Targeted weeding –** target dominant weeds and annuals before seeding within the buffer plantings. Targeted weeding of *Hydrocotyle bonariensis,* hand weeding is desired around native vegetation. **Control of dominant natives -** target and remove *Wollastonia uniflora* as it is dominant and smothering other natives, resulting in decreased diversity and requiring too much up keep to control. Replace with small shrub species where removed. See Appendix F for recommended species. **Maintain delineation –** maintain existing delineations between mown lawn and native vegetation to ensure no encroachment into the remnant. Current spray edge combined with plastic edging is effectively preventing weed incursions. **Creation of piles of sticks and rocks and retention of logs –** where appropriate any fallen logs and dead branches are to be retained and piles of sticks and rocks are to be created as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.	Minimum of 12 site visits per year.	30-70%	Reduce and maintain weed density to <5% by the end of 2022 – 2023 FY. Reduction in *Hydrocotyle bonariensis.* Control of *Wollastonia uniflora.*	**Maintain delineation** – parks staff. **Targeted weeding and control of dominant natives** – trained bush regenerators.
Buffer 5	Medium	**Rodney Reserve** Establishing buffer vegetation above the southern R2 remnants.	**Maintenance weeding –** target annual weeds before seeding to prevent germination. Target any encroaching or reshooting dominant woody weeds and vines. **Maintain delineation –** maintain existing delineations between mown lawn and native vegetation to ensure no encroachment into the remnant. Current spray edge combined with plastic edging is effectively preventing weed incursions.	A minimum of 6 visits per year.	5-15%	Reduce and maintain weed density to <5% by the end of 2022 – 2023 FY.	**Maintain delineation** – parks staff. **Maintenance weeding** – trained bush regenerators.
Buffer 1.2	Low	**Weonga Reserve** Consists of two established buffer patches surrounded by parkland.	**Create delineation (high priority) –** create No Mow Zones to prevent encroachment. Create and maintain delineations between mown lawn and native vegetation to ensure no encroachment into the remnant. Mulch edge, spray edge or a combination with permanent edging for example plastic as per other areas within the site is recommended. For spray edge create a buffer area of approximately 50 – 200cm sprayed	A minimum of 4 site visits per year.	5-30%	Reduce and maintain weed density to <5% by the end of 2022 – 2023 FY. Permanent delineation and control of turf encroachment.	**Create delineation** – parks staff. **Maintenance weeding** – parks staff.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Raleigh, Rodney and Weonga Reserves							
			around the buffer patches with a monocot specific herbicide. Any other non-monocotyledonous weeds should be removed by hand. **Maintenance weeding -** target annual weeds before seeding to prevent germination. **Creation of piles of sticks and rocks and retention of logs –** where appropriate any fallen logs and dead branches are to be retained and piles of sticks and rocks are to be created as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.				
Remnant Z6	Low	**Weonga Reserve** Consists of two remnant patches of Sea-cliff Scrub on the cliff edge. Due to access issues, works will have to concentrate on reducing weed density and improving the condition of the vegetation above within the buffer vegetation, to protect and ensure no further loss of remnant vegetation.	**Ropes work –** to target woody weeds, vines and herbaceous weeds such as *Lantana camara, Ipomoea spp*. and *Asparagus aethiopicus.*	Ropes work four times per year.	30-70%	Maintenance of remnant condition. No net loss of remnants. Reduction of woody weeds.	Trained bush regenerators.
Buffer 2	Low	**Rodney Reserve** Established buffer plantings south of the Rodney Reserve playing field.	**Create delineation –** create and maintain delineations between mown lawn and native vegetation to ensure no encroachment into the remnant. Mulch edge, spray edge or a combination with permanent edging for example plastic as per other areas within the site is recommended. For spray edge create a buffer area of approximately 50 – 200cm sprayed around the buffer patches with a monocot specific herbicide. Any other non-monocotyledonous weeds should be removed by hand. **Public access –** prevent public access or formalise public pathways through the vegetation. Informal paths have been created through the vegetation and either need to be fenced off permanently to allow for the establishment of native plants, or to be made into a formal path. **Creation of piles of sticks and rocks and retention of logs –** where appropriate any fallen logs and dead branches are to be retained and piles of sticks and rocks are to be created as these	A minimum of 4 site visits per year.	5-30%	Reduce and maintain weed density to <5% by the end of 2022 – 2023 FY. Control of turf encroachment. Control of public access.	Parks staff.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Raleigh, Rodney and Weonga Reserves							
			provide habitat for insects and lizards, which in turn provide food for a number of bird species.				
Remnant Z7	Low	**Rodney Reserve** Consists of a remnant patch of Sea-cliff Heath. The remnant is located on the edge of the cliff and is difficult to access, therefore efforts should be focused on the buffer above to prevent further spread into the remnant.	**Ropes work -** target woody weeds and vines. Care should be taken when targeting woody weeds as they may be stabilising the cliff edge. Weeds should be treated gradually in stages. It is important that woody weeds are targeted to prevent the loss of this remnant due to its small size. Target annual weeds before seeding to prevent germination.	Ropes work 4 times per year.	30-70%	No net loss of remnant vegetation. Improvement in condition from targeted works above.	Trained bush regenerators.
Buffer 6	Low	**Raleigh Reserve** Consists of a thin strip of *Lomandra* plantings along residential properties.	**Maintenance weeding –** target annual weeds before seeding to prevent germination.	Minimum of 4 site visits per year.	<5%	Maintain weed density at <5%.	Parks staff.
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish two photo-point in each remnant zone and three photo points in each high priority buffer zones. • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	Trained bush regenerators.

7 LOOMBAH ROAD CLIFFS

Figure 7-1. Loombah Road Cliffs

The Loombah Road Cliffs site is a hidden, yet floristically diverse patch of remnant bushland of high conservation value. The site is made up of five separate remnant patches, contained by Loombah Road to the east, and by residential properties on all other sides and delineates the border between North Bondi and Dover Heights. The site vegetation can be described as low woodland / low forest (SBRC 2020) growing on wet sandstone.

The reserve is of high conservation value as it home to the threatened *Acacia terminalis* subsp. *Eastern Sydney*, commonly known as the Sunshine Wattle (Endangered under the BC Act and EPBC Act). This beautiful and rare subspecies differs from more widespread subspecies by being hairier, possessing thicker flower stalks and wider seed pods (DPIE 2019). Waverley LGA is one of the very few areas the Sunshine Wattle is known to occur, as the species only occurs in coastal areas from the northern shores of Sydney Harbour to Botany Bay. The reserve is threatened by encroachment of neighbouring properties, over-shading, prolonged absence of fire, edge effects and weed dispersal, particularly facilitated by stormwater discharge.

7.1 FLORA

The sandstone cliffs provide habitat for heath species such as *Epacris longiflora* (Fuchsia Heath) and there has been an increase of seedling recruitment of many native species including the threatened *Acacia terminalis* subsp. *Eastern Sydney*. The remnant has previously been mapped as consisting of remnant vegetation that is in 'Very Poor' condition (SBRC 2020), however based on the current weed density and previous management actions the reserve is in good condition. The core of the vegetation contains less than 5% weeds, with edge affects only apparent on the outskirts of the vegetation with some higher density areas in the south-east of the site. The cliff edge also contains a higher density of weed cover due to accessibility issues and increased weed dispersal from stormwater flow.

Table 7-1 – Loombah Road Cliff Native Flora Species (SBRC 2020)

Scientific Name	Common Name	Scientific Name	Common Name
Acacia longifolia	Coastal Wattle	*Juncus continuus*	Juncus continuus
Acacia suaveolens	Sweet Wattle	*Kunzea ambigua*	Tick Bush
Acacia terminalis subsp. *Eastern Sydney*	Sunshine Wattle	*Lachnagrostis filiformis*	Blown Grass
Adiantum aethiopicum	Common Maidenhair	*Leptospermum polyanthum*	Leptospermum polyanthum
Cayratia clematidea	Native Grape	*Lobelia anceps*	Angled Lobelia
Commelina cyanea	Native Wandering Jew	*Lomandra longifolia*	Spiny-headed Mat-rush
Dianella caerulea	Blue Flax-lily	*Lomatia silaifolia*	Crinkle Bush
Dianella congesta	Beach Flax-lily	*Microlaena stipoides*	Weeping Grass
Dichelachne crinita	Longhair Plumegrass	*Opercularia aspera*	Coarse Stinkweed
Entolasia stricta	Wiry Panic	*Paspalidium distans*	Spreading Panic

Scientific Name	Common Name	Scientific Name	Common Name
Epacris longiflora	Fuchsia Heath	*Pittosporum undulatum*	Sweet Pittosporum
Eragrostis brownii	Brown's Lovegrass	*Platysace lanceolata*	Shrubby Platysace
Ficinia nodosa	Knobby Club-rush	*Pteridium esculentum*	Bracken
Gleichenia dicarpa	Pouched Coral Fern	*Rytidosperma longifolium*	Long-leaved Wallaby Grass
Glochidion ferdinandi	Cheese Trees	*Smilax glyciphylla*	Sweet Sarsparilla
Hakea teretifolia	Needlebush	*Stephania japonica var. discolor*	Snake Vine
Histiopteris incisa	Bat's Wing Fern	*Sticherus flabellatus*	Umbrella Fern
Homalanthus populifolius	Bleeding Heart	*Xanthosia pilosa*	Woolly Xanthosia

7.2 FAUNA

The reserve is home to a number of nectarivorous bird species such as the Rainbow Lorikeet, and honeyeaters. The low canopy of *Glochidion ferdinandi* (Cheese Tree) would provide foraging habitat for honeyeaters, doves and parrot species, as well as provide habitat for arboreal mammals such as possums. The rocky sandstone substrate and temporal pooling from stormwater flows creates ideal habitat for a number of amphibian species and reptiles. Small birds, such as wrens and honeyeaters, and bees are key facilitators in genetic dispersion and pollination of the endangered species *Acacia terminalis* subsp. *Eastern Sydney*.

7.3 MANAGEMENT ACTIONS

Previous management actions of the Loombah Road reserve have been very successful. Primary weed control works have been conducted across the majority of the remnant vegetation. Weed and sediment control have increased the resilience of the remnant vegetation. Regular weed works have increased the regeneration of native ground covers and allowed for the establishment of planted tube stock, which now provides a buffer for the core remnant vegetation. The success of current management actions for this remnant site are evident in the prolific regeneration of native seedlings including *Acacia terminalis* subsp. *Eastern Sydney* particularly within the area of buffer planting.

Some remnants are partially or wholly within private property. Currently Council does not have access to these sites and they are not included in the Council bush regeneration contract area.

Currently the core of the site is in good condition with less than 5% weed cover. Most woody weeds have been eradicated. There is evidence of reshooting *Olea europaea* subsp. *cuspidata* (African Olive). *Senna pendula* var. *glabrata* and *Cotoneaster glaucophyllus* are also present on adjoining private land and continue to germinate within. Reshooting should be controlled and new works are to involve negotiation with adjoining residents to expand the area of primary works.

Both *Ipomoea indica* (Morning Glory) and *Anredera cordifolia* (Madeira Vine) are present in low densities. Works should target the eradication of these species from site. The north-western corner of the site contains an ephemeral drainage line fed into by a stormwater pipe. This poses a threat to the vegetation as in high rainfall periods overflows into the adjacent bushland, will result in increased dispersal of weed seeds, sedimentation, water-logging and increased nutrients. The priority for this area is to contain runoff and prevent overland flows.

7.3.1 Key management actions

Management priority of this site is high due to the presence of the threatened species *Acacia terminalis* subsp. *Eastern Sydney* and all works should be conducted by trained bush regenerators. Visits should be conducted monthly at a minimum across the entirety of the site, with efforts as detailed below.

Key management actions generally include:

- **Control runoff:** Contain runoff and prevent overland flows to reduce and control propagule dispersal (L1b and buffer planting). This will include the replacement and maintenance of sediment fencing.
- **Control of dominant natives:** Thinning of mesic species within the canopy targeting *Pittosporum undulatum* (Sweet Pittosporum), *Glochidion ferdinandi* (Cheese Tree) and *Homalanthus populifolius* (Bleeding Heart) should progress in order to increase sunlight levels in areas and promote regeneration of shrub species including *Acacia terminalis* subsp. *Eastern Sydney*. Mosaic clearing of native ground covers (*Microlaena stipoides* and *Commelina cyanea*) should be conducted with a focus on the ground beneath *Acacia terminalis* subsp. *Eastern Sydney* to promote further germination. All vegetation clearing should be conducted mosaically so as to not decrease the area of or reduce the quality

of available fauna habitat. Removed native vegetation should be piled on site to provide fauna habitat. All dead branches and fallen logs should also be left for the same reason.

- **Ecological monitoring:** using photo points and species counts. Ecological monitoring will be reported annually and provide data to support the meeting of goals.

The weed densities and management actions for the different areas are shown in Map 7-1 and provided in Table 7-2. Detailed methodologies for the recommended management actions are provided in Appendix A.

7.4 PREDICTIONS AND RECOMMENDATIONS FOR ACHIEVING EAP4 OBJECTIVES

The management at this site is expected to result in an improvement to the condition of the vegetation across about half of the site. Management of some remnants is not possible as they fall within private property including remnants L25a and L27a. About half of the remnant vegetation (L1b, L1c) will likely be able to be restored to 'good' condition by 2040 as it is already has low weed prevalence and has a high resilience.

Management of the area around the *Acacia terminalis* subsp. *Eastern Sydney* is of particular importance in order to protect the threatened species. The replacement and maintenance of the sediment fencing would minimise erosion and control the dispersal of weeds which would improve habitat downslope. The excavation of the channel to increase channel volume and removal of excess sediment should be considered. The extension of habitat corridors or connections is not possible at this site due to restrictions (i.e. private property, roadway).

Title: **Weeds & Manag. Actions**
Map No: 7-1
Site: Loombah Road Cliffs
Client: Waverley Council
Date: January 2021
Author: G Barron

Lot
Bushland Remnant
Previous Buffer Planting

Weed % Cover
Not assessed
<5%
5% - 30%
30% - 70%
>70%

Management Actions
Contain Runoff
Control Dominant Natives
Targeted Weed Control

0 5 10 20 Meters

N

Data Source:
Total Earth Care
Nearmap

total earth care

TABLE 7-2 – LOOMBAH ROAD CLIFFS MANAGEMENT ZONES AND ACTIONS

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Loombah Road Cliffs							
Remnant L1b	High	Consists of Low Woodland remnant vegetation. The largest of zones within the remnant vegetation. This zone is the core of the bushland which has had primary weed works.	**Control runoff –** prevent overland flow to reduce and control propagule dispersal. Increase channel volume by removing excess sediment and debris. Excavation of channel should be considered. Replace and maintain sediment fencing. **Targeted weeding –** repeated weeding is recommended to exhaust the seed bank, particularly of perennial herbaceous weeds. Eradication of *Ipomoea indica* (Morning Glory) and *Anredera cordifolia* (Madeira Vine). **Control of dominant natives -** thinning of mesic species within the canopy targeting *Pittosporum undulatum* (Sweet Pittosporum), *Glochidion ferdinandi* (Cheese Tree) and *Homalanthus populifolius* (Bleeding Heart) should progress in order to increase sunlight levels in areas and promote regeneration of shrub species including *Acacia terminalis* subsp. *Eastern Sydney.* Removed native vegetation should be piled on site to provide fauna habitat. All dead branches and fallen logs should also be left for the same reason. Control of *Stephania japonica* (Snake vine) and *Cayratia clematidea* (Native Grape) to prevent smothering of native shrub and ground cover species. Mosaic clearing of native ground cover (*Microlaena stipoides* and *Commelina cyanea*) with a focus on the ground beneath *Acacia terminalis* subsp. *Eastern Sydney* to promote further germination.	Minimum 8 times a year with a minimum of 4 visits in spring/summer.	5%	Zone maintained at <5% weed density. Recruitment of native seedbank. Eradication of weed vines. Protection of regenerating *Acacia terminalis* subsp. *Eastern Sydney.*	Trained bush regenerators.
Buffer 1	High	Located upslope of the core remnant vegetation. Creates a buffer between Loombah Road and the reserve.	**Control propagule dispersal -** contain runoff and prevent overland flow. Increase channel volume by removing excess sediment and debris. Excavation of channel should be considered. Replace and maintain sediment fencing. **Targeted weeding -** repeated weeding is recommended to exhaust the seed bank, particularly of perennial herbaceous weeds. Eradication of *Ipomoea indica* (Morning Glory) and *Anredera cordifolia* (Madeira Vine).	12 times a year with a minimum of 4 visits in spring/summer.	5%	Zone maintained at <5% weed density. Recruitment of native seedbank.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Loombah Road Cliffs							
			Control of *Cotoneaster glaucophyllus* and *Asparagus spp.* is high priority as it occurs upslope from the endangered *Acacia terminalis* subsp. *Eastern Sydney*. **Control of dominant natives -** thinning of mesic species within the canopy targeting *Pittosporum undulatum* (Sweet Pittosporum), *Glochidion ferdinandi* (Cheese Tree) and *Homalanthus populifolius* (Bleeding Heart) should progress in order to increase sunlight levels in areas and promote regeneration of shrub species including *Acacia terminalis* subsp. *Eastern Sydney.* Control of *Stephania japonica* (Snake vine) and *Cayratia clematidea* (Native Grape) to prevent smothering of native shrub and ground cover species. Removed native vegetation should be piled on site to provide fauna habitat. All dead branches and fallen logs should also be left for the same reason.				
Buffer 2	High	Weedy slope adjacent to 18 Loombah Road.	**Containment –** due to high weed density, priority is to contain this area until targeted weeding begins here, to minimise encroachment into higher quality remnant vegetation. **Targeted weeding –** target woody weeds (*Senna pendula* and *Cotoneaster glaucophyllus*) and remove reproductive material. Targeted weeding of vines and persistent *Ageratina adenophora* (Crofton Weed), *Asparagus aethiopicus* (Asparagus Fern), *Ipomoea indica* (Morning Glory) and *Parietaria Judaica* (Pellitory). **Buffer planting –** once controlled extend buffer plantings of mesic species between Buffer 1 and L1c. Species list can be found in Appendix F. **Retention of logs –** any fallen logs and branches are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.	12 times a year with a minimum of 4 visits in spring/summer.	>70%	Reduce and maintain weed density at <5% by the end of 2024 – 2025 FY. Maintenance ongoing. Planting survival rate of >80% 6 months after planting. Increased connectivity through establishment of buffer planting.	Trained bush regenerators.
Remnant L1c	High	Consists of Sandstone Dry Scrub vegetation along Loombah Rd.	**Targeted weeding -** control of herbaceous weeds including *Tradescantia fluminensis* (Wandering Jew) and *Asparagus aethiopicus.* Removal of planted exotic species (*Strelitzia spp.*). **Buffer planting –** extend buffer plantings or infill plantings to create connectivity between this remnant and the core of the remnant. **Control of dominant natives -** Thinning of mesic species within the canopy targeting *Pittosporum undulatum* (Sweet Pittosporum), *Glochidion ferdinandi* (Cheese Tree) and *Homalanthus populifolius* (Bleeding Heart). Removed native vegetation should be piled on site to provide fauna	6 times a year with a minimum of 2 visits in Spring/summer.	5-30%	Works to achieve <5% weed density. Recruitment of native seedbank. Increased connectivity through buffer planting. Planting survival rate of >80% 6 months after planting.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Loombah Road Cliffs							
			habitat. All dead branches and fallen logs should also be left for the same reason.				
Remnant L1a	Low	Located along the top of the cliff edge adjoining a shared driveway of residential properties.	**Targeted weed control –** control herbaceous weeds and promote native ground cover at the base of the cliff. **Planting -** potential for infill planting at the base of the cliff. **Promote native regeneration –** soil scarification of intact soils to promote recruitment from the native seedbank. **Erosion controls –** use coir where appropriate upslope to prevent siltation in this area.	Ropes work, once a year to control herbaceous weeds hanging off the cliff such as *Asparagus aethiopicus.* 4 times per year to control herbaceous weeds and promote native ground cover at the base of the cliff.	30-70%	Works to achieve <10% weed density. Regeneration of native species. Reduced siltation in this zone.	Trained bush regenerators.
Buffer 3	Low	Planted street verge containing native ornamentals including *Lomandra longifolia*.	**Targeted weed control** – conduct periodic control of herbaceous annual and perennial weeds.	2 times a year.	<5%	Maintain weed density at <5%.	Parks staff
Remnant L14	Low	Located on private land below the residency at 16 Loombah Road.	Organise access with private landowner for site assessment and primary weed works. Periodic weed work and planting if necessary.	2 times a year.	Not assessed.	Access and assessment of remnant vegetation.	Not assessed.
Remnant L16	Low	Located on private land below the residency at 16/14 Loombah Road.	Organise access with private landowner for site assessment and primary weed works. Periodic weed work and planting if necessary.	2 times a year.	Not assessed.	Access and assessment of remnant vegetation.	Not assessed.
Remnant L18	Low	Located on private land below the residency at 18 Loombah Road.	Organise access with private landowner for site assessment and primary weed works. Periodic weed work and planting if necessary.	2 times a year.	Not assessed.	Access and assessment of remnant vegetation.	Not assessed.
Remnant L134	Low	Located on the edge of the cliff above 134 Clyde St.	Gain access. Potential for ropes work to remove any woody weeds and reproductive material to prevent further degradation.		Not assessed.	Zone access and protection of remnant vegetation.	Not assessed.
Remnant L136	Low	Located on the edge of the cliff above 136 Clyde St.	Gain access. Potential for ropes work to remove any woody weeds and reproductive material to prevent further degradation.		Not assessed.	Zone access and protection of remnant vegetation.	Not assessed.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Loombah Road Cliffs							
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish one photo-point in each accessible zone and two photo-points in L1b. • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	Trained bush regenerators.

8 HUGH BAMFORD RESERVE

Figure 8-1. Hugh Bamford Reserve

Hugh Bamford Reserve is located in North Bondi, bounded by sea cliffs to the east and Military Road to the west. The reserve itself is predominately cleared land with a modified fill area, used as a half size playing field. A total of 4825m^2 of remnant vegetation is located in the reserve spread across a large patch of Sea-cliff Scrub on the north eastern boundary of the reserve and within a small patch of Sandstone Moist Heath located along side Military Road.

The remnant vegetation in Hugh Bamford Reserve contributes the largest area of SEPP 19 Bushland in Urban Areas vegetation, within the LGA. The site is considered important for its recreational, educational and ecological value, which Waverley Council aims to enhance and protect. The diverse bushland is in high ecological condition and supports a range of high quality habitats for both native flora and fauna species.

8.1 FLORA

The core of the bushland (remnant code H1a) has been determined to be in "Good Condition" (SBRC 2020) with the highest floristic diversity across the site reflecting the success of the previous management actions and bush regeneration efforts. The vegetation is classified as Sea-cliff Scrub. This community comprises open to closed low growing vegetation within 50m of sea cliffs on skeletal sand to sand lenses on sandstone. Typical remnant species including *Melaleuca armillaris, Melaleuca nodosa* and *Leptospermum laevigatum.* The small patches along Military Road comprise Sandstone Moist Heath which is an open low growing community occurring more than 50m from the sea cliffs on sandstone slopes and ledges with shallow skeletal soils with impeded drainage. Typical species of this community are moisture tolerant species such as *Banksia ericifolia, Callistemon citrinus* and *Callistemon linearis.* Both *Callistemon citrinus* and *Callistemon linearis* were present in the 2019 floristic surveys.

Of the 41 species recorded in the reserve, nine are considered to be rare in the LGA those being those being *Banksia marginata, Banksia serrata, Billardiera scandens, Callistemon citrinus, Callistemon linearis, Parsonsia straminea, Pimelea linifolia* and *Platysace lanceolata.*

Table 8-1 – Hugh Bamford Reserve Bushland Remnants Native Flora Species (SBRC 2020)

Scientific Name	Common Name	Scientific Name	Common Name
Acacia longifolia	Coastal Wattle	*Lachnagrostis billardierei*	Coast Blown-grass
Acacia suaveolens	Sweet Wattle	*Lachnagrostis filiformis*	Blown Grass
Adiantum aethiopicum	Common Maidenhair	*Lepidosperma concavum*	Sandhill Sword-sedge
Baeckea imbricata	Heath Myrtle	*Lepidosperma viscidum*	Sticky Sword-sedge
Banksia ericifolia	Heath-leaved Banksia	*Leptospermum laevigatum*	Coast Teatree
Banksia marginata	Silver Banksia	*Lobelia anceps*	Angled Lobelia
Banksia serrata	Old-man Banksia	*Lomandra longifolia*	Spiny-headed Mat-rush
Billardiera scandens	Hairy Apple Berry	*Melaleuca armillaris*	Bracelet Honey-myrtle
Callistemon citrinus	Crimson Bottlebrush	*Melaleuca nodosa*	Prickly-leaved Paperbark
Callistemon linearis	Narrow-leaved Bottlebrush	*Monotoca elliptica*	Tree Broom-heath
Cassytha pubescens	Downy Dodder-laurel	*Parsonsia straminea*	Common Silkpod
Centrolepis strigosa	Hairy centrolepis	*Paspalidium distans*	Spreading Panic
Commelina cyanea	Native Wandering Jew	*Pimelea linifolia*	Slender Rice Flower
Corymbia gummifera	Red Bloodwood	*Platysace lanceolata*	Shrubby Platysace

Scientific Name	Common Name	Scientific Name	Common Name
Dianella caerulea	Blue Flax-lily	*Samolus repens*	Creeping Brookweed
Dianella congesta	Beach Flax-lily	*Smilax glyciphylla*	Sweet Sarsparilla
Dianella revoluta	Blueberry Lily	*Tetragonia tetragonioides*	New Zealand Spinach
Entolasia stricta	Wiry Panic	*Typha orientalis*	Broad-leaved Cumbungi
Ficinia nodosa	Knobby Club-rush	*Westringia fruticosa*	Coastal Rosemary
Gleichenia rupestris	Coral Fern	*Zoysia macrantha*	Prickly Couch
Isolepis cernua	Nodding Club-rush		

8.2 FAUNA

Dense native (and exotic) undergrowth interspersed with exposed sandstone and low-growing groundcovers provides foraging, shelter and basking habitats for native skinks and small birds. Flowering native plants such as the *Melaleuca spp., Leptospermum spp.* and *Banksia spp.* attract pollinators and provide abundant foraging resources for many nectarivorous and insectivorous species such as the Red Wattlebird (*Anthochaera carunculata*) which is the second largest honeyeater in Australia, and the White-cheeked Honeyeater (*Phylidonyris niger*) observed on site. The White-browed Scrubwren (*Sericornis frontalis*) and Silvereye (*Zosterops lateralis*) are some of the species that inhabit the dense scrub and can often be heard loudly calling at intruders in the area. Whilst the White-browed Scrubwren is an often sedentary species, the Silvereyes are highly mobile with different populations being present at different times of the year. The exposed sandstone ridges and outcrops are inhabited by a number of reptile species including the Cream-striped Shinning-skink (*Cryptoblepharus virgatus*), Pale-flecked Garden Sunskink (*Lampropholis guichenoti*) and Three-toed Skink (*Saiphos equalis*).

8.3 MANAGEMENT ACTIONS

8.3.1 Previous works

Buffer plantings along Military Road have been extremely successful and are well established. Efforts have been focused on the management of the remnant patch (H2a) along Military Road particularly with regards to treating the infestation of *Hydrocotyle bonariensis*.

Management actions should target the high density weeds which are present above the buffer plantings between Military Road and the reserve playing field, in order to contain and reduce the spread of reproductive material downslope, which will in turn reduce the future maintenance requirements in the buffer planting areas.

The planting in the northern extent of remnant zone H1a is well established and has good diversity. Maintenance weeding (particularly for *Passiflora spp*.) and delineation of this area is necessary to reduce the persistence of grass species.

The patches surrounding H1a (H1b, H1c) are in a relatively stable condition. Spraying of herbicide in these patches has helped keep *Ehrharta erecta* at bay and any *Asparagus aethiopicus* has been removed by hand. The plantings in H1c are growing well and work has continued to remove any germinating *Rumex sagittatus*, although the seed bank there remains persistent. The plantings at the northern end of zone H1a have grown in very well and now only require maintenance from the grasses that intrude from the adjacent mown turf area.

8.3.2 Key management actions

Management priority of this site is high as the large remnant patches to the east (H1a, H1b, H1c) are already in good condition and ongoing management requirements are low to keep the remnants in good condition. The containment of Buffers 3, 4 and 5 is required as a priority to protect the H2a remnant from weed invasion.

Key management actions generally include:

- **Delineation:** maintain and create delineation between the remnant vegetation (H1a) and the mown turf to prevent the encroachment of grasses. This will reduce future maintenance requirements and facilitate a reduction of exotic species within the remnant.
- **Maintain fences:** fences should be maintained in order to prevent public access into the sensitive remnants and to exclude key predators foxes, dogs and cats.
- **Ropes works:** further ropes work will be required to continue the treatment of *Chyrsanthemoides monilifera* along the edge of the cliff (H1a). Works should be focused on good patches of native shrubs with small weed incursions and on treating the roots of vine species (*Ipomoea spp.)*.
- **Containment:** the small remnant H2a is at risk due to its isolated nature and the poor condition of the surrounding Buffers 3, 4 and 5. In order to contain the high density

weeds within these zones, a sediment fence should be installed to control seed dispersal downslope into Buffer 2 and H2a remnant whilst primary works take place.

- **Maintenance weeding:** target re-occurring exotics and germinating annuals. Elimination of *Rumex sagittatus* is achievable in H1a if targeted before germination. Maintenance weeding in Buffer 9 should result in a notable difference and natural regeneration.
- **Ecological monitoring:** using photo points and species counts. Ecological monitoring will be reported annually and provide data to support the meeting of goals.

Alternative management action for this site include pile burns and flame weeding in H1a.This should be trialled to test the resilience of the seedbank in these areas. Where staged primary weeding in Buffers 3, 4, 5, 6 and 7 is planned this could utilise sandstone capping with coir logs and jute mesh for stabilisation. This could then be planted into.

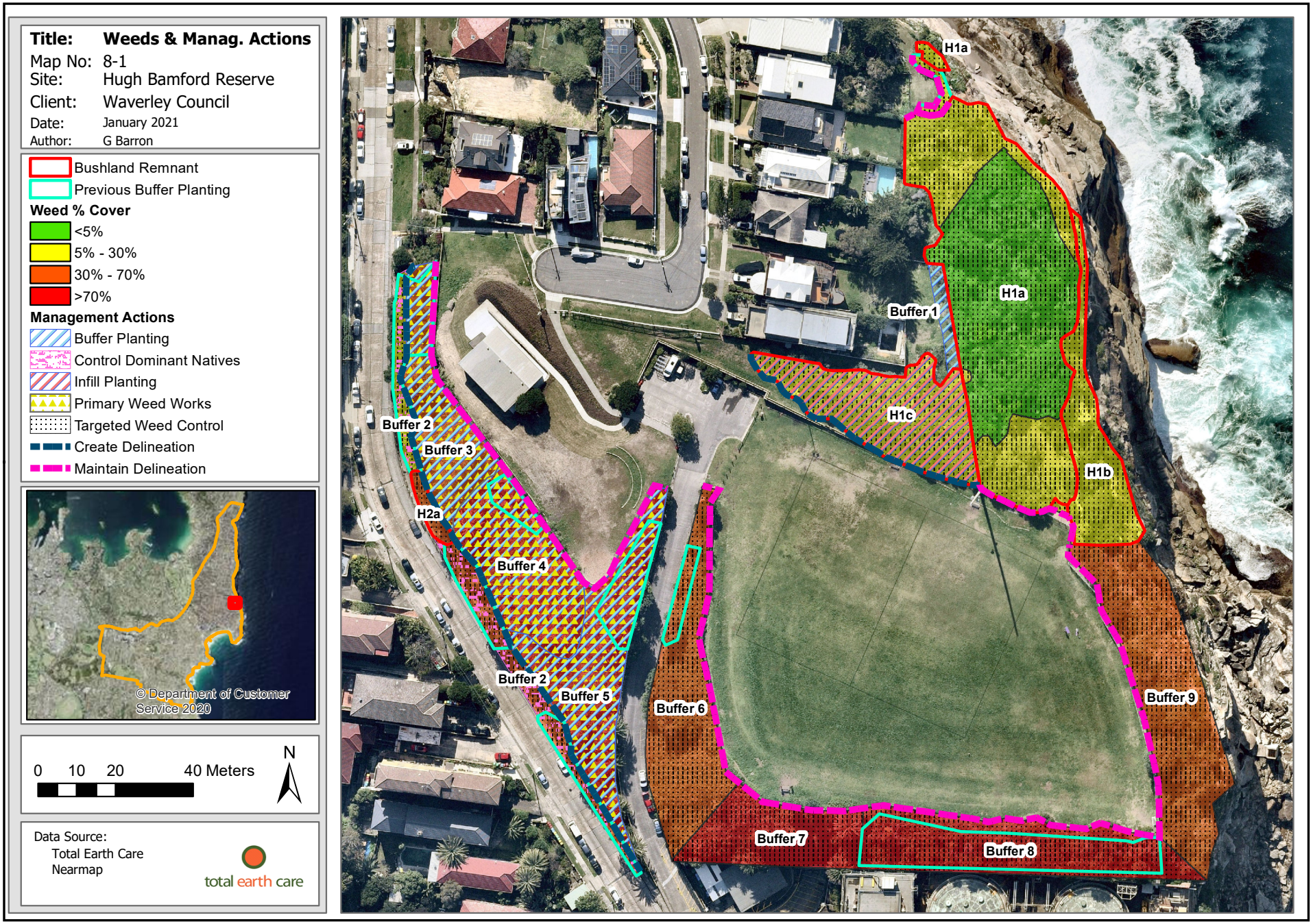
The weed densities and management actions for the different areas are shown in Map 8-1 and provided in Table 8-2. Detailed methodologies for the recommended management actions are provided in Appendix A.

8.4 PREDICTIONS AND RECOMMENDATIONS FOR ACHIEVING EAP4 OBJECTIVES

Management at this site is expected to result in significant improvement to the condition of the vegetation, particularly the maintenance of H1a and the improvement of Buffer 5. The provision of delineation and maintenance (weeding) is expected to maintain the good condition of the existing remnant vegetation (H1a) and improve the condition of H1b, H1c and Buffer 9.

It is likely the remnant patches H1a, H1b and H1c can increase in condition and regenerate throughout the length of the management plan, contributing to meeting the objectives of the EAP4. Due to the high density of weeds and steep nature of the vegetation on the west of the site (Buffers 2 to 5, H2a), it is unlikely that these patches will ever be clear of weeds as it will not be cost effective. Prior to primary weed management in Buffers 3, 4 and 5, containment must be undertaken to protect the H2a remnant from weed invasion during works.

The management of the eastern areas (H1b, H1c and Buffer 9) is important in providing and maintaining a wide connectivity corridor for remnants and fauna habitat along the coastline. Additionally, the thinning out of *Leptospermum spp.* and replanting in H1c will increase the diversity of the western section of the patch and increase the overall quality and diversity of the vegetation in the corridor.


Title: Weeds & Manag. Actions
Map No: 8-1
Site: Hugh Bamford Reserve
Client: Waverley Council
Date: January 2021
Author: G Barron
Bushland Remnant
Previous Buffer Planting
Weed % Cover
<5%
5% - 30%
30% - 70%
>70%
Management Actions
Buffer Planting
Control Dominant Natives
Infill Planting
Primary Weed Works
Targeted Weed Control
Create Delineation
Maintain Delineation
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0 10 20 40 Meters
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Data Source:
Total Earth Care
Nearmap
total earth care
H1a
H1a
Buffer 1
H1c
H1b
Buffer 2
Buffer 3
H2a
Buffer 4
Buffer 2
Buffer 5
Buffer 6
Buffer 9
Buffer 7
Buffer 8

TABLE 8-2 – HUGH BAMFORD RESERVE MANAGEMENT ZONES AND ACTIONS

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Hugh Bamford Reserve							
Remnant H1a	High	The largest of zones within the remnant vegetation. This zone is the core of the bushland which has been maintained at a low weed density. The remnant vegetation is within the SEPP 19.	**Maintenance weeding -** should continue to target re-occurring exotics and germinating annuals. Elimination of *Rumex sagittatus* is achievable if targeted before germination. **Promote native regeneration** – through trialing pile burns, soil scarification and flame weeding to improve diversity. Particularly within 10m of the top of the cliff. **Ropes works -** further rope work will be required to continue the treatment of *Chyrsanthemoides monilifera* along the edge of the cliff. A focus on good patches of native shrubs and roots of vine species (*Ipomoea spp.)*. **Maintain delineation –** maintain delineation between the remnant vegetation and the mown turf to prevent the encroachment of grasses. **Retention of logs –** any fallen logs and branches are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.	Ropes work 4 times per year. 10 site visits per year with a minimum of 5 in spring/summer.	<5%	Reduced encroachment of turf. Zone maintained at <5% weed density on going. Regeneration of native species.	Trained bush regenerators.
Buffer 1	High	Buffer planting proposed to be established along fenced edge on the western side of H1a.	**Maintain delineation –** maintain existing fence delineation to prevent public access and create edge delineation between the buffer and the mown turf to prevent encroachment by exotic grass species. Spray edge recommended with a buffer area of approximately 50 – 200cm sprayed around the buffer patches with a monocot specific herbicide. Any other non-monocotyledonous weeds should be removed by hand. **Maintenance weeding -** should continue to target re-occurring exotics and germinating annuals. **Buffer planting –** extend buffer plantings around the remnant fence at the end of the laneway behind numbers 48 and 50 Wentworth Street. Plantings should be installed to improve remnant connectivity, deter public access and improve the resilience of the remnant. Habitat creation should be considered during species selection including species which provide foraging and nesting resources for birds or habitat for ground fauna such as reptiles.	6 site visits per year.	5-30%	Reduced encroachment of turf. Reduce weed density to <5% by the end of 2022 – 2023 FY. Maintain at <5% weeds ongoing.	Parks staff.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Hugh Bamford Reserve							
			Retention of logs – any fallen logs and branches are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.				
Remnant H1b	High	Sea-cliff Scrub remnant south of the core H1a remnant.	**Targeted weeding** – target persistent annual weeds and vines. Elimination of *Rumex sagittatus* may be possible as it occurs in a small density, and by targeting the species before seeding. Progression of works into lower quality areas. **Ropes works** – focused around patches of good patches of native shrubs and *Ipomoea indica* roots. **Promote native regeneration** – through trialing pile burns, soil scarification and flame weeding to improve diversity. Particularly within 10m of the top of the cliff. **Retention of logs –** any fallen logs and branches are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.	Ropes work 4 times per year. 10 site visits per year with a minimum of 5 in spring/summer.	5-30%	Reduce weed density to <5% by the end of 2022 – 2023 FY. Maintain at <5% weeds ongoing. Regeneration of native species.	Trained bush regenerators.
Remnant H1c	High	Located between the private residency at 50 Wentworth Street and the playing field.	**Delineation** – create delineation here between the remnant vegetation and the mown turf to deter informal public access and to prevent the encroachment of grasses, particularly in the area of new plantings in the north of the zone. A spray or mulch edge is recommended. **Maintenance of APZ –** maintenance of the APZ between the bushland remnant and 48 and 50 Wentworth Street by means of vegetation clearing as per the RFS Standards for Asset Protection Zones (2006). **Control of dominant natives –** thin out or selectively prune and control the *Leptospermum spp.* Removed native vegetation should be piled on site to provide fauna habitat. All dead branches and fallen logs should also be left for the same reason. **Infill planting -** planting of ground covers and small heath shrub species as currently low diversity due to the monoculture of *Leptospermum spp.* This will improve habitat for ground fauna such as reptiles. **Retention of logs –** any fallen logs and branches are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.	Plantings are best planted during growing season (Autumn/Spring) to maximise plant survival rates. Water regularly after installation, which is to be increased in hot and/or windy conditions during the establishment phase (6 weeks) and then as required. 12 visits per year.	5-30%	80% survival rate of plantings. Increased diversity. Reduced encroachment of turf. Zone maintained at <5% weed density.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Hugh Bamford Reserve							
Buffer 9	High	Consists of weed infested vegetation between the playing field and the cliff edge. This vegetation is of high priority has it displays signs of natural resilience and connects to the H1 remnant to the north.	**Targeted weeding -** annuals and vines including the removal of reproduction material to reduce infestation and slowly exhaust seedbank. Target species include vines and woody weeds (*Lantana camara, Olea europaea subsp. cuspidata*). **Delineation –** maintain existing fence to deter access and prevent dogs, cats and foxes. Create edge delineation between the remnant vegetation and the mown turf to prevent the encroachment of grasses. Spray edge recommended with a buffer area of approximately 50 – 200cm sprayed around the buffer patches with a monocot specific herbicide. Any other non-monocotyledonous weeds should be removed by hand. Mulch edge not recommended adjacent to the cliff-line. **Ropes works** - focused around patches of good patches of native shrubs and *Ipomoea indica* roots. If the regeneration of native species from the natural seedbank is not sufficient, post targeted weed works, infill planting may be required to increase the resilience of the vegetation.	Ropes works 4 times per year. Minimum of 12 site visits per year	30-70%	Reduce weed density to <5% by the end of 2022 – 2023 FY. Maintain at <5% weeds ongoing. Natural regeneration of native species and increased connectivity.	Trained bush regenerators.
Remnant H2a	High	Small patch of remnant vegetation located between the buffer plantings on Military Road. Remnant is at risk of becoming dominated by weed species due to being exposed to high density weed areas up slope in Buffers 3, 4 and 5. The remnant is also adjacent to Military Road and could be subject to the transport of weed propagules by vehicles. If not managed, this remnant could be lost.	**Maintenance weeding -** regularly to focus on vines (*Lonicera japonica* and *Ipomoea spp.)* and reducing the growth of *Hydrocotyle bonariensis* and *Asparagus aethiopicus.* Works should be focused on the buffer zones above to reduce the facilitation of weeds downslope. **Create delineation -** installation of a sediment fence along the boundary of buffer zones 3, 4 and 5, in order to contain the weed infestation above. This is particularly important to prevent the spread of weed propagules down slope during primary works in these areas.	6 site visits per year.	30-70%	Zone maintained at <10% weed density.	Trained bush regenerators.
Buffer 3	High	Buffer planting above Military Road and H2 remnant. This zone consists of multiple buffer planting areas which are well-established native shrubs and grasses.	**Containment (High Priority) –** due to the poor condition of the adjacent zone (Buffer 4), priority is to contain the high density weeds. Installation of a sediment fence to control seed dispersal downslope into Buffer 2 and H2a remnant. This sediment fence should continue south along the base of Buffer 4 and Buffer 5. **Targeted weeding –** bush regeneration works above the buffer planting adjacent to Military Road. Target weed species include	2022 – 2023 FY – establish buffer. Primary works and buffer plantings to occur in two year time slots. For example:	30-70%	Mosaic clearing of *Lantana camara* and other persistent woody weeds above the roadside plantings. <50% weed cover by end of 2024 – 2025 FY.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Hugh Bamford Reserve							
			vines and woody weeds (*Lantana camara*), prior to germination to prevent weed seed dispersal downslope. This should be carried out in a mosaic style in order to limit disturbance to fauna likely to be utilising the dense *Lantana* thickets. **Buffer planting –** following bush regeneration, install infill plantings where required. These will serve to buffer the H2a remnant and provide fauna habitat. Suggestions of coir logging and jute matting to assist with erosion control. **Maintain delineation -** between the buffer vegetation and the mown turf to the east to prevent encroachment of exotic grasses.	2023 – 2026 FYs – start primary weed works around existing buffers. Installation of buffer plantings. In 2026 – 2029 repeat and push primary works out. 24 site visits per year.		<30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing. Successful establishment of buffer planting. Planting survival rate of >80% 6 months after planting.	
Buffer 4	Medium	High weed density area above Military Road and H2a remnant. This zone also contains existing buffer planting areas adjacent to the mown turf area.	**Containment (High Priority) –** due to the poor condition of this zone, priority is to contain the high density weeds. Installation of a sediment fence to control seed dispersal downslope into Buffer 2 and H2a remnant whilst primary works take place. This sediment fence should continue to the north and south along the base of Buffer 3 and Buffer 5. **Primary weeding –** bush regeneration works above the buffer planting adjacent to Military Road. Target species include vines and woody weeds (*Lantana camara*). This should be carried out in a mosaic style to limit disturbance to fauna likely to be utilising the dense *Lantana* thickets. Primary weed works to focus around areas of higher quality buffer plantings and extend outwards to increase the chances of natural regeneration. **Buffer planting –** once primary works addressed, future buffer and infill plantings should be installed where required. These will serve to buffer the H2a remnant. Suggestions of coir logging and jute matting to assist with erosion control. Habitat creation should be considered during species selection including species which provide foraging and nesting resources for birds or habitat for ground fauna such as reptiles. **Maintain delineation -** between the remnant vegetation and the mowed turf to prevent the encroachment of grasses.	2022 – 2023 FY – establish buffer. Primary works and buffer plantings to occur in two year time slots. For example: 2023 – 2026 FYs – start primary weed works around existing buffers. Installation of buffer plantings. In 2026 – 2029 repeat and push primary works out. 24 site visits per year.	>70%	Mosaic clearing of *Lantana camara* and other persistent woody weeds above the roadside plantings. <50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing. Successful establishment of buffer planting. Planting survival rate of >80% 6 months after planting.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Hugh Bamford Reserve							
Buffer 5	Medium	High weed density area upslope from Buffer 2 and Military Road. This zone also contains an established buffer planting area in the north-east of the zone adjacent to the Medland-Bamford Ramp.	**Containment (High Priority) –** due to the poor condition of this zone, priority is to contain the high density weeds. Installation of a sediment fence to control seed dispersal downslope into Buffer 2 whilst primary works take place. This sediment fence should continue to the north along the base of Buffer 3 and Buffer 4. **Primary weeding –** bush regeneration works above the buffer planting adjacent to Military Road. Target species include vines and woody weeds (*Lantana camara*). This should be carried out in a mosaic style to limit disturbance to fauna likely to be utilising the dense *Lantana* thickets. Primary weed works to focus around areas of higher quality buffer plantings and extend outwards to increase the chances of natural regeneration. **Buffer planting –** once primary works addressed, future buffer and infill planting should be installed where required. These will serve to buffer the H2a remnant. Suggestions of coir logging and jute matting to assist with erosion control. Habitat creation should be considered during species selection including species which provide foraging and nesting resources for birds or habitat for ground fauna such as reptiles. **Targeted weeding** – targeted treatment of weeds around the edges of established buffer plantings to maintain the quality of the buffer plantings. **Maintain delineation -** between the remnant vegetation and the mown turf to the north of the zone to prevent the encroachment of grasses.	2022 – 2023 FY – establish buffer. Primary works and buffer plantings to occur in two year time slots. For example: 2023 – 2026 FYs – start primary weed works around existing buffers. Installation of buffer plantings. In 2026 – 2029 repeat and push primary works out. 24 site visits per year.	>70%	Mosaic clearing of *Lantana camara* and other persistent woody weeds above the roadside plantings. <50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing. Successful establishment of buffer planting. Planting survival rate of >80% 6 months after planting.	**Primary and targeted weeding and weed containment** - Trained bush regenerators. **Previous buffer planting** – Parks staff **Maintain delineation** – Parks staff
Buffer 2	Medium	Buffer 2 comprises established planted areas adjacent to Military Road.	**Control of dominant natives -** control/trim planted *Acacia longifolia* within the buffer planting areas to allow for the growth and recruitment of other native species. Removed native vegetation should be piled on site to provide fauna habitat. All dead branches and fallen logs should also be left for the same reason. **Maintenance weeding -** regular sweeps to focus on vines (*Lonicera japonica and Ipomoea spp.)* and reducing the growth of *Hydrocotyle bonariensis* and *Asparagus aethiopicus* within the roadside plantings. This will serve to protect the adjacent remnant (H1a).	8 site visits per year.	5-30%	Reduce weed density to <5% by the end of 2022 – 2023 FY. Maintain at <5% weeds ongoing. Decreased dominance of *Acacia longifolia* in buffer planting areas. Decreased presence of weed vines species, *Hydrocotyle bonariensis* and *Asparagus*	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Hugh Bamford Reserve							
						aethiopicus within the roadside plantings.	
Buffer 6	Low	Located along Medland Bamford Ramp on the west of the field. This zone includes a patch of existing buffer plantings along the road verge. Whilst this buffer is not directly adjacent to a remnant, management of weeds in this area will reduce weed seed dispersion within the locality. It also improves habitat connectivity for fauna.	**Containment –** priority of this zone is to contain the high density weeds to the south, particularly above the Sydney Water Wastewater Treatment Plant. **Targeted weeding** – targeted treatment of weeds around the edges of established buffer plantings to maintain the quality of the buffer plantings. Annuals and vines in particular should be targeted including the removal of reproduction material to reduce infestation and slowly exhaust seedbank. **Maintain delineation** – delineation between the mown turf and the buffer area should be Maintained to prevent further encroachment of exotic grasses. Spray or mulch edge recommended.	4 times per year.	30-70%	Containment of high density weed areas. Reduce and maintain to <30% weed density.	Parks staff
Buffer 7	Low	Located to the north of the Sydney Water Wastewater Treatment Plant, in the south-west corner of the field. This zone is largely weed dominated and does not contain any existing buffer plantings. Whilst this buffer is not directly adjacent to a remnant, management of weeds in this area will reduce weed seed dispersion within the locality. It also improves habitat connectivity for fauna.	**Containment –** priority of this zone is to contain the high density weeds, particularly above the Sydney Water Wastewater Treatment Plant. **Targeted weeding -** annuals and vines including the removal of reproduction material to reduce infestation and slowly exhaust seedbank. **Maintain delineation** – delineation between the mown turf and the buffer area should be Maintained to prevent further encroachment of exotic grasses. Spray or mulch edge recommended.	4 times per year.	>70%	Containment of high density weed areas. Reduce and maintain to <30% weed density.	Parks staff
Buffer 8	Low	Located to the north of the Sydney Water Wastewater Treatment Plant, in the south-east corner of the playing field. This zone includes established buffer plantings. Whilst this buffer is not directly adjacent to a remnant, management of weeds in this	**Containment –** priority of this zone is to contain the high density weeds to the west (Buffer 7) from dominating the existing buffer plantings. **Targeted weeding -** annuals and vines including the removal of reproduction material to reduce infestation and slowly exhaust seedbank.	4 times per year.	>70%	Containment of high density weed areas. Reduce and maintain to <30% weed density.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Hugh Bamford Reserve							
		area will reduce weed seed dispersion within the locality. It also improves habitat connectivity for fauna.	**Maintain delineation** – delineation between the mown turf and the buffer area should be Maintained to prevent further encroachment of exotic grasses. Spray or mulch edge recommended.				
Remnant H2b		No longer exists					
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish two photo-points within each buffer zone, one photo-point in H2a and two photo-points in all other remnant zones • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	Trained bush regenerators.

9 BONDI GOLF COURSE & WILLIAMS PARK

Figure 9-1. Remnant vegetation adjacent to Bondi Golf Course

Bondi Golf Course and Williams Park remnant vegetation persists along the cliff line to the east of the recreational spaces including the Murriverie Pass. The remnant vegetation is made up of 5787m^2 of Sea-cliff Heath and Sea-cliff Sedgeland. The park includes an Aboriginal engraving site which features clifftop engravings of a whale, humans, fish and mundoes. Mundoes are Aboriginal rock carvings of human-like footprints that are usually restricted to sacred sites as they indicate a spiritual path to be followed.

The 2009 Waverley Council Landscape Plan for Bondi Golf Course incorporated plant species tolerant of the exposed environment and reflective of the Aboriginal heritage including *Lomandra spp.* which was traditionally used for weaving baskets. Waverley Council acknowledges the Bidjigal and Gadigal people who traditionally occupied the Sydney coast and adopted a Reconciliation Action Plan in 2014 which aims to protect the carvings of the Bondi Golf Course.

9.1 FLORA

The 2020 Flora Survey report determined all remnants to be in 'Very Poor' condition with the exception of a small patch of vegetation in the Murriverie Pass. Total Earth Care's mapping is consistent with this due to the extensive infestation of turf species into the remnant vegetation, reducing the resilience of the remnant vegetation. Delineation and control of exotic grass invasion will be a priority action for this site.

The Sea-cliff Heath is an open to closed low growing community within 50m of sea cliffs on skeletal sand to sand lenses on sandstone with impeded drainage. Typical remnant species include *Baeckea imbricata, Banksia ericifolia, Melaleuca armillaris, Melaleuca* nodosa and *Westringia fruticosa.* The Sea-cliff Sedgeland is dominant in *Ficinia nodosa* which is located within 20m of the sea cliffs, has an open canopy growing on skeletal sand to sand lenses on sandstone, often on modified soils (SBRC 2020). Along with the encroachment of *Centaurium tenuiflorum* and other turf species, into the Sea-cliff remnants, invasion of Asparagus aethiopicus *Lantana camara* and *Asparagus aethiopicus* is also problematic.

Table 9-1 – Bondi Golf Course & Williams Park Native Flora Species (SBRC 2020)

Scientific Name	Common Name	Scientific Name	Common Name
Acacia longifolia	Coastal Wattle	*Lobelia anceps*	Angled Lobelia
Baeckea imbricata	Heath Myrtle	*Lomandra longifolia*	Spiny-headed Mat-rush
Carpobrotus glaucescens	Pigface	*Melaleuca armillaris*	Bracelet Honey-myrtle
Dianella congesta	Beach Flax-lily	*Melaleuca nodosa*	Prickly-leaved Paperbark
Dichelachne crinita	Longhair Plumegrass	*Monotoca elliptica*	Tree Broom-heath
Dillwynia retorta	Heathy Parrot-pea	*Opercularia aspera*	Coarse Stinkweed
Epaltes australis	Spreading Nut-heads	*Tetragonia tetragonioides*	New Zealand Spinach
Ficinia nodosa	Knobby Club-rush	*Westringia fruticosa*	Coastal Rosemary
Isolepis cernua	Nodding Club-rush	*Xanthosia pilosa*	Woolly Xanthosia
Leptospermum laevigatum	Coast Teatree	*Zoysia macrantha*	Prickly Couch

9.2 FAUNA

The Bondi Golf Course and Williams Park is highly exposed to the elements subject to high winds, and scorching heat. Small pockets of microhabitats and rock crevices are essential for the species that inhabit the cliff-tops. The flora habitat is not considered diverse as the majority of remnant occupies a thin linear space on the cliff-tops. Some change in soil

moisture levels occurs as a result of drainage patterns where sedgeland is supported. The Large open rock platforms provide an abundance of basking and foraging areas for native skinks. Ephemeral pools, damp sedgeland and low heath provide potential breeding and foraging habitat for frogs. The more dense heath vegetation surrounding the Murriverie Pass provides sheltering and nesting opportunities for smaller passerine birds, whilst the airspace above the cliff line would provide foraging habitat for larger birds of prey. The crevices and overhangs within the Murriverie Pass are sheltered and likely to be used by nesting swallows and martins, which are a social species foraging on insects in large flocks. Overhangs and crevices are also likely to be utilised by roosting microbats. The Grey-headed Flying-fox (*Pteropus poliocephalus*) (Vulnerable under the BC Act and EPBC Act) has also been recently recorded at this site and may forage on some of the native flowering shrub species.

9.3 MANAGEMENT ACTIONS

9.3.1 Previous works

No previous bush regeneration work has been undertaken at this site as it has not previously been included in the previous BAP 2014-20 and it is not currently Council managed land.

9.3.2 Key management actions

Management priority of this site is high as it has potential to extend the corridor from Hugh Bamford Reserve in the north. Key management actions generally include:

- **Buffer planting:** along the cliff edge to create a buffer between turfed Golf Course and the remnant vegetation. Buffer plantings will increase the overall aesthetics of the site and the safety of the site by placing a barrier between pedestrians and the cliff edge. Buffer plantings will also increase connectivity, create habitat, increase diversity and protect the remnants from weed encroachment.
- **Delineation**: following buffer planting formal edge delineation should be installed to prevent the encroachment of exotic grasses. This will reduce future maintenance and facilitate a reduction of exotic species within the remnant.
- **Ropes works:** targeting weeds including *Asparagus aethiopicus, Chyrsanthemoides monilifera* and *Lantana camara* along the edge of the cliff. Ropes work is required due to inaccessibility and the hazard of the cliff edge.
- **Maintenance weeding:** targeting germinating perennial and annual weeds including *Asparagus aethiopicus, Anredera cordifolia* and *Centaurium tenuiflorum.* Elimination of *Coprosma repens* and woody weeds. Maintenance will reduce the re-establishment of weeds. Woody weeds should be targeted to prevent potential reduction in size of remnants, however removal should be staged as weeds may be stabilizing cliff edge and providing habitat to fauna species. To protect patches of *Ficinia nodosa* on rocky areas, weeding should progress outwards from the *Ficinia* patches clearing rock shelves of weeds and creating more habitat for the remanet to expand.
- **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species.
- **Ecological monitoring:** using photo points and species counts. Ecological monitoring will be reported annually and provide data to support the meeting of goals.

Additionally, this site would be suited to trialling a sugar treatment of annual weeds to alter the soil pH which would reduce recruitment of annuals over time.

The weed densities and management actions for the different areas are shown in Map 9-1 and provided in Table 9-2. Detailed methodologies for the recommended management actions are provided in Appendix A.

9.4 PREDICTIONS AND RECOMMENDATIONS FOR ACHIEVING EAP4 OBJECTIVES

This site was not covered by the previous BAP (TEC 2014) and so implementation of management at this site is expected to result in significant improvement to the condition of remnant vegetation. The provision of buffer planting, delineation and weeding is expected to protect the existing remnant vegetation, particularly the core of the remnants G2 and G3 and avoid further encroachment of grasses into the patches.

Patches G2 and G3 will likely be able to be restored to 'good' condition by 2040. The installation of buffer plantings along the remnants G1 and G4 will contribute to the no net-loss targets of these remnants.

Management at this site will improve the existing vegetation and the connectivity of the habitat corridor along the coastline by improving vegetation condition and encouraging the regeneration of native species. This will provide more habitat for fauna to utilise and provide protected passage between existing patches of remnant vegetation.

The use of a combination of hand removal and herbicide spraying is recommended within the core remnant to increase the area available for native species occurrence. The use of herbicide spraying will be required during early stages of management and in high priority areas due to the high degree of weed cover, particularly exotic grasses.

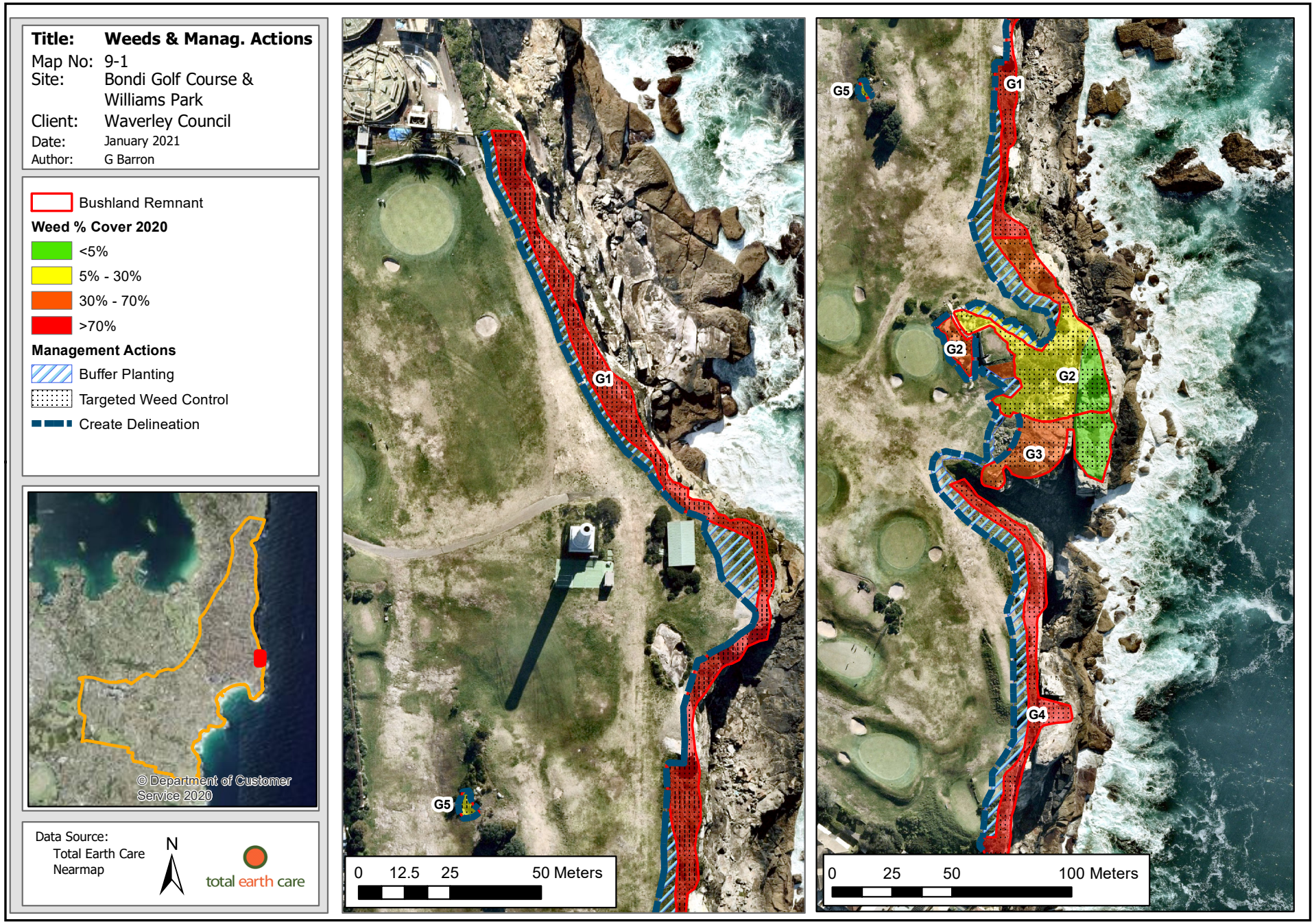
Title: Weeds & Manag. Actions
Map No: 9-1
Site: Bondi Golf Course & Williams Park
Client: Waverley Council
Date: January 2021
Author: G Barron
Bushland Remnant
Weed % Cover 2020
<5%
5% - 30%
30% - 70%
>70%
Management Actions
Buffer Planting
Targeted Weed Control
Create Delineation
© Department of Customer Service 2020
Data Source:
Total Earth Care
Nearmap
N
total earth care
G1
G5
0 12.5 25 50 Meters
G1
G5
G2
G2
G3
G4
0 25 50 100 Meters

TABLE 9-2 – BONDI GOLF COURSE & WILLIAMS PARK REMNANTS MANAGEMENT ZONES AND ACTIONS

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Bondi Golf Course & Williams Park							
Remnant G2	High	This zone is located on the cliffs and rock ledge north of the Murriverie Pass and encompasses 2050m^2 of Sea-Cliff Heath.	**Maintenance weeding –** targeting germinating perennial and annual weeds. Control of *Asparagus aethiopicus, Anredera cordifolia* and *Centaurium tenuiflorum.* Elimination of *Coprosma repens* and woody weeds on the flat cliff-top, not along the cliff face where ropes work is required. **Ropes work (low priority) –** target *Asparagus aethiopicus, Chyrsanthemoides monilifera* and *Lantana camara* along the edge of the cliff. Woody weeds should be targeted to prevent potential reduction in size of remnant, however removal should be staged as weeds may be stabilising the cliff edge and providing habitat to fauna species. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species.	Minimum of 6 visits per year. Ropes work four times per year.	5-30%	Zone to reach and maintain at <5% weed density. Recruitment of native seedbank.	Trained bush regenerators.
Remnant G3	High	Located on the south-eastern point of the Murriverie Pass and encompasses 997m^2 of Sea-cliff Sedgeland: c) *Ficinia nodosa.*	**Targeted weeding –** targeting germinating perennial and annual weeds. Control of *Asparagus aethiopicus, Anredera cordifolia* and *Centaurium tenuiflorum.* **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species.	Minimum of 6 visits per year. Ropes work four times per year. Plantings are best planted during growing season (Autumn/Spring) to maximise plant survival rates. Water regularly after installation, which is to be increased in hot and/or windy conditions during the establishment phase (6 weeks) and then as required.	30-70%	Zone to reach <10% weed density. Recruitment of native seedbank. Planting survival rate of >80% 6 months after planting.	Trained bush regenerators.
Buffer 1	High	Creation of a new buffer along the cliff-top between the remnants and the golf course grass. The area for the proposed plantings currently comprises mown grass.	**Buffer planting –** occurs along the cliff edge to create a buffer between turfed Golf Course and the remnant vegetation. Buffer plantings will increase the overall aesthetics of the site and the safety of the site by placing a barrier between pedestrians and the cliff edge. Buffer plantings will also increase connectivity, create habitat, increase diversity and protect the remnants from weed encroachment. A gap may be left between the remnant edge and the buffer planting in order to allow areas for natural regeneration and expansion of the remnants. However, if this approach is to be taken more resources will be required to manage weeds in between	Plantings are best planted during growing season (Autumn/Spring) to maximise plant survival rates. Water regularly after installation, which is to be increased in hot and/or windy conditions during the establishment phase (6 weeks) and then as required.	-	Establishment of buffer plantings and connectivity between Hugh Bamford Reserve in the north and remnant vegetation in the south and along the eastern edge of Bondi Golf Course. Establishment of buffer plantings and connectivity.	Parks staff.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Bondi Golf Course & Williams Park							
			the plantings and remnant in order to protect the condition of the remnant. **Create delineation –** following buffer plantings the edge should be delineated between the mown lawn and planted vegetation to ensure no encroachment of exotic grasses. The buffer in turn protects the edge of the remnant. Spray edge is recommended with a buffer area of approximately 50 – 200cm sprayed around the buffer patches with a monocot specific herbicide. Any other non-monocotyledonous weeds should be removed by hand. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species.			Planting survival rate of >80% 6 months after planting. Recruitment of native seedbank. Containment and reduced encroachment of turf into the adjacent remnants.	
Remnant G4	Medium	Extends south from the Murriverie Pass along the cliff edge and encompasses 1265m^2 of Sea-cliff Sedgeland: c) *Ficinia nodosa*.	**Ropes work** – Ropes work to target *Asparagus aethiopicus, Chyrsanthemoides monilifera* and *Lantana camara* along the edge of the cliff. Woody weeds should be targeted to prevent potential reduction in size of remnant, however removal should be staged as weeds may be stabilising the cliff edge and providing habitat to fauna species. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species.	Ropes work four times per year to control *Asparagus aethiopicus* and *Chyrsanthemoides monilifera* infestation. Minimum of 6 site visits per year.	>70%	Recruitment of native seedbank. No loss of remnant vegetation.	Trained bush regenerators.
Remnant G1	Medium	The northern most zone within Bondi Golf course consisting of Sea-cliff Sedgeland: c) *Ficinia nodosa*. This is the largest zone spanning 1447m^2.	**Ropes work –** targeting *Asparagus aethiopicus, Chyrsanthemoides monilifera* and *Lantana camara* along the edge of the cliff. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species.	Ropes work four times per year. A minimum of 8 site visits per year.	>70%	Recruitment of native seedbank. No loss of remnant.	Trained bush regenerators.
Remnant G5	Low	The remnant vegetation potentially no longer exists here has it was classified as “to disturbed to discern” (SBRC 2020). The vegetation present is native plantings and some	**Create delineation –** between the remnant vegetation and the mowed turf to prevent the encroachment of grasses. **Maintenance weeding –** targeting germinating perennial and annual weeds.	Site visit four times per year.	5-30%	Reduced encroachment of turf. Zone maintained at <5% weed density.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Bondi Golf Course & Williams Park							
		mature *Banksia integrifolia.*					
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish two fixed photo monitoring points within each remnant. • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	Trained bush regenerators.

10 SOUTH CLIFFTOP REMNANTS - Bronte to Tamarama, South Bondi & Gaerloch to South Bondi

Figure 10-1. Remnant vegetation along the cliffs at Gaerloch to South Bondi

The South Clifftop remnants consist of pockets of vegetation adjoining small public parks and cliff coastlines. These patches include the vegetation communities of Sea-cliff Heath, Sea-cliff Sedgeland, Sea-cliff Herbland, Sea-cliff Grassland, Imperata Grassland and Beach Grassland (SBRC 2020), the latter of which is rare in the LGA. Although these patches are typically small in size, they exhibit a diversity of niche vegetation communities and provide connective patches along the coastline.

The remnants at Gaerloch to South Bondi, South Bondi and Bronte to Tamarama are located within an area of local heritage significance listed for their natural and scenic coastal landscapes which include the native vegetation and restorative plantings. The Mirror Bush (*Coprosma repens*) at the Bronte to Tamarama patches (T3a, T3b, T7) are protected under the listing of 'Tamarama Beach, Park & Marine Drive' (OEH, 2000).

10.1 FLORA

These patches are considered to be in in 'very poor' condition primarily due to the presence of weeds including *Rumex sagittatus, Hydrocotyle bonariensis, Coprosma repens* and *Asparagus aethiopicus* (SBRC 2020). However, at Gaerloch to South Bondi there is a strong population of the native grass*, Sporobolus virginicus* (Apunga 2019b).

The vegetation communities of Sea-cliff Sedgeland and Sea-cliff Herbland are present at the Gaerloch to South Bondi, Bronte to Tamarama and South Bondi. Sea-cliff Heath is also present at the latter two sites. Sea-cliff Grassland is present at South Bondi and Gaerloch to South Bondi. Beach Grassland is present at Bronte to Tamarama and Imperata Grassland is present at South Bondi.

The three grassland communities vary depending on the location, key species and soils present. Sea-cliff Grassland is low to open community dominated *by Paspalum vaginatum, Sporobolus virginicus* and *Zoysia macrantha* and is located on skeletal sands with impeded drainage. Beach Grassland is a low open vegetation community dominated by *Sporobolus virginicus* which occurs on deep marine sands. Comparatively, Imperata Grassland is an open to closed community dominated by *Imperata cylindrica* and located on deeper, disturbed sandy soils. Imperata Grassland is much more common across the LGA (SBRC 2020).

South Bondi has the largest diversity of species in this group with 21 species observed (SBRC 2020). This can be attributed to the variation within the five different vegetation communities present along this section of coastline.

Table 10-1 – Native Flora Species of the South Clifftop Remnants (SBRC 2020)

Scientific Name	Common Name	Gaerloch to South Bondi	South Bondi	Bronte to Tamarama
Acacia longifolia	Coastal Wattle		X	
Adiantum aethiopicum	Common Maidenhair		X	
Apium prostratum var. filiforme	Sea Celery			X
Atriplex semibaccata	Creeping Saltbush	X	X	X
Carex pumila			X	X
Commelina cyanea	Native Wandering Jew	X	X	

Scientific Name	Common Name	Gaerloch to South Bondi	South Bondi	Bronte to Tamarama
Cyperus polystachyos	Bunchy Sedge	X	X	X
Dianella congesta	Beach Flax-lily	X	X	
Ficinia nodosa	Knobby Club-rush	X	X	X
Imperata cylindrica	Blady Grass		X	
Isolepis cernua	Nodding Club-rush	X	X	X
Lachnagrostis billardierei	Coast Blown-grass	X	X	X
Lachnagrostis filiformis	Blown Grass	X		X
Lobelia anceps	Angled Lobelia	X	X	X
Lomandra longifolia	Spiny-headed Mat-rush		X	
Monotoca elliptica	Tree Broom-heath	X	X	
Paspalum vaginatum	Salt-water Couch	X	X	
Samolus repens	Creeping Brookweed	X		X
Sonchus hydrophilus	Native Sowthistle		X	
Sporobolus virginicus	Sand Couch	X	X	
Tetragonia tetragonioides	New Zealand Spinach	X	X	
Triglochin striata	Streaked Arrowgrass		X	X
Zoysia macrantha	Prickly Couch	X	X	X

10.2 FAUNA

The rocky cliff line provides roosting habitat for a multitude of marine bird species. The Silver Gull (*Chroicocephalus novaehollandiae*), White-faced Heron (*Egretta novaehollandiae*), Cape Gannet (*Morus capensis*), Great Cormorant (*Phalacrocorax carbo*) were observed flying by, foraging in the ocean and resting on the sea cliffs (SBRC 2020).

The low lying native and exotic shrubs and grass and sedge species typical of this area provide sheltering and foraging resources for small passerine birds such as the Superb Fairy-wren (*Malurus cyaneus*) and Variegated Fairy-wren (*Malurus lamberti*) as well as reptiles. Leaf litter and rocky outcrops provide basking and foraging opportunities for reptiles such as Sunskinks (*Lampropholis guichenoti*) and provided pockets of moisture in high rainfall events for amphibian species. These patches provide important islands of vegetation to support connectivity for fauna to move along the coastline.

10.3 MANAGEMENT ACTIONS

10.3.1 Previous works

A significant amount of effort has been undertaken in remnant patches Z13a-c and the surrounding buffer areas to establishing stable pocket of vegetation and eradicate or minimise *Asparagus aethiopicus*, *Salpichroa organifolia, Hydrocotyle bonariensis* and *Anredera cordifolia* (Apunga 2019b).

Other small patches around the coastline at Gaerloch to South Bondi, South Bondi and Bronte to Tamarama have been generally hand weeded or by rope work. Weed species in these areas include *Bryophyllum delagoense, Hydrocotyle bonariensis* and *Rumex sagittatus.*

10.3.2 Key management actions

A large proportion of remnants are isolated and difficult to access, therefore are of lower priority. The management of the buffer plantings is often of higher priority than the remnant itself as the buffer plantings would support the condition of the remnant, and contribute to the objective of no-net loss of remnant vegetation be reducing the pressure of weed encroachment and lack of connectivity.

Currently there is little habitat connectivity around the remnants from Tamarama to Bronte (Map 10-3) and remnants are largely isolated and of low diversity. Alternative methods such as direct seeding within the remnants could be trialed as soils are generally too shallow to infill plant.

Key management actions generally include:

- **Targeted weeding:** targeting infestations of herbaceous weeds such as *Parietaria judaica, Coprosma repens, Gazania tomentosa and Ageratina adenophora*. Target annual weeds before seeding to prevent germination.
- **Buffer planting:** infill planting within existing buffer zones to increase diversity and improve habitat for fauna. This is particularly important where monocultures of natives such as *Acacia longifolia* have established, which would have a low resilience to

disturbance. The creation of new buffer planting to create connectivity, particularly at Tamarama.

- **Maintenance weeding:** target annual weeds before seeding to prevent germination at most patches.
- **Habitat creation:** there is opportunity for habitat creation within buffer zones. It is recommended that a diversity of at least 20 species if achieved from a variety of grasses and nectar providing species. Where sandstone exists, it is important to clear them of weedy ground covers such to provide basking habitat for amphibians. The introduction of sandstone boulders and logs would encourage the retention of water and make the sites more inhabitable for amphibians and decaying wood adds nutrients to the soils and attracts insects. This will also assist with erosion control in steep areas.
- Ecological monitoring: using photo points and species counts. Ecological monitoring will be reported annually and provide data to support the meeting of the objectives**.**

The weed densities and management actions for the different areas are shown in Map 10-1, Map 10-2 and Map 10-3 and provided in Table 10-2, Table 10-3 and Table 10-4. Detailed methodologies for the recommended management actions are provided in Appendix A.

Alternative management actions include:

- **Sandstone capping:** particularly between Tamarama and Bronte along the cliffline (between remnants Z15a and T3a) to create connection between remnants and combat weed encroachments. This should be a staged trial as the nature of the site may make this challenging and to manage removal and re-establishment of fauna habitat. Coir logs and jute mesh will be required to stabilise the capping See Appendix A for more detail. Other areas that could utilise this method include
- **Direct seeding:** of local provenance seeds, within clifftop remnants with low diversity to improve diversity thus improve resilience to disturbance. This can also be used on in the sandstone capping areas and can be combined with planting.

10.4 PREDICTIONS AND RECOMMENDATIONS FOR ACHIEVING EAP4 OBJECTIVES

Management at these patches generally aims to ensure no net-loss of remnant patches by focusing on the management of buffer planting. This is particularly relevant to the patches at South Bondi and Gaerloch to South Bondi which have previously unworked vegetation and infestations of *Coprosma repens.*

With adequate weeding and management of the associated buffers, it is possible that remnant patch Z13d, Z13f, Z13i and Z14a can likely be maintained in 'good' condition by 2040. Other patches which are isolated and display low diversity would take significant work to increase the remnant to 'good' condition. These patches would require ropes work to target hard to reach infestations, and should be prioritised to ensure remnants are not lost. Diversity could be increased through direct seeding method as planting is not viable on shallow cliff edge soils.

The management of the remnant patch Buffer 3 is of high priority to ensure the nearby remnants Z12f and Z12a are not lost. Buffer 3 also an important connective habitat for fauna passage and requires infill planting within the buffer to increase diversity and improve microhabitat. Currently Buffer 3 contains a monoculture of *Acacia longifolia*, and infestations of *Stenotaphrum secundatum*. The buffer would benefit from the planting of a variety of nectar provide shrubs, and a variety of native grasses to attract a more diverse assemblage of pollinators, reptiles and birds.

Overall, the improvement of buffers along the coastline of Gaerloch to South Bondi is important as they double the habitat availability. The planting in these buffers (Buffer 3, 6, 7 and 8) would encourage complexity in the vegetation and improve habitat and passage for native fauna.

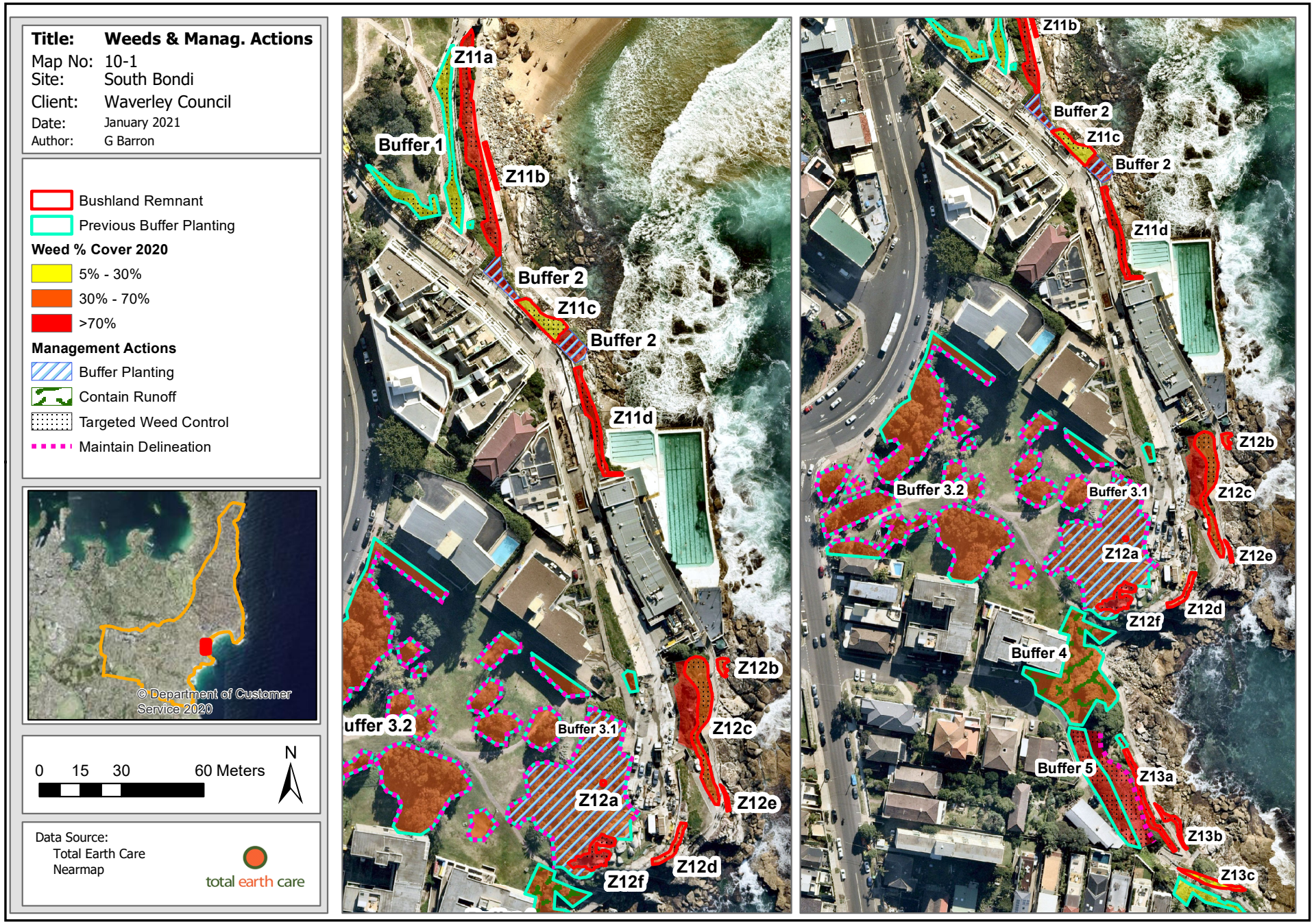
Title: Weeds & Manag. Actions
Map No: 10-1
Site: South Bondi
Client: Waverley Council
Date: January 2021
Author: G Barron
Bushland Remnant
Previous Buffer Planting
Weed % Cover 2020
5% - 30%
30% - 70%
>70%
Management Actions
Buffer Planting
Contain Runoff
Targeted Weed Control
Maintain Delineation
© Department of Customer Service 2020
0 15 30 60 Meters
N
Data Source:
Total Earth Care
Nearmap
total earth care
Z11a
Buffer 1
Z11b
Buffer 2
Z11c
Buffer 2
Z11d
Z12b
uffer 3.2
Buffer 3.1
Z12c
Z12a
Z12e
Z12f
Z12d
Z11b
Buffer 2
Z11c
Buffer 2
Z11d
Z12b
Buffer 3.2
Buffer 3.1
Z12c
Z12a
Z12e
Z12f
Z12d
Buffer 4
Buffer 5
Z13a
Z13b
Z13c

TABLE 10-2 – SOUTH CLIFFTOP REMNANTS MANAGEMENT ZONES AND ACTIONS – SOUTH BONDI (MAP 10-1)

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
South Clifftop Remnants – South Bondi (Map 10-1)							
Remnant Z12b-e	High	**South Bondi (Map10-1) –** South of Bondi Icebergs Club. Consists of two patches of Sea-cliff Sedgeland dominant in *Ficinia nodosa* and Sea-cliff Grassland. Remnant patches are largely isolated due to fragmentation from the sea-cliffs and public pathway. These patches are of priority to ensure remnants are not completely overrun by weed species and lost.	**Targeted weeding –** control and contain weed infestations. Target weed species include *Coprosma repens, Gazania tomentosa* and exotic grasses. **Maintenance weeding –** target annual weeds before seeding to prevent germination. **Buffer planting –** potential for buffer plantings of native grasses above Z12c to increase connectivity, decrease weed encroachment and ensure no net loss of remnants.	Minimum of 6 site visits per year.	30-70%	Reduce and maintain at <5% weed density by 2024 – 2025 FY. No net loss of remnant. Increased connectivity through buffer plantings. Buffer planting survival rate of >80% 6 months after planting. Signs of regeneration aided by direct seeding.	Trained bush regenerators.
Remnant Z11c	High	**South Bondi (Map10-1) –** North of Bondi Icebergs Club. Consists of 100m^2 of Imperata Grassland, in fairly good condition. This patch is isolated by two weed plumes (Buffer 2) and it is a high priority to ensure no encroachment.	**Contain:** weed infestations north and south of remnant patch to ensure no encroachment. **Targeted weeding –** target woody and herbaceous weed infestations such as *Coprosma repens* and *Asparagus aethiopicus.* **Maintenance weeding –** target annual weeds before seeding to prevent germination.	Minimum of 4 visits per year.	5-30%	Reduce and maintain <5% weed density within first year. Natural native regeneration.	Trained bush regenerators.
Buffer 3.1	High	**South Bondi (Map10-1) –** Hunter Park. Consists of buffer vegetation that is dominated by *Acacia longifolia* protecting remnant Z12a	**Maintain delineation –** maintain buffer edge around native vegetation. This can be achieved by spraying and mulching (re-mulched every 2 to 3 years). Permanent delineation to stop future encroachment of exotic grasses into buffer plantings and reduce maintenance. Once exotic grass species are controlled, there is potential for natural native germination or ground species. Control public access into established buffer plantings. **Targeted weeding –** targeting infestations of herbaceous weeds such as *Parietaria judaica* and *Ageratina adenophora*. Target annual weeds before seeding to prevent germination.	Minimum of 8 visits per year. Buffer/infill planting only to occur once exotic grasses and reoccurring annuals are controlled.	30-70%	Reduce and maintain at <5% weed density by 2023 - 2024. Containment and reduced encroachment of turf. Permanent delineation established by 2023 – 2024 FY. Recruitment of native seedbank. Increased diversity.	**Delineation** – parks staff **Targeted weeding, control of dominant natives, buffer planting and habitat creation** - trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
South Clifftop Remnants – South Bondi (Map 10-1)							
			Control of dominant natives – *Acacia longifolia* has become a dominant species and needs trimming and removal to promote diversity. **Infill planting –** infill planting within buffers if natural regeneration is not successful to increase diversity and replace thinned out Acacias. **Habitat creation –** It is recommended that a diversity of at least 15 species if achieved from a variety of grasses and nectar providing species. Clear natural bushrock of weeds and dominant groundcovers to allow for basking opportunities for reptiles. Retain fallen logs and branches.			Planting survival rate of >80% 6 months after planting.	
Remnant Z13a-c	High	**Gaerloch to South Bondi (Map 10-1) –** Marks Park. Consists of 200m^2 of Sea-cliff Grassland highly infested with garden exotics. Primary works in Buffer 5 upslope will reduce maintenance in this area. Remnant patches are largely isolated due to fragmentation from the sea-cliffs and public pathway. These patches are of priority to ensure remnants are not completely overrun by weed species and lost.	**Targeted weeding –** once above buffer is controlled. Control and contain weed infestations. Target weed species include *Coprosma repens, Gazania tomentosa, Geranium spp. Anredera cordifolia, Canna x generalis* and *Rumex sagittatus.* Target annual weeds before seeding to prevent germination. **Ropes work –** to target priority weeds.	Minimum of 12 times per year once weeds are controlled in the buffer upslope.	70%	Reduce and maintain at <20% weed density by 2027 – 2028 FY. Recruitment of native seedbank. No loss of remnants.	Trained bush regenerators.
Buffer 3.2	Medium	**South Bondi (Map10-1) –** Hunter Park. Consists of scattered stands of buffer vegetation.	**Maintain delineation –** maintain buffer edge around native vegetation. This can be achieved by spraying and mulching (re-mulched every 2 to 3 years). Permanent delineation to stop future encroachment of exotic grasses into buffer plantings and reduce maintenance. Once exotic grass species are controlled, there is potential for natural native germination or ground species. Control public access into established buffer plantings. **Targeted weeding –** targeting infestations of herbaceous weeds such as *Parietaria judaica* and *Ageratina adenophora*. Target annual weeds before seeding to prevent germination.	Minimum of 8 visits per year. Buffer/infill planting only to occur once exotic grasses and reoccurring annuals are controlled.	30-70%	Reduce and maintain at <5% weed density by 2023 - 2024. Containment and reduced encroachment of turf. Permanent delineation established by 2023 – 2024 FY. Recruitment of native seedbank.	**Delineation** – parks staff **Targeted weeding, control of dominant natives, buffer planting and habitat creation** – Parks staff in consultation with Urban Ecology team.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
South Clifftop Remnants – South Bondi (Map 10-1)							
			Control of dominant natives – *Acacia longifolia* has become a dominant species and needs trimming and removal to promote diversity. **Infill planting –** infill planting within buffers where required. **Habitat creation –** It is recommended that a diversity of at least 15 species if achieved from a variety of grasses and nectar providing species. Clear natural bushrock of weeds and dominant groundcovers to allow for basking opportunities for reptiles. Retain fallen logs and branches.			Increased diversity. Planting survival rate of >80% 6 months after planting.	
Buffer 5	Medium	**South Bondi (Map10-1) –** Consists of buffer plantings a dense thickets of weeds above remnants Z13a-b, will need to be contained to prevent propagule dispersion into the remnants.	**Containment (high priority) –** seed dispersal and erosion needs to be controlled along the drainage line. **Maintain delineation –** to aid containment of weed infestation by installing sediment fencing. **Maintenance weeding (high priority) –** a large portion of the buffer plantings are established and resilient. Target annual weeds before seeding to prevent germination. **Primary weeding (low priority) –** targeting infestations of woody weeds, herbaceous weeds and exotic grasses. Target weeds include *Coprosma repens, Parietaria judaica, Geranium spp. Anredera cordifolia, Canna x generalis* and *Rumex sagittatus.* **Buffer planting –** buffer planting to increase connectivity and diversity.	**2021 – 2026 FY –** Minimum of 8 visits per year. **Subsequent years –** Minimum of 6 visits per year.	70%	Reduce weed density to <20% by end of 2026 FY. Maintain at <20% weed density. Increased connectivity and diversity. Recruitment of native seedbank. Planting survival rate of >80% 6 months after planting.	Trained bush regenerators.
Buffer 2	Medium	**South Bondi (Map10-1) –** North of Bondi Icebergs Club. Consists of weed plumes north and south of the Z11c remnant patch which have potential to be rehabilitated to create a buffer.	**Containment (high priority) –** contain infestation to ensure no encroachment into remnant. **Primary weeding –** mosaic clearing targeting woody and herbaceous weeds. Target weeds are *Coprosma repens, Geranium spp. Ricinus communis* and *Asparagus aethiopicus.* **Buffer planting –** extend buffer planting north and south of remnant patch Z11c to increase resilience and connectivity. **Maintenance weeding –** target annual weeds before seeding to prevent germination. Ensure a gap around Z11c is maintained to allow to expansion of remnants.	Minimum of 18 site visits per year until 2025 – 2026 FY. Minimum of 6 site visits subsequently for maintenance weeding.	>70%	Reduce and maintain <10% weed density by 2025 – 2026 FY. Establishment of buffer plantings and increased connectivity Planting survival rate of >80% 6 months after planting.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
South Clifftop Remnants – South Bondi (Map 10-1)							
Remnant Z11a-b	Low	**South Bondi (Map 10-1) -** South Bondi Beach. Consists of 330m^2 of Sea-cliff Grassland.	**Contain –** remnant vegetation is isolated. Works should focus on containment. **Primary weeding –** mosaic clearing targeting woody and herbaceous weeds such as *Coprosma repens, Rumex sagittatus* and exotic grasses. **Infill Planting –** natural regeneration is unlikely and the area may need to be revegetated post primary works. Planting to incorporate local sourced or propagated species of Sea-cliff Grassland to maintain genetic integrity.	Minimum of 6 visits per year.	>70%	Containment of weeds. No loss of remnant.	Trained bush regenerators.
Buffer 1	Low	**South Bondi (Map10-1) –** South Bondi Beach. Consists of the buffer plantings west of the Z11a remnant patches. This buffer is isolated from remnants by the public pathway therefore is of low priority, but provides a good opportunity for habitat improvement.	**Maintenance weeding –** target annual weeds before seeding to prevent germination. **Habitat creation** – It is recommended that a diversity of at least 20 species if achieved from a variety of grasses and nectar providing species. Introduce sandstone boulders and retain fallen logs and branches.	Minimum of 4 visits per year.	5-30%	Reduce and maintain weed density <5% by 2023 – 2024 FY.	Trained bush regenerators.
Remnant Z11d	Low	**South Bondi (Map 10-1) –** North of Bondi Icebergs Club. Consists of 108m^2 of Sea-cliff Herbland dominant in *Dianella congesta.*	**Contain –** remnant vegetation is isolated. Works should focus on containment. **Targeted weeding –** target woody and herbaceous weed infestations such as *Coprosma repens* and *Asparagus aethiopicus.*	Minimum of 2 visits per year. Likely to need ropes work but not a high priority.	>70%	Weed density reduced. Containment of weeds.	Trained bush regenerators.
Remnant Z12a and f	Low	**South Bondi (Map 10-1) –** Hunter Park Consists of 95m^2 of Sea-cliff Herbland predominant in *Dianella congesta.* The remnant will benefit from works in the surrounding buffer.	Will benefit from targeted weed works and delineation in the surrounding buffer. **Targeted weeding –** target infestations of herbaceous weeds and exotic grasses such as *Bidens pilosa* and *Centaurium tenuiflorum*.	Minimum of 4 visits per year.	>70%	Reduce and maintain at <5% weed density. Natural regeneration.	Trained bush regenerators.
Buffer 4	Low	**South Bondi (Map10-2) –**16 Wilga St, Bondi	**Containment and control runoff (high priority) –** seed dispersal and erosion needs to be controlled along the drainage line. Installation of sediment fencing.	Minimum of 4 visits per year.	30-70%	Control runoff and propagule dispersion by 2023 – 2024 FY.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
South Clifftop Remnants – South Bondi (Map 10-1)							
		Consists of buffer vegetation south of the Z12 remnant. Drainage and erosion problems are causing consistent weed infestations e.g. *Parietaria judaica* and *Ageratina adenophora.*	**Targeted weeding –** target infestations of herbaceous weeds due to high seed dispersal. Target annual weeds before seeding to prevent germination. **Buffer planting –** once sediment and hydrology is contained, area has potential for revegetation. **Maintenance weeding –** a large portion of the buffer plantings are established and resilient. Target annual weeds before seeding to prevent germination. Maintenance of young buffer plantings.	Plantings are best planted during growing season (Autumn/Spring) to maximise plant survival rates. Water regularly after installation, which is to be increased in hot and/or windy conditions during the establishment phase (6 weeks) and then as required.		Reduce and maintain at <5% weed density by 2025 2026 FY. Established native plantings. Increased connectivity and diversity. Planting survival rate of >80% 6 months after planting.	
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish one fixed photo monitoring point within each remnant and buffer zone. • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	Trained bush regenerators.


Title: Weeds & Manag. Actions
Map No: 10-2a
Site: Gaerloch to South Bondi
Client: Waverley Council
Date: May 2021
Author: G Barron
Bushland Remnant
Previous Buffer Planting
Weed % Cover 2020
5% - 30%
30% - 70%
>70%
Management Actions
Buffer Planting
Contain Runoff
Primary Weed Works
Targeted Weed Control
Maintain Delineation
© Department of Customer Service 2020
0 15 30 60 Meters
N
Data Source:
Total Earth Care
Nearmap
total earth care
Buffer 4
Buffer 5
Buffer 6
Z12f
Z12d
Z13a
Z13b
Z13c
Z13d
Z13e
Z13f

Title: **Weeds & Manag. Actions**
Map No: 10-2b
Site: Gaerloch to South Bondi
Client: Waverley Council
Date: May 2021
Author: G Barron

Bushland Remnant
Previous Buffer Planting

Weed % Cover 2020
<5%
5% - 30%
30% - 70%

Management Actions
Buffer Planting
Connectivity Planting
Primary Weed Works
Targeted Weed Control

0 12.5 25 50 Meters

N

Data Source:
Total Earth Care
Nearmap

total earth care

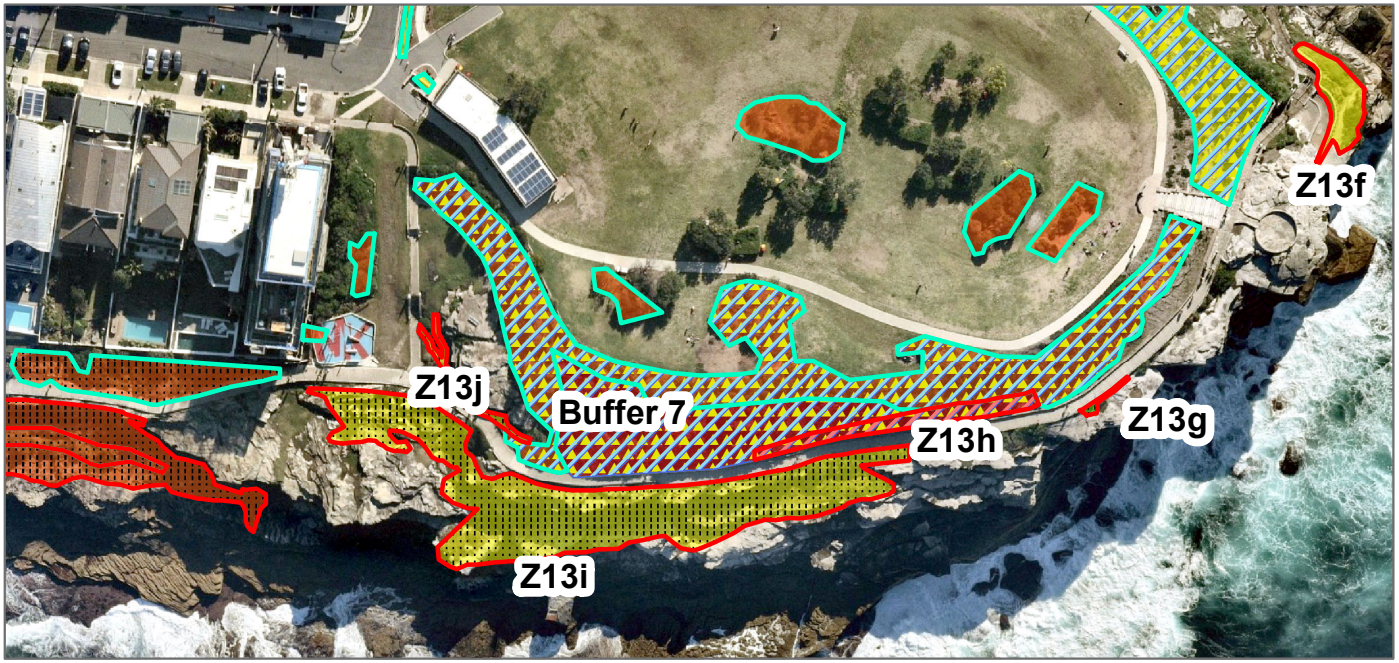

TABLE 10-3 – SOUTH CLIFFTOP REMNANTS MANAGEMENT ZONES AND ACTIONS – GAERLOCH TO SOUTH BONDI (MAP 10-2)

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
South Clifftop Remnants – Gaerloch to South Bondi (Map 10-2)							
Remnant Z14a	High	**Gaerloch to South Bondi (Map10-2) –** Gaerloch Reserve, Tamarama. Consists of approximately 100m^2 of Sea-cliff Grassland.	**Targeted weeding –** to control infestations of *Coprosma repens, Gazania tomentosa* and exotic grasses. Target annual weeds before seeding to prevent germination. ***Direct seeding or infill planting –** within remnant to increase diversity, once weed infestations are contained.	**2022 – 2023 FY -** 12 visits per year. **Subsequent years -** 6 visits per year.	30-70%	Reduce and maintain at <5% weed density. No reduction in remnant.	Trained bush regenerators.
Remnant Z14b - c	Medium	**Gaerloch to South Bondi (Map 10-2) –** Gaerloch Reserve, Tamarama. Consists of a small 22m^2 isolated patch of Sea-cliff Grassland and three small isolated patches of Sea-cliff Herbland dominant in *Lobelia anceps* across 36m^2.	**Maintenance weeding –** target annual weeds before seeding to prevent germination and to ensure no loss of remnant.	Minimum of 6 visits per year.	<5%	Maintain at <5% weed density. Increased connectivity through buffer maintenance. No net loss of remnant.	Trained bush regenerators.
Buffer 6	Medium	**Gaerloch to South Bondi (Map10-2) –** Marks Park. Consists of fragmented patches of buffer plantings. Still contains stands of woody weeds which have the potential to be removed and revegetated. Good opportunity for habitat creation.	**Primary weeding –** continue primary weeding targeting infestations of woody weeds such as *Coprosma repens* and exotic grasses. Begin primary weeding in areas of high resilience or close to remnant Z13e. **Buffer planting –** once primary works addressed, future buffer and infill planting where required. Suggestions of coir logging and jute matting to assist with erosion control. **Maintenance weeding –** a large portion of the buffer plantings are established and resilient. Target annual weeds before seeding to prevent germination. **Habitat creation** – It is recommended that a diversity of at least 20 species if achieved from a variety of grasses and nectar providing species. Introduce sandstone boulders and logs, this will also assist with erosion control.	**2022 – 2023 FY –** Minimum of 6 visits per year. **Subsequent years –** Minimum of 4 visits per year. Plantings are best planted during growing season (Autumn/Spring) to maximise plant survival rates. Water regularly after installation, which is to be increased in hot and/or windy conditions during the establishment phase (6 weeks) and then as required.	5-30%	Maintain at <5% weed density in areas previously planted. Reduce weed density to <5% in previously untargeted areas by 2023 – 20234 FY. Increased connectivity and diversity. Planting survival rate of >80% 6 months after planting.	Parks staff - although trained bush regenerators are to manage areas of the buffer immediately adjacent to any remnant vegetation.
Remnant Z13h	Medium	**Gaerloch to South Bondi (Map 10-2) –** Marks Park. Consist of 136m^2 of Sea-cliff Sedgeland dominant in *Carex pumila.*	No longer discernible. **Primary weeding –** to control infestations of woody weeds such as *Coprosma repens.* Will benefit from primary works within the buffer zone, (Buffer 7) and further buffer planting, potential for recovery.	Minimum of 6 visits per year. Works to occur in line with buffer zone upslope.	>70%	Create connectivity through buffer planting. Recruitment of native seedbank.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
South Clifftop Remnants – Gaerloch to South Bondi (Map 10-2)							
			Ensure gap is created and maintained between buffer plantings and remnant. **Infill planting –** within remnant to increase diversity.			Planting survival rate of >80% 6 months after planting.	
Remnant Z13d-f	Medium	**Gaerloch to South Bondi (Map 10-2 and 10-3) -** Bondi Bay / Marks Park Consists of 480m^2 of Sea-cliff Grassland.	**Targeted weeding –** to control infestations of *Coprosma repens, Gazania tomentosa* and exotic grasses.	Minimum of 6 visits per year.	5-30%	Maintain at <5% weed density. Increased connectivity and diversity. Recruitment of native seedbank.	Trained bush regenerators.
Remnant Z14b - c	Medium	**Gaerloch to South Bondi (Map 10-2) –** Gaerloch Reserve, Tamarama. Consists of a small 22m^2 isolated patch of Sea-cliff Grassland and three small isolated patches of Sea-cliff Herbland dominant in *Lobelia anceps* across 36m^2.	**Maintenance weeding –** target annual weeds before seeding to prevent germination and to ensure no loss of remnant.	Minimum of 6 visits per year.	<5%	Maintain at <5% weed density. Increased connectivity through buffer maintenance. No net loss of remnant.	Trained bush regenerators.
Buffer 7	Medium	**Gaerloch to South Bondi (Map10-2) –** Marks Park / Mackenzies Point. Consists of established buffer plantings and weed plumes along the coastal walk and within Marks Park. A large portion of this buffer is a monoculture of *Coprosma*.	**Contain (high priority) –** weed infestations around remnant Z13h. **Buffer planting –** once primary works addressed, future buffer and infill planting where required. Suggestions of coir logging and jute matting to assist with erosion control. **Targeted weeding –** target annual weeds before seeding to prevent germination. Target exotic grasses to allow for natural regeneration of native groundcovers. **Habitat creation and retention** – The monoculture of Coprosma should be contained as habitat. It is recommended in other areas that a diversity of at least 20 species if achieved from a variety of grasses and nectar providing species. Introduce sandstone boulders and logs, this will also assist with erosion control.	**2021 – 2023 FYs –** Minimum of 4 visits per year. Buffer planting to occur once weed density it controlled. Plantings are best planted during growing season (Autumn/Spring) to maximise plant survival rates. Water regularly after installation, which is to be increased in hot and/or windy conditions during the establishment phase (6 weeks) and then as required.	30-70%	Reduce and maintain at <10% weed density by 2026 – 2027 FY. Establishment of buffer plantings. Planting survival rate of >80% 6 months after planting.	Parks staff - although, trained bush regenerators are to manage areas of the buffer immediately adjacent to any remnant vegetation.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
South Clifftop Remnants – Gaerloch to South Bondi (Map 10-2)							
Buffer 8	Low	**Gaerloch to South Bondi (Map10-2) –** Gaerloch Reserve, Tamarama. Consists of buffer plantings and the heath vegetation surrounding the Z14 remnants. Also includes Stage 2 and 3 of Gaerloch Reserve steep slope remediation.	**Targeted weeding –** control infestations of *Coprosma repens, Gazania tomentosa* and exotic grasses. **Maintenance weeding -** target annual weeds before seeding to prevent germination. **Buffer planting –** infill planting where required to increase connectivity. Extend further buffer planting where stand of *Coprosma repens* have been removed and no native regeneration. Plant species to consist of low heath shrubs and ground covers to maintain residential view. Suggestions of coir logging and jute matting to assist with erosion control. **Habitat creation** – It is recommended that a diversity of at least 20 species if achieved from a variety of grasses and nectar providing species. Introduce sandstone boulders and logs, this will also assist with erosion control.	**2021 – 2024 FYs –** Minimum of 4 visits per year. Buffer planting to occur once weed density it controlled. Plantings are best planted during growing season (Autumn/Spring) to maximise plant survival rates. Water regularly after installation, which is to be increased in hot and/or windy conditions during the establishment phase (6 weeks) and then as required.	30-70%	Reduce and maintain at <5% weed density by 2026 – 2027 FY. Establishment of buffer plantings. Planting survival rate of >80% 6 months after planting.	Trained bush regenerators.
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish one fixed photo monitoring point within each remnant and buffer zone. • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	Trained bush regenerators.

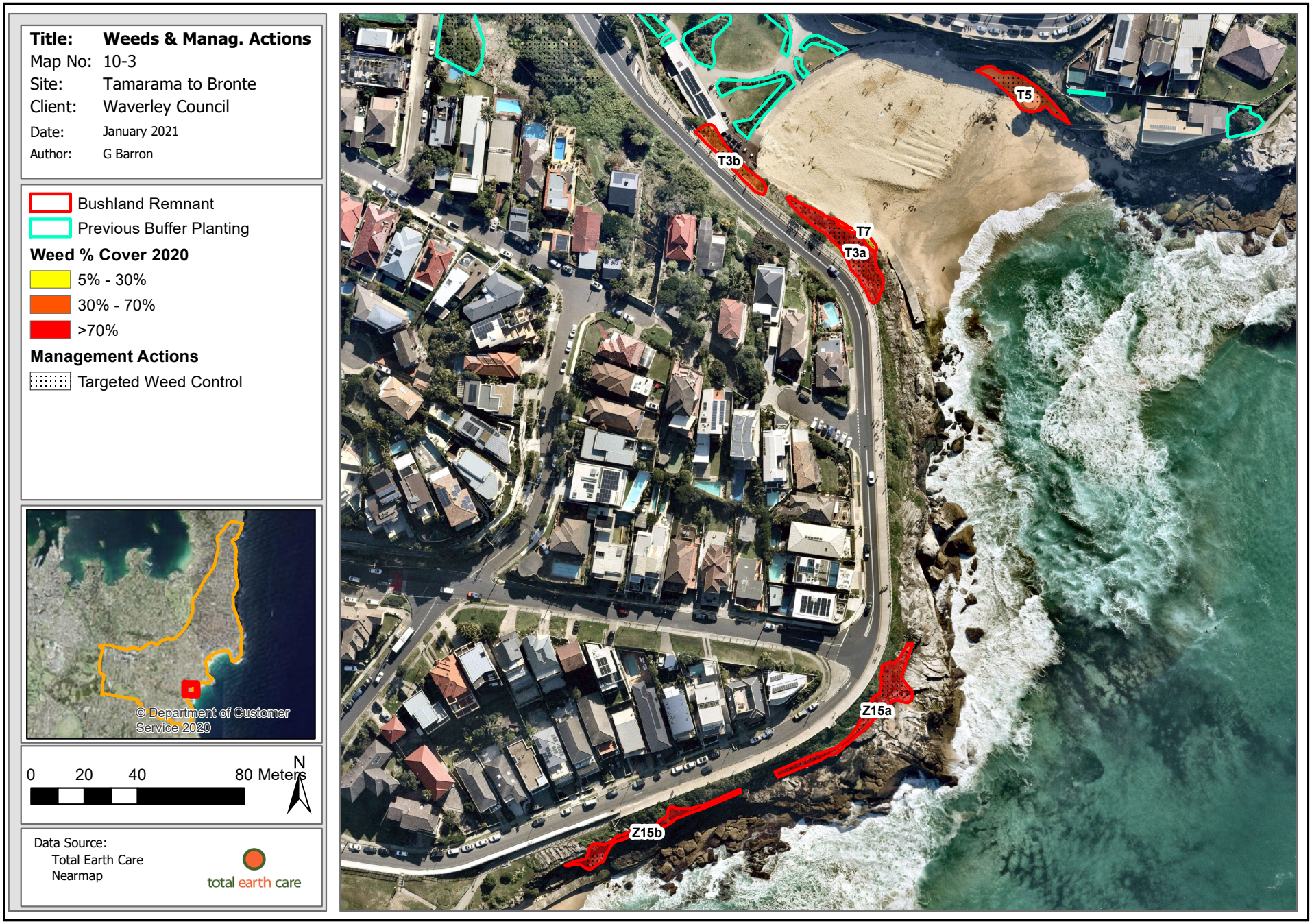
Title: Weeds & Manag. Actions
Map No: 10-3
Site: Tamarama to Bronte
Client: Waverley Council
Date: January 2021
Author: G Barron
Bushland Remnant
Previous Buffer Planting
Weed % Cover 2020
5% - 30%
30% - 70%
>70%
Management Actions
Targeted Weed Control
© Department of Customer Service 2020
0 20 40 80 Meters
N
Data Source:
Total Earth Care
Nearmap
total earth care
T5
T3b
T7
T3a
Z15a
Z15b

TABLE 10-4 – SOUTH CLIFFTOP REMNANTS – BRONTE TO TAMARAMA – MANAGEMENT ZONES AND MANAGEMENT ACTIONS (MAP 10-3)

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
South Clifftop Remnants – Bronte to Tamarama (Map10-3)							
Remnant T5	High	**Bronte to Tamarama (Map 10-3) –** North of Tamarama Beach. Consists of 214m^2 of Sea-cliff Sedgeland dominant in *Carex pumila*.	**Targeted weeding –** target weed species above the remnant first. Control dominant weed species within remnant such as *Asparagus aethiopicus, Gazania tomentosa* and exotic grasses. Target annual weeds before seeding to prevent germination. ***Direct seeding –** within remnant to increase diversity and stabilisation. **Infill planting –** above remnant T5 between public footpaths once weed density has been reduced to extend and protect remnant below.	Minimum of 6 times per year.	30-70%	<50% weed cover by end of 2022 – 2023 FY. <30% weed cover by end of 2023 – 2024 FY. <10% weed cover by end of 2024 – 2025 FY. Main and reduce to <10% weed density. Planting survival rate of >80% 6 months after planting.	Trained bush regenerators.
Remnant T7	Medium	**Bronte to Tamarama (Map 10-3) –** South Tamarama Beach. Consists of a 31m^2 patch of Beach Grassland.	**Targeted weeding –** control *Gazania tomentosa* and exotic grasses to ensure no loss of remnant.	Minimum of 4 times per year.	5-30%	Maintain at <10% weed density. Not likely to improve due to isolation and public access.	Trained bush regenerators.
Remnant T3a-b	Medium	**Bronte to Tamarama (Map 10-3) –** South Tamarama Beach. Consists of two patches of Sea-cliff Heath across approximately 500m^2.	**Targeted weeding –** control priority weed species such as *Asparagus aethiopicus, Gazania tomentosa*, *Lantana camara* and exotic grasses. Target annual weeds before seeding to prevent germination.	Minimum of 4 times per year.	30-70%	<50% weed cover by end of 2022 – 2023 FY. <30% weed cover by end of 2023 – 2024 FY. <10% weed cover by end of 2024 – 2025 FY. Main and reduce to <10% weed density.	Trained bush regenerators.
Remnant Z15a-b	Medium	**Bronte to Tamarama (Map 10-3) –** Between Tamarama Beach and Bronte Beach located along the Bronte Marine Drive pathway. Consists of a patch of Sea-cliff Herbland dominant in *Lobelia anceps*	**Targeted weeding –** Target annual weeds before seeding to prevent germination. Removal of woody weeds not a priority here due to slope destabilisation. **Containment** – control and contain exotic grass encroachment onto remnant patches growing in shallow soils on the rock platforms.	Minimum of 4 times per year.	>70%	Containment of weeds. No reduction in remnant patches. <50% weed cover by end of 2024 – 2025 FY.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
South Clifftop Remnants – Bronte to Tamarama (Map10-3)							
		and a patch of Sea-cliff Sedgeland dominant in *Ficinia nodosa.* Both patches are suffering from edge effects and low diversity due to isolation.	Buffer planting and revegetation unlikely to be successful due to exposure and shallow soils.			<30% weed cover by end of 2027 – 2028 FY. <10% weed cover by end of 2024 – 2025 FY. Main and reduce to <10% weed density. Regeneration of native species aided by direct seeding.	
Between remnants Z15a and T3a (not mapped)	Medium	Areas of rock shelves and weeds on the cliffline. Not including mapped remnant zones. Coprosma repens is the dominant weed in this area. Limited substrate for planting into.	**Sandstone capping and direct seeding –** to link and buffer remnants T3b, T3a, T7, Z15a and Z15b. This will also create habitat connectivity. This should be staged in sections to test methodology and manage habitat removal and re-establishment. See Appendix A for more information on sandstone capping and direct seeding methodology.	When resources are available.	N/A	Sandstone capping retained on sloped. Germination and establishment of seed. Eventually stabilized by vegetation	Trained bush regenerators.
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish one fixed photo monitoring point within each remnant and buffer zone. • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	Trained bush regenerators.

11 TAMARAMA MARINE DRIVE

Figure 11-1. Tamarama Marine Drive remnant vegetation

The Tamarama Marine Drive remnant is one of the largest and most diverse patches of native vegetation in the Waverley LGA, with 56 native species recorded in the reserve (SBRC 2020). The remnant vegetation consist of approximately 2800m^2 of Sea-cliff Heath. The remnant patch is of substantial importance due to its size, species diversity within all strata layers and condition. It provides opportunities for long term resilience of the remnant vegetation as the edge effects are minimal. It provides a unique location for fauna to utilise as a haven in the urban landscape.

The remnant patch is located within an area of local heritage significance listed for its natural and scenic coastal landscapes which include the native vegetation and can be enjoyed along the 1930's period scenic drive from Tamarama to Bronte.

11.1 FLORA

This patch exhibits the most diverse native species of all patches of remnant vegetation. It contains species such as River Rose (*Bauera rubioides*), Red spider flower (*Grevillea speciosa)* and Wonga Wonga Vine (*Pandorea pandorana*) which are not recorded in any other remnant patch (SBRC 2020). In the majority of core remnant the weed density is less than 5% weed cover with sections in 'good' and 'fair' condition. The core of the vegetation is highly resilient. The considerable size and round shape of this patch enables the core to be protected from weed invasion allowing it to support more complexity in the vegetation structure including canopy trees, mid-storey shrubs and native groundcovers.

The Sea-cliff Heath vegetation typically exists within 50m of sea-cliffs on skeletal sands to sand lenses on sandstone, drainage is often impeded. Characteristic species are *Baeckea imbricata, Banksia ericifolia, Melaleuca armillaris, Melaleuca nodosa* and *Westringia fruticosa*, all of which are present in this patch.

Table 11-1 – Tamarama Marine Drive Native Flora Species (SBRC 2020)

Scientific Name	Common Name	Scientific Name	Common Name
Acacia longifolia	Coastal Wattle	*Histiopteris incisa*	Bat's Wing Fern
Adiantum aethiopicum	Common Maidenhair	*Homalanthus populifolius*	Bleeding Heart
Apium prostratum var. filiforme	Sea Celery	*Isolepis cernua*	Nodding Club-rush
Atriplex semibaccata	Creeping Saltbush	*Juncus continuus*	Juncus continuus
Baeckea imbricata	Heath Myrtle	*Juncus kraussii*	Sea Rush
Banksia ericifolia	Heath-leaved Banksia	*Kunzea ambigua*	Tick Bush
Banksia marginata	Silver Banksia	*Lachnagrostis billardierei*	Coast Blown-grass
Bauera rubioides	River Rose	*Lachnagrostis filiformis*	Blown Grass
Machaerina juncea	Bare Twig-rush	*Lepidosperma concavum*	Sandhill Sword-sedge
Billardiera scandens	Hairy Apple Berry	*Lobelia anceps*	Angled Lobelia
Carex pumila		*Lomandra longifolia*	Spiny-headed Mat-rush
Cassytha pubescens	Downy Dodder-laurel	*Melaleuca armillaris*	Bracelet Honey-myrtle
Centella asiatica	Indian Pennywort	*Melaleuca nodosa*	Prickly-leaved Paperbark

Scientific Name	Common Name	Scientific Name	Common Name
Commelina cyanea	Native Wandering Jew	*Monotoca elliptica*	Tree Broom-heath
Cyperus polystachyos	Bunchy Sedge	*Opercularia aspera*	Coarse Stinkweed
Deyeuxia quadriseta	Reed Bent-grass	*Pandorea pandorana*	Wonga Wonga Vine
Dianella caerulea	Blue Flax-lily	*Paspalidium distans*	
Dianella congesta	Beach Flax-lily	*Paspalum vaginatum*	Salt-water Couch
Dichelachne crinita	Longhair Plumegrass	*Pteris vittata*	Chinese Brake
Entolasia stricta	Wiry Panic	*Pultenaea linophylla*	
Eragrostis brownii	Brown's Lovegrass	*Samolus repens*	Creeping Brookweed
Ficinia nodosa	Knobby Club-rush	*Schoenus brevifolius*	Zig-zag Bog-rush
Gleichenia dicarpa	Pouched Coral Fern	*Sporobolus virginicus*	Sand Couch
Gleichenia rupestris	Coral Fern	*Tetragonia tetragonioides*	New Zealand Spinach
Glochidion ferdinandi	Cheese Tree	*Triglochin striata*	Streaked Arrowgrass
Grevillea speciosa	Red Spider Flower	*Westringia fruticosa*	Coastal Rosemary
Hakea gibbosa	Needlebush	*Xanthosia pilosa*	Woolly Xanthosia
Hakea teretifolia	Needlebush	*Zoysia macrantha*	Prickly Couch

11.2 FAUNA

This patch provides one of the larger extents of habitat for fauna within the LGA. It is also in close proximity to significant vegetated area in Tamarama Park to the north, providing a larger refuge for native fauna. Overall the site displays high habitat complexity, floral diversity and is in close proximity to Tamarama Gully. The thick shrubs and canopy trees provide habitat for arboreal mammals such as the Common Brushtail Possum (*Trichosurus vulpecula*) and Common Ringtail Possum (*Pseudocheirus peregrinus*). The presence of many flowering species including various Banksias and Melaleucas provides foraging and sheltering habitat for small bird and mammal species including the New Holland Honeyeater (*Phylidonyris novaehollandiae*), Superb Fairy-wren (*Malurus cyaneus*) and the Grey-headed Flying-fox (*Pteropus poliocephalus*) (Vulnerable under the BC Act and EPBC Act) which has been recently recorded on the site (DPIE 2020). The calls of several amphibian species can be heard in this patch including the Bleating Tree Frog (*Litoria dentata*) and the Eastern Dwarf Tree Frog (*Litoria fallax*) (AMBS 2010, ALA 2020). However the bushland is largely isolated with limited connectivity to surrounding bushland.

11.3 MANAGEMENT ACTIONS

11.3.1 Previous works

The success of current management actions for this remnant site are evident (Southern Habitat 2019). Weeding has been recently undertaken in the remnant patch targeting *Ipomoea indica, Anredera cordifolia, Rumex sagittatus* and *Asparagus aethiopicus*. Steep areas have been re-terraced, mulched and planted to minimise erosion. Revegetation of buffer areas should continue, as this will assist in protecting the remnant from further weed encroachment and provide additional habitat for fauna.

11.3.2 Key management actions

Management priority of this site is high as the core vegetation should be maintained in good condition. Key management actions generally include:

- **Targeted weeding:** Continued bush regeneration targeting re-occurring exotic species and managing abundant exotics, particularly in the good condition core vegetation (T1). Key target species include *Ehrharta erecta, Bidens pilosa, Conzya spp.*, *Ipomoea indica* and *Senna pendula* var. *glabrata*.
- **Buffer planting:** Install terracing or coir logs and leaf much along the length of the slope prior to installation of buffer plantings and mulching. Removal of high density weeds in buffer areas must be staged as they provide habitat to small birds and reptiles. New plantings must be well established to replace weed habitat before clearing additional areas.
- **Maintenance weeding:** Target annual weeds before seeding to prevent germination.
- **Preserve rocky areas and retention of logs –** prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species. Any fallen logs are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species this is of particular importance within the T1 remnant of Buffer 3.
- **Ecological monitoring:** using photo points and species counts. Ecological monitoring will be reported annually and provide data to support the meeting of goals.

Alternative restoration methods that could be used at this site include trialling flame weeding in remnants to treat exotic grasses and promote native regeneration from the seedbank.

Additionally, scarification of the soil and pruning in areas of dense Banksia canopy will also assist in promoting native regeneration. As an alternative option to planting out Buffer 5 after primary weed treatment, this area could be considered as a recipient site for soil seedbank translocation if a suitable donor site is available.

The weed densities and management actions for the different areas are shown in Map 11-1 and provided in Table 11-2. Detailed methodologies for the recommended management actions are provided in Appendix A.

11.4 PREDICTIONS AND RECOMMENDATIONS FOR ACHIEVING EAP4 OBJECTIVES

The management at this site is expected to result in an improvement to the condition of the vegetation, particularly in the core (T1). The provision of targeted weeding and buffer planting is expected to improve the condition of the core remnant vegetation.

The core vegetation (T1) will likely be able to be restored to 'good' condition by 2040 as it is already has low weed density and has a high resilience. The revegetation and management of the buffers are likely to increase the resilience and condition, as it will reduce the stress from the high weed density vegetation in the south (Buffer 4 and Buffer 5).

The use of a combination of hand removal and herbicide spraying is recommended. The use of herbicide can likely be avoided within the core (T1) area, however may be required along the edges to achieve good condition.

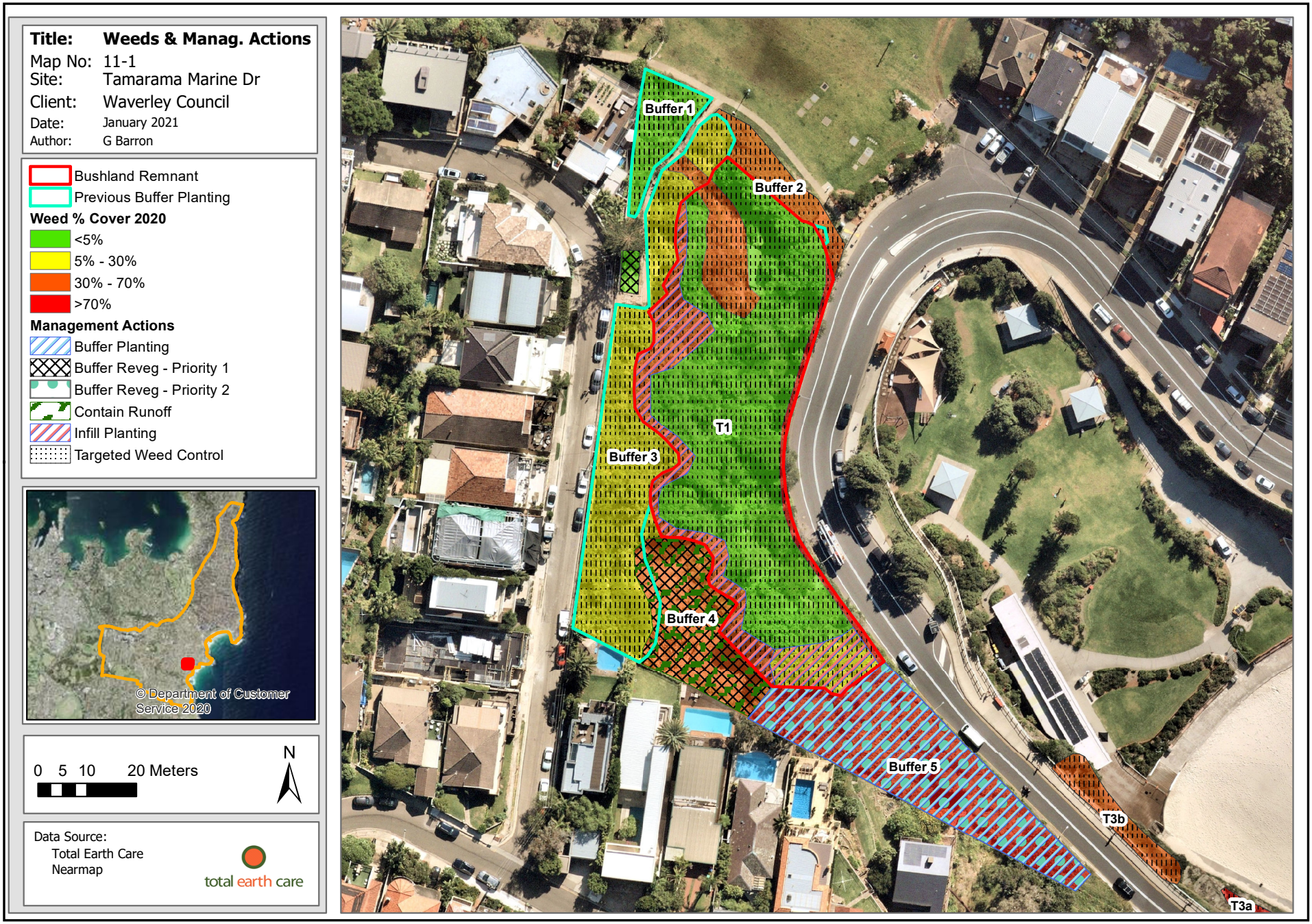
Title: Weeds & Manag. Actions
Map No: 11-1
Site: Tamarama Marine Dr
Client: Waverley Council
Date: January 2021
Author: G Barron
Bushland Remnant
Previous Buffer Planting
Weed % Cover 2020
<5%
5% - 30%
30% - 70%
>70%
Management Actions
Buffer Planting
Buffer Reveg - Priority 1
Buffer Reveg - Priority 2
Contain Runoff
Infill Planting
Targeted Weed Control
© Department of Customer Service 2020
0 5 10 20 Meters
N
Data Source:
Total Earth Care
Nearmap
total earth care
Buffer 1
Buffer 2
T1
Buffer 3
Buffer 4
Buffer 5
T3b
T3a

TABLE 11-2 – TAMARAMA MARINE DRIVE MANAGEMENT ZONES AND ACTIONS

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Tamarama Marine Drive							
Remnant T1 **Core**	High	Core of the bushland remnant. This area is mostly free of weeds. Some areas of ground cover contain patches of *Ehrharta erecta* and herbaceous species including *Bidens pilosa* and *Conzya spp*. *Commelina cyanea,* whilst native, has dominated some areas of ground cover which may be preventing recruitment of other natives from the seedbank.	**Targeted weeding -** continued bush regeneration targeting re-occurring exotic species and managing abundant exotics. Weed control should work from the areas of low density weeds towards boundaries of other zones with a higher abundance of weeds. Exotic vines should be targeted, followed by woody weeds and smothering ground covers. **Control of dominant natives –** target native ground covers including *Commelina cyanea* to encourage recruitment of the native seedbank. **Promote native regeneration** – through trialing pile burns, soil scarification and smoke use to improve diversity. Particularly within 20m of Tamarama Drive. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species. **Retention of logs –** any fallen logs are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.	Minimum of 6 times a year with a minimum of 3 visits in spring/summer.	<5%	Zone maintained at <5% weed cover. Recruitment of native seedbank in areas previously dominated by *Ehrharta erecta* and *Commelina cyanea*. Planting survival rate of infill planting if required >80% 6 months after planting. Regeneration of native species.	Trained bush regenerators.
Remnant T1 South	High	Consists of the transitional zone of the bushland remnant between the good areas of the remnant and the high density weed zones outside the remnant (Buffer 4 and 5). There is some encroachment of *Ipomoea indica* and *Senna pendula* var. *glabrata* in this zone.	**Targeted weeding –** trained bush regenerator to target exotic vines and woody weeds working from the boundary of this zone towards the poorer condition Buffer 5. **Promote native regeneration** – through trialing pile burns, soil scarification and smoke use to improve diversity. Particularly within 20m of Tamarama Drive. **Infill planting –** along the edges would assist the expansion of the remnant, particularly if no	Minimum of 6 times a year with a minimum of 3 visits in Spring/summer.	5-30%	<10% weed cover by end of 2022 – 2023 FY. <5% weed cover by end of 2023 – 2024 FY. Maintain at <5% weed cover ongoing. Regeneration of native species.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Tamarama Marine Drive							
			natural recruitment along edges is noted after weed removal.				
Remnant T1 Western Edge	High	This zone consists of the western edge of the T1 remnant core and has suffered edge effects from the clearing and planting of buffer planting. Weed species in this zone include *Rumex sagittatus, Anredera cordifolia, Solanum nigrum* and *Ricinus communis.* Buffer plantings have developed well in this area.	**Targeted Weeding –** trained bush regenerator to target exotic vines as a priority working from the areas of low weed density outwards. **Infill planting –** along the edges would assist the expansion of the remnant, particularly if no natural recruitment along edges is noted after weed removal.	Minimum of 6 times a year with a minimum of 3 visits in Spring/summer.	30-70%	<5% weed cover in by end of 2022 – 2023 FY.	Trained bush regenerators.
Buffer 4	High	This zone was previously marked for buffer revegetation which is currently underway. The vegetation in this zone has been cleared including Coral Trees and the site has had some terracing completed to prepare for planting. Some weed species are starting to occur as a result of the clearing, which include: *Ricinus communis, Ipomoea indica and Bidens pilosa*. Stormwater from a neighbouring property was observed running directly into this zone, and runoff will need to be addressed in order to ensure the survival of the buffer plantings.	**Control runoff and erosion –** use check dams made of coir logs to disperse stormwater flow and prevent erosion. Coir logs should be used between the buffer and the remnant below cleared areas and areas prone to erosion to prevent siltation in the remnant. **Buffer planting -** install terracing or coir logs and leaf much along the length of the slope. Allow initial flush of exotics seeds to germinate, treat and install native plant species. Low growing shrubs should be installed along the upper slope to maintain residents' views. Water in and maintain to establish. Ensure a gap is maintained between buffer 4 and remnant vegetation to allow for the expansion of the remnant. This could be assisted by infill planting along the remnant edge. **Targeted weeding -** address the current flush of weeds and monitor Coral Tree debris for reshooting.	Weed treatment and preparation for planting to begin as soon as possible. Stormwater issue to be addressed prior to planting.	30-70%	<5% weed cover by end of 2022 – 2023 FY. Planting completed by end of 2022 – 2023 FY. Installation of terracing or coir logs after clearing weeds. Establishment of buffer plantings Planting survival rate of >80% 6 months after planting. Substitute planting if required.	Parks staff or trained bush regenerators.
Buffer 1	High	Planted buffer zone north of the core remnant, mostly free of weed species.	**Maintenance weeding –** resilience of this zone is high and therefore a key priority is to target re-occurring weed species, vines and wood weeds.	4 times a year with a minimum of 2 visits in spring/summer.	>5%	Zone maintained at <5% weed cover.	Parks staff or trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Tamarama Marine Drive							
Buffer 3	High	Planted buffer zone has developed well and provides a layer of dense native shrubs with a low weed presence. Some weed species were identified in this zone including *Anredera cordifolia, Ipomoea indica* and *Bidens pilosa.*	**Targeted weeding –** resilience of this zone is high and therefore a high priority to address weed recruitment particularly *Anredera cordifolia* and *Ipomoea indica.* **Maintenance weeding -** target annual weeds before seeding to prevent germination. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species. **Retention of logs –** any fallen logs are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species.	4 times a year with a minimum of 2 visits in spring/summer.	5-30%	<5% weed cover by end of 2022 – 2023 FY. Maintained at <5% weed cover ongoing.	Parks staff or trained bush regenerators.
Remnant T1 North	High	Consists of the poorer bushland north of the T1 core remnant. Intrusion of weed species amongst the areas of good condition remnant including *Ipomoea indica* and *Bidens pilosa.*	**Targeted weeding –** to prevent weed species encroaching on the surrounding areas of good condition remnant, targeted weed control should address vine species is a priority, followed by the treatment of woody weeds and smothering ground covers. **Promote native regeneration** – through trialing pile burns, soil scarification and smoke use to improve diversity. Particularly within 20m of Tamarama Drive.	4 times a year with a minimum of 2 visits in spring/summer.	30-70%	<20% weed cover by end of 2022 – 2023 FY. <5% weed cover by end of 2023 – 2024 FY. Maintain at <5% weed cover ongoing. Regeneration of native species.	Trained bush regenerators.
Remnant T1 Eastern Edge	Medium	This zone acts as a buffer from edge effects for the core of the remnant from Tamarama Marine Drive. These edges contain mostly *Ehrharta erecta,* herbaceous and perennial weeds. Some *Asparagus aethiopicus* is present.	**Targeted weeding – trained** bush regeneration to target exotic vines and *Asparagus aethiopicus.* Continue bush regeneration tasks outlined for T1 Core. **Promote native regeneration** – through trialing pile burns, soil scarification and smoke use to improve diversity. Particularly within 20m of Tamarama Drive.	Minimum of 4 times a year with a minimum of 2 visits in spring/summer.	>70%	<50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing. Regeneration of native species.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Tamarama Marine Drive							
Buffer 5	Low	Buffer 5 consists of high density weeds which have smothered native species. *Ipomoea indica, Lantana camara* and *Senna pendula* var. *glabrata* dominate this zone. *Lagunaria patersonia* dominates the canopy. *Banksia integrifolia* are also present in this zone but are smothered by *Ipomoea indica*. There are occurrences of *Tropaeolum* spp. and *Hydrocotyle bonariensis* in this area. Resilience of this zone is low and the seed bank is likely depleted of native species.	**Targeted weeding –** bush regeneration to target vines, woody weeds and herbaceous annuals before seeding to control germination. Target vine species smothering natives. **Buffer planting –** install terracing or coir logs and leaf much along the length of the slope. Allow initial flush of exotics seeds to germinate, treat and install native plant species. Low growing shrubs should be installed along the upper slope to maintain residents' views. Water in and maintain to establish. **Erosion controls -** following primary weeding and clearing of weeds install coir logs between below cleared areas to control erosion. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species.	Start 3-4 years after planting is completed in Zone F. Zone F should be well established prior to cleared high density weeds from Zone E. Plantings are best planted during growing season (Autumn/Spring) to maximise plant survival rates. Water regularly after installation, which is to be increased in hot and/or windy conditions during the establishment phase (6 weeks) and then as required.	>70%	Installation of terracing or coir logs after clearing weeds. Establishment of buffer plantings. Planting survival rate of >80% 6 months after planting. Substitute planting if required.	Parks staff or trained bush regenerators.
Buffer 2	Low	This zone forms a buffer to the remnant bushland and is mostly made up of planted *Lophostemon confertus* and herbaceous weeds.	**Targeted weeding –** continue targeted weeding as described for T1. Weed control works should work from the boundary of T1 Core and areas of low density weeds towards the northern edges of this zone.	Minimum of 3 site visits per year.	30-70%	<10% weed cover by end of 2022 – 2023 FY. <5% weed cover by end of 2023 – 2024 FY. Maintain at <5% weed cover ongoing.	Parks staff or trained bush regenerators.
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish one fixed photo monitoring point within each remnant and buffer zone. • Establish one fixed quadrat or transect survey location to assess species	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Tamarama Marine Drive							
			composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.				

12 CALGA RESERVE & BRONTE CUTTING

Figure 12-1. Vegetation at the north of Calga Reserve

The Calga Reserve and Bronte Cutting exhibits scattered remnant vegetation along the sandstone cliff-tops between Bronte Baths in the north and Calga Reserve in the south. The site is made up of four separate remnant patches of Sea-cliff Heath and Sea-cliff Grassland which are largely isolated to thin strips along the cliff edge.

The site is of local heritage significance, as it is listed for its outstanding sandstone cliffs and rock shelving of both natural and scenic value. The site provides a vantage point for spectacular views of the headlands to the north and south and views of Waverley Cemetery.

12.1 FLORA

Four remnant patches remain at this site. One small 2m^2 patch was previously mapped within Calga Reserve, however was not discernible at the time of the survey. This patch has previously been recorded as the only vegetation in the LGA to contain the Lemon Flax Lily (*Thelionema umbellatum*). The northern most remnant patch of Sea-cliff Grassland is located on a sandstone shelf above the Bronte Baths. The vegetation community typically consists of characteristic species *Paspalum vaginatum, Sporobolus virginicus* and *Zoysia macrantha,* occurring within 10m of sea-cliffs on skeletal sand to sand lenses on sandstone, and can often include areas of impeded drainage. This patch displays moderate density of weeds including *Asparagus spp.* It is bound to the west by a strip of buffer plantings (SBRC 2020).

Two patches of Sea-cliff Heath stretch along the cliff edge. Sea-cliff Heath vegetation typically exists within 50m of sea-cliffs on skeletal sands to sand lenses on sandstone and drainage is often impeded. Characteristic species are *Baeckea imbricata, Banksia ericifolia, Melaleuca armillaris, Melaleuca nodosa* and *Westringia fruticosa.*

All patches display low weed density, however are suffering from low floristic diversity due to pressures from urbanisation and fragmentation. Future bush regeneration works are to focus on the buffer areas to contain weed plumes and prevent the encroachment and further loss of the remnant vegetation.

Table 12-1 – Calga Reserve and Bronte Cutting Bushland Remnants Native Flora Species (SBRC 2020)

Scientific Name	Common Name	Scientific Name	Common Name
Acacia longifolia	Coastal Wattle	*Gleichenia rupestris*	Coral Fern
Acacia suaveolens	Sweet Wattle	*Isolepis cernua*	Nodding Club-rush
Adiantum aethiopicum	Common Maidenhair	*Lachnagrostis billardierei*	Coast Blown-grass
Atriplex semibaccata	Creeping Saltbush	*Lachnagrostis filiformis*	Blown Grass
Baeckea imbricata	Heath Myrtle	*Leptospermum laevigatum*	Coast Teatree
Carex pumila		*Lobelia anceps*	Angled Lobelia
Commelina cyanea	Native Wandering Jew	*Lomandra longifolia*	Spiny-headed Mat-rush
Cyperus polystachyos	Bunchy Sedge	*Melaleuca nodosa*	Prickly-leaved Paperbark
Deyeuxia quadriseta	Reed Bent-grass	*Paspalum vaginatum*	Salt-water Couch

Scientific Name	Common Name	Scientific Name	Common Name
Dianella congesta	Beach Flax-lily	*Psilotum nudum*	Skeleton Fork-Fern
Dichelachne crinita	Longhair Plumegrass	*Thelionema umbellatum*	Lemon Flax Lily
Eragrostis brownii	Brown's Lovegrass	*Westringia fruticosa*	Coastal Rosemary
Ficinia nodosa	Knobby Club-rush	*Xanthosia pilosa*	Woolly Xanthosia
Gleichenia dicarpa	Pouched Coral Fern		

12.2 FAUNA

The Clifftop is exposed to a high degree of strong, salty winds. Therefore, the Sea-cliff Heath and buffer plantings provide important sheltering habitat for reptiles and small birds. The open rock platforms provide an abundance of basking and foraging areas for native skinks including the Dark-flecked Garden Sunskink (*Lampropholis delicate*). The flowering shrubs attract numerous nectarivorous birds including the Red Wattlebird (*Anthochaera carunculata*) and the New Holland Honeyeater (*Phylidonyris novaehollandiae*) and provides habitat for species that require the dense shrub including the Variegated Fairy-wren (*Malurus lamberti*) and Silvereye *(Zosterops lateralis*).

The cliff line itself is likely to be used by nesting swallows and martins which are social species foraging on insects in large flocks. Overhangs and crevices are also likely to be utilised by roosting microbats which also utilise man-made structures such as culverts and bridges.

12.3 MANAGEMENT ACTIONS

12.3.1 Previous works

Weed control in Calga Reserve is well advanced and plantings are well established, and serve for providing pockets of microhabitat for fauna and increasing the species diversity of the vegetation (SBRC 2018). Weed works are necessary to maintain the integrity of the vegetation and to maintain the edges of the buffer plantings. Targeted weeding of *Asparagus aethiopicus* and *Gazania tomentosa* has been successfully undertaken at the Bronte cutting. However, both species are still present amongst remnant native vegetation on cliff ledges that require rope access.

12.3.2 Key management actions

Management priority of this site is high, as it comprises a site with multiple remnant patches that are vulnerable to being lost. Due to the small size of several of the patches (B8, B7, Z19), the management of the surrounding buffers are a priority in order to preserve the remnant patches. Key management actions generally include:

- **Maintenance weeding:** Elimination of *Asparagus aethiopicus* and *Erythrina crista-galli.* Targeting herbaceous weeds and vines across most of the site.
- **Rope works:** Target *Asparagus aethiopicus* and *Gazania tomentosa* amongst the remnant native vegetation on cliff ledges that require rope access in B1 and B2.
- **Infill planting:** to be used in buffers where dominant natives are controlled. Additional mulch would assist in preventing weed recruitment.
- **Preserve rocky areas** – There is a large number of rocky sandstone areas across this site. It is important that these are maintained as they provide basking opportunities and habitat for a number of reptile species. Weeds should be prevented from overgrowing rocky outcrops and platforms.
- **Prevent public access –** Remnants B1 and B2 and buffers 3.1 and 3.2 are along the cliff edge above the cutting and provide a good lookout spot of the ocean. As a result vegetation in these areas is vulnerable to trampling by tourists. Fencing should be installed to prevent access along with educational signage advising of the importance of the remnant vegetation within the Waverley LGA. Fencing should incorporate remnants B1 and B2 and Buffers 3.1 and 3.2.
- **Ecological monitoring:** Using photo points and species counts. Ecological monitoring will be reported at regular intervals and provide data to support the meeting of goals.

Alternative methods including sandstone capping or soil seedbank translocation could be used at Calga Reserve for the proposed Buffer 7. If using sandstone capping both direct seeding and planting could be utilised. See Appendix A.

The weed densities and management actions for the different areas are shown in Map 12-1 and Map 12-2 and provided in Table 12-2. Detailed methodologies for the recommended management actions are provided in Appendix A for more details on the implementation of soil seedbank translocation and sandstone capping.

12.4 PREDICTIONS AND RECOMMENDATIONS FOR ACHIEVING EAP4 OBJECTIVES

The management at this site would preserve the existing good condition remnant vegetation (B2) and would further assist in preserving the small remnant patches (B8, B7, Z19). The remnant patches B2 and B8 can likely be maintained in 'good' condition by 2040. Additionally, with adequate weeding and management of the associated buffers, it is possible that

remnant patch B1, Z19 and B7 could also reach 'good' condition. For each of these remnant patches, management of the surrounding buffer is an important action as the patches themselves have low diversity and are too small to adequately manage alone. This requires maintenance weeding and ecological monitoring.

The management of the remnant patch B1 is of high priority to ensure the remediation of the large patch which provides important connectivity within the site. The management of the associated buffer (3.2) will support the improvement of remnant patch B1.

The improvement of Buffer 1 and Buffer 2 would support the expansion of the connectivity corridor in the northern section of the site. The planting in these buffers would encourage complexity in the vegetation and provide better habitat for fauna.

Title: **Weeds & Manag. Actions**
Map No: 12-1
Site: Calga Reserve & Bronte Cutting (North)
Client: Waverley Council
Date: January 2021
Author: G Barron

Bushland Remnant
Previous Buffer Planting

Weed % Cover 2020
<5%
5% - 30%
30% - 70%
>70%

Management Actions
Connectivity Planting
Infill Planting
Primary Weed Works
Targeted Weed Control

0 10 20 40 Meters

N

Data Source:
Total Earth Care
Nearmap

total earth care

Title: **Weeds & Manag. Actions**
Map No: 12-2
Site: Calga Reserve & Bronte Cutting (South)
Client: Waverley Council
Date: May 2021
Author: G Barron

Bushland Remnant
Previous Buffer Planting

Weed % Cover 2020
<5%
5% - 30%
>70%

Management Actions
Buffer Planting
Primary Weed Works
Targeted Weed Control
Create Delineation

0 5 10 20 Meters

N

Data Source:
Total Earth Care
Nearmap

total earth care

TABLE 12-2 – CALGA RESERVE & BRONTE CUTTING MANAGEMENT ZONES AND ACTIONS

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Calga Reserve and Bronte Cutting							
Remnant B2	High	Consists of a 1018m² patch of Sea-cliff Heath fringing the rock platform between the cliffs and Calga Place.	**Maintenance Weeding –** elimination of *Asparagus aethiopicus* and *Ehrharta erecta.* Target herbaceous weeds and exotic vines. **Rope works –** *Asparagus aethiopicus* and *Gazania tomentosa* are under control across accessible rock ledges but are still present amongst remnant native vegetation on cliff ledges which require rope access. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species. **Prevent public access –** this remnant is at a good lookout spot of the ocean and is vulnerable to trampling by tourists. Fencing should be installed to prevent access along with educational signage advising of the importance of the remnant vegetation within the Waverley LGA. Fencing should incorporate remnants B1 and B2 and Buffers 3.1 and 3.2.	Ropes works 4 times per year. Minimum of 8 site visits per year.	<5%	Maintain at <5% weed density.	Trained bush regenerators.
Remnant B1	High	Consists of a 91m² patch of Sea-cliff Heath fringing the rock platform between the cliffs and Calga Place.	**Targeted weeding –** control of *Hydrocotyle bonariensis* and exotic vines. **Ropes work –** *Asparagus aethiopicus* and *Gazania tomentosa* are under control across accessible rock ledges but are still present amongst remnant native vegetation on cliff ledges which require rope access. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species. **Prevent public access –** this remnant is at a good lookout spot of the ocean and is vulnerable to trampling by tourists. Fencing should be installed to prevent access along with educational signage advising of the importance of the remnant vegetation within the Waverley LGA. Fencing should incorporate remnants B1 and B2 and Buffers 3.1 and 3.2.	Ropes work twice per year. Minimum of 6 site visits per year.	<5%	Maintain at <5% weed density.	Trained bush regenerators.
Buffer 3.2	High	Consists of buffer plantings between the B1 remnant and Calga Reserve.	**Maintenance Weeding –** maintain good condition, targeting annual weeds through hand weeding techniques and spot spraying. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species. **Prevent public access –** this buffer planting area is at a good lookout spot of the ocean and is vulnerable to trampling by tourists. Fencing should be	8 visits per year with a minimum of 5 in spring/summer.	<5%	Maintain at <5% weed density.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Calga Reserve and Bronte Cutting							
			installed to prevent access along with educational signage advising of the importance of the remnant vegetation within the Waverley LGA. Fencing should incorporate remnants B1 and B2 and Buffers 3.1 and 3.2.				
Buffer 2	Medium	This buffer is directly adjacent to the remnant B8 vegetation and consists of native and exotic plantings along Calga Place.	**Control of dominant natives (High priority) –** target planted *Wollastonia uniflora,* particularly in the southern end of the zone, which has become dominant and is now smothering other natives. The control and eradication of this species will result in the increased germination and diversity of natives. Replace with small shrub species. See Appendix F for recommended species. **Infill planting** – where dominant natives have been control. Mulch will also assist in reducing weed recruitment in these areas. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species. **Maintenance weed works –** control herbaceous weeds within the previously burnt area and to target any germination of *Erythrina crista-galli.* **Targeted weeding –** target annual weeds before seeding to prevent germination. Continuation of thinning of *Strelitzia nicolai.* **Connectivity planting –** future buffer and infill planting where required. Suggestion of coir logging and jute matting to assist with erosion control, over the existing terracing methodology that has previously been used. Buffer 2 should be extended north to connect to buffer 1. This will improve fauna habitat connectivity. Eliminate pedestrian access through plantings in order to prevent the trampling of natives and the spread of weed propagules. **Ropes work (low priority) –** control *Lantana camara* and *Asparagus aethiopicus* on cliff edges. Care should be taken when treating woody weeds along the cliff edge as these may be providing stabilisation and preventing erosion. Removal should be staged.	Minimum of 12 site visits per year. Plantings are best planted during growing season (Autumn/Spring) to maximise plant survival rates. Water regularly after installation, which is to be increased in hot and/or windy conditions during the establishment phase (6 weeks) and then as required.	>70%	<50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing. Recruitment of native seedbank. Planting survival rate of >80% 6 months after planting.	Trained bush regenerators.
Buffer 1	Medium	The buffer vegetation is north of the B8 remnant made up of landscape plantings fringing the public pathways along Calga Place.	**Targeted weeding –** target annual weeds before seeding to prevent germination. Continuation of thinning of *Strelitzia nicolai.* Targeted weeding to eradicate *Hydrocotyle bonariensis.*	Minimum of 8 visits per year. Plantings are best planted during growing season	30-70%	<50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY.	Parks staff.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Calga Reserve and Bronte Cutting							
				(Autumn/Spring) to maximise plant survival rates. Water regularly after installation, which is to be increased in hot and/or windy conditions during the establishment phase (6 weeks) and then as required.		<10% weed cover by end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing. Planting survival rate of >80% 6 months after planting.	
Buffer 8	Medium	Consists of a highly weed infested patch of vegetation north of the C2 remnant. Works to contain weeds (retain some as habitat) and reduce the risk of encroachment into the remnant.	**Containment (High priority) –** bush regeneration to contain weed infestations. **Ropes work –** target infestations of *Coprosma repens* for containment as habitat and stabilization. Work towards eradicating *Asparagus aethiopicus* on the cliff edge. **Buffer planting –** potential for buffer planting to increase diversity, aesthetics and stability.	>70%	Minimum of 8 visits per year. Ropes work 4 times per year.	Recruitment of native seedbank. <50% weed cover by the end of 2024 – 2025 FY. <30% weed cover by the end of 2025 – 2026 FY. <10% weed cover by the end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing. Planting survival rate of >80% 6 months after planting.	Trained bush regenerators.
Remnant B8	Medium	Consists of a 75m^2 patch of Sea-cliff grassland fringing the rock shelf above Bronte Baths.	**Ropes work (low priority) –** *Asparagus aethiopicus* and *Gazania tomentosa* are under control across accessible rock ledges but are still present amongst remnant native vegetation on cliff ledges which require rope access. **Maintenance Weeding –** control of *Asparagus aethiopicus, Rumex sagittatus* and other herbaceous weeds within native remnants on cliff ledges has been successful to date and only requires maintenance. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species.	Ropes works twice per year. Minimum of 8 visits per year.	5-30%	Reduce weed density to <20% within first year of weed treatment, <10% within the first 2 years and <5% within the first 3 years. Maintain at <5% ongoing.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Calga Reserve and Bronte Cutting							
			Prevent public access – this remnant is at a good lookout spot of the ocean and is vulnerable to trampling by tourists. Fencing should be installed to prevent access along with educational signage advising of the importance of the remnant vegetation within the Waverley LGA.				
Buffer 3.1	Medium	Consists of weedy thickets of vegetation between the remnants B1 and B2 on the cliff line.	**Targeted weeding –** control and contain to ensure no encroachment on remnant vegetation patch. **Prevent public access –** this buffer planting area is at a good lookout spot of the ocean and is vulnerable to trampling by tourists. Fencing should be installed to prevent access along with educational signage advising of the importance of the remnant vegetation within the Waverley LGA. Fencing should incorporate remnants B1 and B2 and Buffers 3.1 and 3.2.	Minimum of 6 visits per year.	70%	<50% weed cover by end of 2024 – 2025 FY. <30% weed cover by end of 2025 – 2026 FY. <10% weed cover by end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing.	Trained bush regenerators.
Buffer 4	Medium	Consists of buffer plantings immediately west of the public walkway as well as an isolated area of buffer planting within Calga Reserve.	**Create delineation -** create a buffer between the turf and areas of buffer planting to reduce and control the encroachment of grasses. Mulch edge, spray edge or a combination with permanent edging is recommended. For spray edge create a buffer area of approximately 50 – 200cm sprayed around the buffer patches with a monocot specific herbicide. Any other non-monocotyledonous weeds should be removed by hand. Permanent delineation is beneficial for preventing pedestrian access. **Maintenance Weeding –** maintain condition, targeting annual weeds through hand weeding techniques and spot spraying. **Control of dominant natives (High priority) –** target planted *Wollastonia uniflora,* particularly in the southern end of the zone, which has become dominant and is now smothering other natives. The control and eradication of this species will result in the increased germination and diversity of natives. Replace with small shrub species. See Appendix F for recommended species.	Minimum of 8 visits per year.	5-30%	Reduce weed density to <20% by the end of 2022 – 2023 FY, <10% by the end of 2023 – 2024 FY and <5% by the end of 2024 – 2025 FY. Maintain at <5% ongoing.	Trained bush regenerators.
Buffer 5	Medium	Consists of a large planted buffer around B7 remnant. The vegetation is largely low heath with some semi-mature *Banksia integrifolia* present.	**Create delineation –** create a buffer between the turf and areas of buffer planting to reduce and control the encroachment of grasses. Spray edge or a combination with permanent edging is recommended. For spray edge create a buffer area of approximately 50 – 200cm sprayed around the buffer patches with a monocot specific herbicide. Any other non-monocotyledonous weeds should be removed by hand. Permanent delineation is beneficial for preventing pedestrian access.	Minimum of 8 visits per year.	<5%	Maintain at < 5% weed density.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Calga Reserve and Bronte Cutting							
			Maintenance weeding – weeding to target and control herbaceous weeds and *Hydrocotyle bonariensis*. No woody weeds are present. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species.				
Buffer 6	Medium	Located north-west of the Calga Reserve between Calga Place, consisting of a small strip of *Gleichenia dicarpa* growing on intermittently moist sandstone.	**Targeted weeding –** target annual weeds before seeding to prevent germination. Hand weeding to target *Ageratina adenophora* and *Asparagus aethiopicus*. Spot spraying of grass weeds. The control and eradication of these invasive species should result in the increased germination of natives.	Minimum of 8 visits per year.	>70%	Maintenance of buffer edge. <20% weed cover by the end of 2022 – 2023 FY. <5% weed cover by the end of 2023 – 2024 FY. Maintain at <5% weed cover ongoing.	Trained bush regenerators to manage areas adjacent to the remnant. Parks staff to manage areas further upslope.
Buffer 7	Medium	New buffer planting areas to be installed by Council along Calga Avenue and the southern boundary of Calga Reserve with Waverley Cemetery.	**Buffer planting –** future buffer and infill planting where required. Suggestion of coir logging and jute matting to assist with erosion control. Mulching? **Create delineation –** create and maintain delineation between new buffer plantings and turf. Spray edge or a combination with permanent edging for example plastic edging or wooden sleepers. For spray edge create a buffer area of approximately 50 – 200cm sprayed around the buffer patches with a monocot specific herbicide. Any other non-monocotyledonous weeds should be removed by hand. *Consider using alternative methods such as sandstone capping and soil seedbank translocation if a suitable donor site is available.	Minimum of 8 visits per year. Plantings are best planted during growing season (Autumn/Spring) to maximise plant survival rates. Water regularly after installation, which is to be increased in hot and/or windy conditions during the establishment phase (6 weeks) and then as required.	-	Maintenance of buffer edge. Planting survival rate of >80% 6 months after planting.	Parks staff.
Remnant B7	Low	Consists of a small 2m^2 remnant patch of Sea-cliff Sedgeland. However, has been described as "Too disturbed to discern" (SBRC 2020).	**Monitoring –** as this remnant is completely isolated and displays very low diversity, monitoring to occur during works within the surrounding buffer to ensure no loss of remnant. The remnant vegetation will benefit from weed control in the surrounding buffer vegetation.	Monitoring to occur during Buffer 5 site visits.	<5%	No net loss of remnant vegetation.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
Calga Reserve and Bronte Cutting							
Remnant Z19	Low	Located north-west of the Calga Reserve between Calga Place, consisting of a small strip of *Gleichenia dicarpa* growing on intermittently moist sandstone.	**Targeted weeding –** target annual weeds before seeding to prevent germination. Hand weeding to target *Ageratina adenophora* and *Asparagus aethiopicus*. Spot spraying of grass weeds. The control and eradication of these invasive species will result in the increased germination of natives.	Minimum of 8 times a year with a minimum of 2 visits in spring/summer.	>70%	Maintenance of buffer edge. <20% weed cover by the end of 2022 – 2023 FY. <5% weed cover by the end of 2023 – 2024 FY. Maintain at <5% weed cover ongoing.	Trained bush regenerators.
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish one fixed photo monitoring point within each remnant and buffer zone. • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A		Trained bush regenerators.

13 WAVERLEY CEMETERY CLIFFS

Figure 13-1. Remnant vegetation below Waverley Cemetery

The Waverley Cemetery Cliffs consists of five patches of remnant vegetation along the sandstone cliff-tops to the east of the Waverley Cemetery. The vegetation comprises three communities including: Sea-Cliffs Sedgeland, Sea-cliff Heath and Sea-cliff Herbland (SBRC 2020). The Sea-cliff Herbland is diverse for a small location. These patches are isolated from others along the coastline.

Waverley Cemetery Cliffs are within an area of local and State heritage significance, as a unique Victorian-era cemetery which demonstrates the historic and contemporary social character of Sydney against a dramatic natural landscape.

13.1 FLORA

A good condition patch of Sea-cliff Heath is located at the north of the site. This community is an open to closed low growing community within 50m of sea cliffs on skeletal sand to sand lenses on sandstone with impeded drainage. Typical remnant species including *Baeckea imbricata, Banksia ericifolia, Melaleuca armillaris, Melaleuca* nodosa and *Westringia fruticosa.* This patch is protected by a long section of buffering vegetation below the boardwalk.

A small patch of Sea-cliff Herbland is positioned under the boardwalk near the north of the site which is of 'fair' condition.

The remaining three patches comprise of Sea-cliff Sedgland. This community is dominant with *Ficinia nodosa* and *Machaerina juncea* and is located within 20m of the sea cliffs. It is an open canopy growing on skeletal sand to sand lenses on sandstone, often on modified soils (SBRC 2020). These patches are in poor condition due to the infestations of *Ipomoea cairica* and *Asparagus aethiopicus.*

Table 13-1 – Waverley Cemetery Cliffs Bushland Remnants Native Flora Species (SBRC 2020)

Scientific Name	Common Name	Scientific Name	Common Name
Adiantum aethiopicum	Common Maidenhair	*Lachnagrostis filiformis*	Blown Grass
Atriplex semibaccata	Creeping Saltbush	*Lobelia anceps*	Angled Lobelia
Baeckea imbricata	Heath Myrtle	*Lomandra longifolia*	Spiny-headed Mat-rush
Machaerina juncea	Bare Twig-rush	*Melaleuca armillaris*	Bracelet Honey-myrtle
Carpobrotus glaucescens	Pigface	*Melaleuca nodosa*	Prickly-leaved Paperbark
Commelina cyanea	Native Wandering Jew	*Paspalum vaginatum*	Salt-water Couch
Cyperus polystachyos	Bunchy Sedge	*Samolus repens*	Creeping Brookweed
Dianella congesta	Beach Flax-lily	*Schoenus brevifolius*	Zig-zag Bog-rush
Dichelachne crinita	Longhair Plumegrass	*Sonchus hydrophilus*	Native Sowthistle
Drosera pygmaea	Pygmy Sundew	*Sporobolus virginicus*	Sand Couch
Ficinia nodosa	Knobby Club-rush	*Tetragonia tetragonioides*	New Zealand Spinach
Isolepis cernua	Nodding Club-rush	*Triglochin striata*	Streaked Arrowgrass
Juncus kraussii	Sea Rush	*Westringia fruticosa*	Coastal Rosemary
Juncus pallidus	Pale Rush	*Zoysia macrantha*	Prickly Couch
Lachnagrostis billardierei	Coast Blown-grass		

13.2 FAUNA

Numerous shorebirds and seabirds have been observed along the cliff-line at this site, including the Cape Gannet (*Morus capensis*), Pied Cormorant (*Phalacrocorax varius*) and Great Cormorant (*Phalacrocorax carbo*). The rocky outcrops provided basking and foraging habitat for reptiles such as Water Skinks (*Eulamprus quoyii*) (ALA 2020) and also pool with freshwater in high rainfall events providing habitat for Amphibians. Frogs such as the Common Eastern Toadlet (*Crinia signifera*) have been noted here and would utilise the ephemeral creekline in the north of the site and damp sedges for breeding. Amphibians species have only been noted at four other sites, thus Waverly Cemetery is significant for this feature.

The dense native and exotic shrub layers, particularly in the Sea-cliff Heath and the buffer planting, provide foraging and sheltering habitat for small reptile and bird species including the Superb Fairy-wren (*Malurus cyaneus)*). Flowering native plants such as the *Baeckea spp., Melaleuca spp.,* and *Banksia spp.* attract pollinators and provide abundant foraging resources for many nectarivorous and insectivorous species including the New Holland Honeyeater (*Phylidonyris novaehollandiae*) and the Grey-headed Flying-fox (*Pteropus poliocephalus*) (Vulnerable under the BC Act and EPBC Act) which have been recently recorded at the site.

13.3 MANAGEMENT ACTIONS

13.3.1 Previous works

Recent management has proved effective at this site in the reduction of annuals such as *Rumex sagittatus* and *Parietaria judaica* and invasive vines such as *Ipomoea indica* around native shrubs (Apunga 2019c). The significant infestation of *Hydrocotyle bonariensis* remains the primary management issue. Small areas of *Hydrocotyle* have been reduced using slow hand removal techniques, however these methods have proven inefficient against the large main infestations (Apunga 2019c). The use of herbicide to manage the *Hydrocotyle* would be ideal, however research into appropriate herbicides to use in a delicate remnant wetland has been unsuccessful to date (Apunga 2019c).

13.3.2 Key management actions

This site is of moderate management priority. Key management actions generally include:

- **Targeted weeding:** Target annual weeds before seeding to prevent germination. Target species including *Ipomoea indica, Parietaria judaica, Rumex sagittatus, Hydrocotyle bonariensis* and *Wollastonia uniflora.*
- **Ropes work:** Target infestations of *Asparagus aethiopicus* and *Coprosma repens* on the cliff edge. Ropes work is required due to inaccessibility and the hazard on the cliff edge.
- **Primary weeding**: Primary weed management in Buffer 5 to remove the *Lantana camara, Asparagus aethiopicus, Ipomoea indica* and *Coprosma repens.* This is required to manage the C1b remnant which is at risk of being lost.
- **Habitat creation –** plant additional macrophytes in drainage areas to provide additional habitat for frogs. Prioritise weed management in areas of frog habitat. It is recommended that a diversity of at least 20 species if achieved from a variety of grasses and nectar providing species. Introduce sandstone boulders and retain fallen logs and branches. This would also assist in slope stability.
- **Preserve and introduction of rocky areas –** prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species. Rocky areas also increase pooling of water increasing the habitat availability for amphibians.
- **Ecological monitoring:** using photo points and species counts. Ecological monitoring will be reported annually and provide data to support the meeting of goals.

The management of *Hydrocotyle bonariensis* at this site has been an ongoing issues. Alternative treatment methods including application of iron-sulphate, crunch spraying and methodical handweeding should be trialled in plots. See Appendix A.

The weed densities and management actions for the different areas are shown in Map 13-1 and Map 13-2 and provided in Table 13-2. Detailed methodologies for the recommended management actions are provided in Appendix A for more detail on these methods.


Title: Weeds & Manag. Actions
Map No: 13-1
Site: Waverley Cemetery Cliffs (North)
Client: Waverley Council
Date: January 2021
Author: G Barron
Bushland Remnant
Previous Buffer Planting
Weed % Cover 2020
<5%
5% - 30%
30% - 70%
>70%
Management Actions
Targeted Weed Control
© Department of Customer Service 2020
0 5 10 20 Meters
N
Data Source:
Total Earth Care
Nearmap
total earth care
Buffer 1
Buffer 2
C2c
C2a
C2a
Buffer 2
C2b

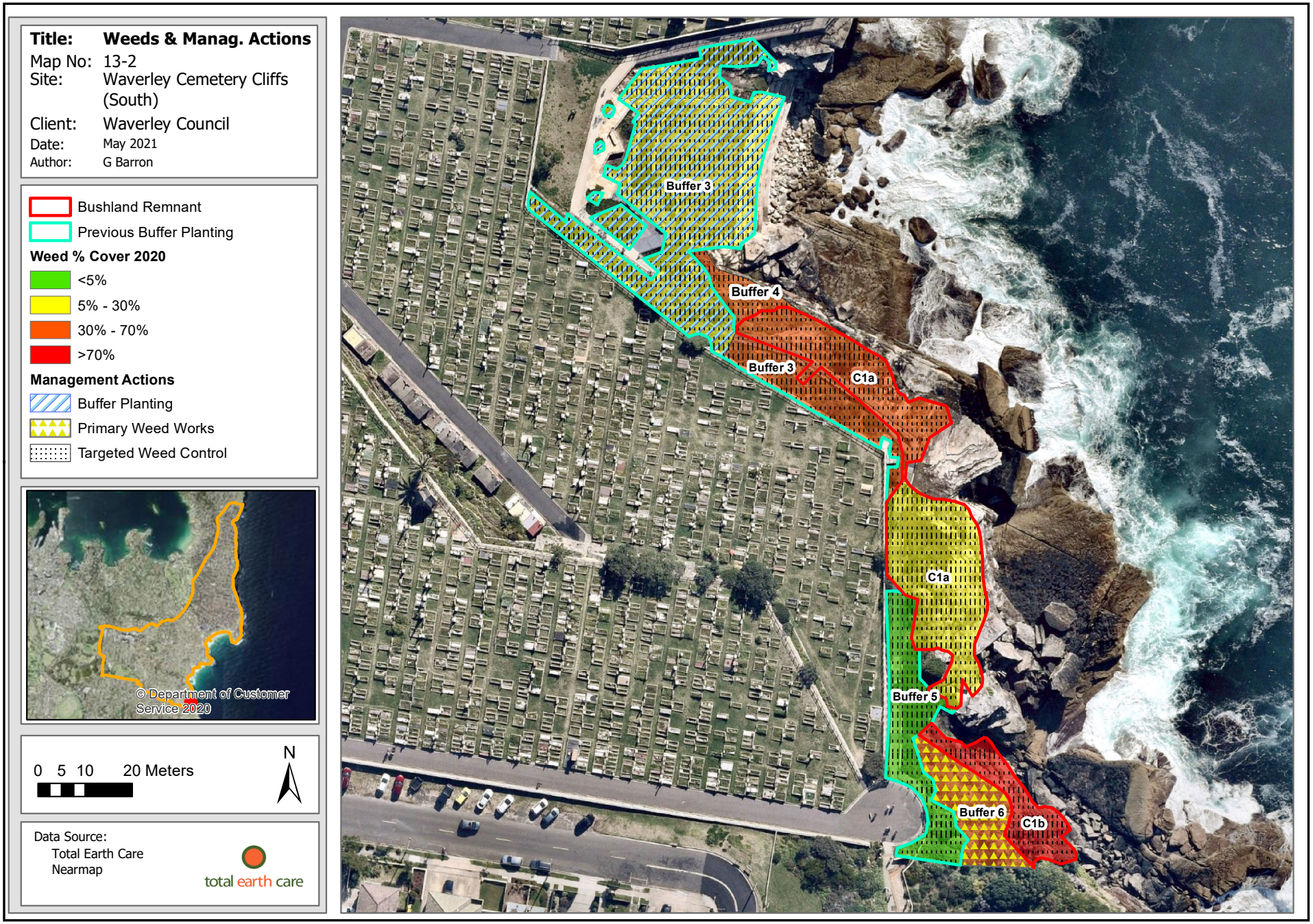
Title: Weeds & Manag. Actions
Map No: 13-2
Site: Waverley Cemetery Cliffs (South)
Client: Waverley Council
Date: May 2021
Author: G Barron
Bushland Remnant
Previous Buffer Planting
Weed % Cover 2020
<5%
5% - 30%
30% - 70%
>70%
Management Actions
Buffer Planting
Primary Weed Works
Targeted Weed Control
© Department of Customer Service 2020
0 5 10 20 Meters
N
Data Source:
Total Earth Care
Nearmap
total earth care
Buffer 3
Buffer 4
Buffer 3
C1a
C1a
Buffer 5
Buffer 6
C1b

TABLE 13-2 – WAVERLEY CEMETERY CLIFFS MANAGEMENT ZONES AND ACTIONS

Zone	Priority	Description of Management Zone	Management Actions	Weed Density 2020	Timing	Key Performance Indicators (KPIs)	Role
Waverley Cemetery Cliffs							
Remnant C1a	High	This zone has remained reasonably stable throughout the past year, comprising predominantly of patches of *Ficinia nodosa* and *Machaerina juncea.*	**Maintenance weeding -** target annual weeds before seeding to prevent germination. Target vines (*Ipomoea indica*) to prevent reestablishment. **Targeted weeding –** focus on controlling *Hydrocotyle bonariensis* within native areas (*Machaerina juncea*) as it outcompetes native species. Hand removal around natives is preferred. **Ropes work -** target infestations of *Asparagus aethiopicus,* and *Coprosma repens* on the cliff edge. **Direct seeding –** after treatment of *Hydrocotyle bonariensis* if no natural regeneration and to increase diversity.	30-70%	12 visits per year with a minimum of 6 in spring/summer. Ropes work 4 times per year.	Reduce weed density to <20% by the end of 2022 – 2023 FY, <10% by the end of 2023 – 2024 FY and <5% by the end of 2024 – 2025 FY. Maintain at <5% ongoing. Recruitment of native seedbank. Reduction and containment of *Hydrocotyle bonariensis.* No reduction in remnant.	Trained bush regenerators.
Remnant C2a	High	This zone covers a large proportion of the Sea-cliff heathland and currently suffers from a significant infestation of *Hydrocotyle bonariensis* and *Asparagus aethiopicus* on the cliff line. Infestations of *Ipomoea indica* and *Parietaria judaica* have previously been controlled.	**Targeted weeding -** target annual weeds before seeding to prevent germination. Continue to targeted vines (*Ipomoea indica*) and hand removal of *Parietaria Judaica* and *Rumex sagittatus.* Eradication of *Wollastonia uniflora* which has been seen to be highly invasive within the buffer plantings and could be detrimental to the remnant vegetation. Replace with small shrub species. See Appendix F for recommended species. Control and further research into successful and viable treatment methods of *Hydrocotyle bonariensis.* Suggestion for spot spraying and containment larger infestations. Hand removal and hand application of herbicide where root zones are accessible and minimal soil disturbance can be achieved. **Ropes work -** target infestations of *Asparagus aethiopicus* on the cliff edge.	5-30%	12 visits per year with a minimum of 6 in spring/summer. Ropes work 4 times per year.	Reduce weed density to <5% by the end of 2022 – 2023 FY. Maintain at <5% ongoing. Eradication of *Wollastonia uniflora.* Reduction and containment of *Hydrocotyle bonariensis.* Recruitment of native seedbank.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Weed Density 2020	Timing	Key Performance Indicators (KPIs)	Role
Waverley Cemetery Cliffs							
			Containment of *Coprosma repens* north of the remnant patch to ensure there is no encroachment into the remnant patch.				
Remnant C2b	High	This zone is south of C2a containing Sea-cliff Sedgeland dominant in *Machaerina juncea.* This zone also contains a significant infestation of *Hydrocotyle bonariensis.*	**Targeted weeding -** target annual weeds before seeding to prevent germination. Control and contain *Hydrocotyle bonariensis.* Suggestion for spot spraying and containment of larger infestations. Hand removal and hand application of herbicide where root zones are accessible and minimal soil disturbance can be achieved. **Ropes work -** target infestations of *Asparagus aethiopicus* on the cliff edge.	5-30%	Minimum of 12 visits per year with a minimum of 6 in spring/summer. Ropes work 2 times per year.	Reduce weed density to <20% by the end of 2022 – 2023 FY, <10% by the end of 2023 – 2024 FY and <5% by the end of 2024 – 2025 FY. Maintain at <5% ongoing. Reduction and containment of *Hydrocotyle bonariensis.* Recruitment of native seedbank.	Trained bush regenerators.
Buffer 4 and southern part of buffer 3 (adjacent to Remnant C1a)	High	Areas of weeds adjacent to Remnant C1a.	**Maintenance weeding -** target annual weeds before seeding to prevent germination. Target vines (*Ipomoea indica*) to prevent reestablishment. **Targeted weeding –** focus on controlling *Hydrocotyle bonariensis* remnant boundaries as it outcompetes native species. Hand removal around natives is preferred. **Ropes work -** target infestations of *Asparagus aethiopicus,* and contain *Coprosma repens* for stabilisation and habitat on the cliff edge. **Direct seeding –** after treatment of *Hydrocotyle bonariensis,* if no natural regeneration occurs and to increase diversity.	30-70%	12 visits per year with a minimum of 6 in spring/summer. Ropes work 4 times per year.	Reduce weed density to <20% by the end of 2022 – 2023 FY, <10% by the end of 2023 – 2024 FY and <5% by the end of 2024 – 2025 FY. Maintain at <5% ongoing. Recruitment of native seedbank. Reduction and containment of *Hydrocotyle bonariensis.*	Trained bush regenerators.
Buffer 5	High	This area located at the southern end of the site near the bowling club. The buffer plantings are well established. However, the planted *Wollastonia uniflora* is	**Maintenance weeding -** target annual weeds before seeding to prevent germination targeting annual weeds. Target vines (*Ipomoea indica*) to prevent reestablishment.	<5%	Minimum of 8 visits per year with a minimum of 4 in spring/summer.	Maintain <5% weed density. Eradication of *Wollastonia uniflora.*	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Weed Density 2020	Timing	Key Performance Indicators (KPIs)	Role
Waverley Cemetery Cliffs							
		becoming dominant and has required regular management. This species should be completely removed to reduce maintenance and ensure no biodiversity loss.	**Control of dominant natives -** target and remove *Wollastonia uniflora* as it is dominant and smothering other natives, resulting in decreased diversity and requiring too much up keep to control. Infill planting and mulching should occur where these are removed. Replace with small shrub species. See Appendix F for recommended species. **Retention of logs –** any fallen logs are to be retained as these provide habitat for insects and lizards, which in turn provide food for a number of bird species. **Preserve and introduction of rocky areas –** prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species. Rocky areas also increase pooling of water increasing the habitat availability for amphibians.			Recruitment of native seedbank.	
Buffer 6	Medium	A patch of high density weeds are located above the C1b remnant. If this zone is not targeted, the C1b remnant is likely to be lost all together.	**Primary Weeding –** primary weeding to slowly target infestations of *Lantana camara, Asparagus aethiopicus, Ipomoea indica* and *Coprosma repens.* **Buffer planting –** buffer planting to extend east of Buffer 4 to replace habitat lost during primary weed works. Plantings of suitable sedges, rushes and Clifftop heath species. This will protect and enhance the remnant below C1b and ensure that this is not lost. Recommendation of coir logging and jute matting. **Habitat creation** – It is recommended that a diversity of at least 20 species if achieved from a variety of grasses and nectar providing species. Introduce sandstone boulders and retain fallen logs and branches. This would also assist in slope stability. **Maintenance weeding –** target annual weeds before seeding to prevent germination. Target any reshooting *Lantana camara, Asparagus aethiopicus, Ipomoea indica* and *Coprosma repens.*	>70%	Minimum of 12 visits per year with a minimum of 6 in spring/summer. Plantings are best planted during growing season (Autumn/Spring) to maximise plant survival rates. Water regularly after installation, which is to be increased in hot and/or windy conditions during the establishment phase (6 weeks) and then as required.	<50% weed cover by the end of 2024 – 2025 FY. <30% weed cover by the end of 2025 – 2026 FY. <10% weed cover by the end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing. Establishment of buffer plantings.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Weed Density 2020	Timing	Key Performance Indicators (KPIs)	Role
Waverley Cemetery Cliffs							
Buffer 3	Medium	This zone consists of established and young buffer plantings north and west of remnant C1a. Young plantings will be monitored to ensure success and infill planting will be conducted where survival rates are compromised.	**Targeted weeding –** control and contain *Hydrocotyle bonariensis* and *Asparagus aethiopicus.* Trial alternative methods for *Hydrocotyle bonariensis* treatment. See Appendix A. **Maintenance weeding –** target annual weeds before seeding to prevent germination, through the areas of young buffer planting. **Buffer/infill planting –** additional buffer planting of suitable sedges and rushes below the boardwalk, north of the sea wall. Infill planting required where establishment and low diversity. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species.	5-30%	Minimum of 12 visits per year with a minimum of 6 in spring/summer Plantings are best planted during growing season (Autumn/Spring) to maximise plant survival rates. Water regularly after installation, which is to be increased in hot and/or windy conditions during the establishment phase (6 weeks) and then as required.	Reduce and maintain at <5% weed density. Recruitment of native seedbank. Establishment of buffer plantings.	Areas south of the board walk and isolated patches west of the landslip are managed by Parks staff. Trained bush regenerators to manage landslip area.
Remnant C1b	Medium	This is the southernmost zone which has not recently been targeted for regeneration works due to access. The remnant vegetation is classified as Sea-cliff Sedgeland dominant in *Machaerina juncea.*	**Targeted Weeding –** Primary weeding to slowly target infestations of once Buffer 5 is contained. Weeding to target *Lantana camara, Asparagus aethiopicus, Ipomoea indica* and *Coprosma repens.* Woody weeds only to be targeted if slope stability allows. Root balls must be left *in situ.* **Ropes work –** Clearing of weed plumes targeted around areas of native shrubs.	>70%	Ropes work 4 times per year.	Protection and no loss of remnant. <50% weed cover by the end of 2024 – 2025 FY. <30% weed cover by the end of 2025 – 2026 FY. <10% weed cover by the end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing. Recruitment of native seedbank.	Trained bush regenerators.
Buffer 1	Medium	Consists of a highly weed infested patch of vegetation north of the C2 remnant. Priority weeds include *Coprosma repens.*	**Containment (High priority) –** bush regeneration to contain weed infestations. **Targeted weeding –** removal and containment of *Coprosma repens* north of the remnant patch to ensure	>70%	Minimum of 8 visits per year. Ropes work 4 times per year.	Recruitment of native seedbank.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Weed Density 2020	Timing	Key Performance Indicators (KPIs)	Role
Waverley Cemetery Cliffs							
		Works to contain weeds and reduce the risk of encroachment into the remnant.	there is no encroachment into the remnant patch. Mosaic removal prevents complete loss of habitat. Hand removal of *Watsonia meriana* and *Canna x generalis.* **Ropes work –** target infestations of *Coprosma repens* and *Asparagus aethiopicus* on the cliff edge. **Buffer planting –** potential for buffer planting to increase diversity, aesthetics and stability.			<50% weed cover by the end of 2024 – 2025 FY. <30% weed cover by the end of 2025 – 2026 FY. <10% weed cover by the end of 2026 – 2027 FY. Maintained at <10% weed cover ongoing. Planting survival rate of >80% 6 months after planting.	
Buffer 2	Medium	Consists of a planted buffer along the Waverley Cemetery public boardwalk to the west of remnant zones C2a and C2b. The plantings are well established and resilient, with a low weed density. Fewer hours are needed in this area to maintain the condition.	**Maintenance weeding -** target annual weeds before seeding to prevent germination. Trial alternative methods for *Hydrocotyle bonariensis* treatment. See Appendix A. **Control of dominant natives –** eradication of the *Wollastonia uniflora* as it is becoming dominant, smothering other natives, decreasing diversity and is requiring too much pruning up keep to control the species. **Buffer planting –** infill planting if necessary if natural germination of natives is not successful after the removal of *Wollastonia uniflora.* Replace with small shrub species. See Appendix F for recommended species. **Preserve rocky areas** – prevent weeds overgrowing rocky outcrops and platforms as these provide basking opportunities and habitat for a number of reptile species. **Protect and enhance frog habitat** – through planting of macrophyte species and prioritizing weed management in drainage areas.	<5%	Minimum of 8 visits per year.	Maintain <5% weed density. Eradication of *Wollastonia uniflora.* Recruitment of native seedbank. Increased diversity through buffer planting. Planting survival rate of >80% 6 months after planting.	Trained bush regenerators.

Zone	Priority	Description of Management Zone	Management Actions	Weed Density 2020	Timing	Key Performance Indicators (KPIs)	Role
Waverley Cemetery Cliffs							
Remnant C2c	Medium	This remnant is a small patch (44m^2) of Sea-cliff Herbland dominant in *Dianella congesta*. This zone remains in a fairly stable condition.	**Maintenance weeding –** target annual weeds before seeding to prevent germination. Target vines (*Ipomoea indica*) to prevent reestablishment. Trial alternative methods for *Hydrocotyle bonariensis* treatment. See Appendix A.	<5%	Minimum of 6 visits per year.	Maintain <5% weed density.	Trained bush regenerators.
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish one fixed photo monitoring point within each remnant and two within each buffer zone. • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.	N/A	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	Submission of annual reports to Council.	Trained bush regenerators.

14 YORK ROAD BUSHLAND

Figure 14-1. Remnant vegetation adjacent to York Road

The York Road Bushland comprises Eastern Suburbs Banksia Scrub which is listed as a Critically Endangered Ecological Community (CEEC) under the BC Act and an Endangered Ecological Community (EEC) under the federal EPBC Act (SBRC 2020). The patch managed under this Action Plan (about 521m^2) is Council owned verge and forms part of a larger area (over 11,000m^2) in Queens Park which is the largest area of Eastern Suburbs Banksia Scrub in the LGA. Although small, this patch comprises the only example of remnant Eastern Suburbs Banksia Scrub managed under this Action Plan.

14.1 FLORA

The Eastern Suburbs Banksia Scrub is typically an open to closed canopy with species including *Acacia longifolia, Banksia serrata, Leptospermum laevigatum* and *Monotoca elliptica* on aeolian sands (SBRC 2020). The condition of the vegetation is of good quality with less than 5% weeds present (BHRC 2019). Although, this patch is small and it is separated from the larger area by a chain mail fence, the management of the patch provides an important buffer to protect the larger area from edge effects including weed invasion.

Table 14-1 – York Road Bushland Remnants Native Flora Species (SBRC 2020)

Scientific Name	Common Name	Scientific Name	Common Name
Acacia longifolia	Coastal Wattle	*Eragrostis brownii*	Brown's Lovegrass
Acacia suaveolens	Sweet Wattle	*Ficinia nodosa*	Knobby Club-rush
Acacia ulicifolia	Prickly Moses	*Kunzea ambigua*	Tick Bush
Astroloma pinifolium	Pine Heath	*Leptospermum laevigatum*	Coast Teatree
Austrostipa mollis	Soft Speargrass	*Leucopogon ericoides*	Pink Beard-heath
Banksia serrata	Old-man Banksia	*Leucopogon juniperinus*	Prickly Beard-heath
Bossiaea heterophylla	Variable Bossiaea	*Lomandra glauca*	Pale Mat-rush
Bossiaea scolopendria	Plank Plant	*Lomandra longifolia*	Spiny-headed Mat-rush
Brachyloma daphnoides	Daphne Heath	*Micrantheum ericoides*	Micrantheum ericoides
Commelina cyanea	Native Wandering Jew	*Microlaena stipoides*	Weeping Grass
Dianella caerulea	Blue Flax-lily	*Monotoca elliptica*	Tree Broom-heath
Dianella congesta	Beach Flax-lily	*Persoonia lanceolata*	Lance Leaf Geebung
Dianella revoluta	Blueberry Lily	*Schoenus ericetorum*	Heath Bog-rush
Dichelachne crinita	Longhair Plumegrass	*Wahlenbergia gracilis*	Australian Bluebell
Dichondra repens	Kidney Weed	*Xanthosia pilosa*	Woolly Xanthosia
Dillwynia glaberrima	Smooth Parrot-pea	*Xanthosia tridentata*	Rock Xanthosia
Dillwynia retorta	Heathy Parrot-pea		

14.2 FAUNA

The small patch itself provides little foraging and sheltering resources for birds, reptiles and frogs, however has connectivity to the larger area of adjacent Eastern Suburbs Banksia Scrub. As the fence is chain mail, it will not impede passage for small mammals, birds and reptiles, whilst excluding foxes from the large area to the east. In the adjacent area, there are recent records of the Powerful Owl (*Ninox strenua*) (Vulnerable under the BC Act) and Grey-headed Flying-fox (*Pteropus poliocephalus*) (Vulnerable under the BC Act and EPBC Act) (DPIE 2020). Due to the small size of the patch and given that it is within the road verge, opportunities for fauna habitat creation at this site are limited.

14.2.1 Previous works

The condition of the patch of Eastern Suburbs Banksia Scrub has improved in recent years. It has slightly extended to the north and is improving in species diversity. There is a low weed density present, with only a weed sweep required to be conducted monthly as part of management works (BHRC 2018a, 2019a). Replanting, which has been undertaken in the buffer to restore diversity, has had limited success due to soil quality and the dominance of *Acacia binervia*. The plantings of Wallaby Grass have been reasonably successful and the species is increasing in numbers (BHRC 2018b, 2019b).

14.2.2 Key management actions

Management priority of this site is high as it is the only example of Eastern Suburbs Banksia Scrub managed under this plan. This site can be maintained at good condition with effective and consistent management. Key management actions generally include:

- **Maintenance weeding:** Target annual weeds before seeding to prevent germination. This is high priority in remnant Y2 as this edge acts as a buffer for the core of the remnant vegetation which is managed by Centennial Park and Moore Park Trust. As the patch is adjacent to York Road, it is likely that weed seeds will be transported by vehicles and pedestrians and so maintenance weeding will require to be ongoing.
- **Delineation:** Maintenance of the delineated edges of the buffer. The current sediment fence is working well to exclude exotic grasses and herbaceous weeds. This will need to be maintained and repaired.
- **Promote native regeneration:** Scarification of the soil and flame weeding in the remnant should be trialled to test the resilence of the seedbank and promote native regeneration.
- **Ecological monitoring:** Conducted using photo points and species counts. Ecological monitoring will be reported annually and provide data to support the meeting of goals.

The weed densities and management actions for the different areas are shown in Map 14-1 and provided in Table 14-2. Detailed methodologies for the recommended management actions are provided in Appendix A.

14.3 PREDICTIONS AND RECOMMENDATIONS FOR ACHIEVING EAP4 OBJECTIVES

The management at this site will preserve the existing good condition vegetation of the Eastern Suburbs Banksia Scrub (Y2) and the buffer planting.

The remnant patch (Y2) can be maintained in 'good' condition by 2040. The weed density across the whole site (Y2 and Buffer) can likely be kept below 5%.

The remnant has expended in the last 2 or 3 years and there is a few meters of verge to the east that could allow for more expansion in the future. However, the maintenance of this remnant patch (Y2) is important as it provides a buffer to edge effects for the larger area of Eastern Suburbs Banksia Scrub to the east. Due to the low densities of weeds present at this site, bush regeneration by hand is an acceptable technique.

Title: **Weeds & Manag. Actions**
Map No: 14-1
Site: York Road Bushland
Client: Waverley Council
Date: January 2021
Author: G Barron

Bushland Remnant
Previous Buffer Planting

Weed % Cover 2020

<5%

Management Actions

Targeted Weed Control
Maintain Delineation

0 5 10 20 Meters

N

Data Source:
Total Earth Care
Nearmap

total earth care

TABLE 14-2 – YORK ROAD MANAGEMENT ZONES AND ACTIONS

Zone	Priority	Description of Management Zone	Management Actions	Timing	Weed Density 2020	Key Performance Indicators (KPIs)	Role
York Road Bushland							
Remnant Y2	High	Remnant vegetation consisting of Eastern Suburbs Banksia Scrub. This vegetation is regularly maintained and displays low weed densities, however is subject to edge effects.	**Maintenance weeding -** target annual weeds before seeding to prevent germination. High priority as this edge acts a buffer for the core of the remnant vegetation to the east, which is managed by Centennial Park and Moore Park Trust. *Trial scarification and flame weeding. **Maintenance of fences** – signs of feral species have been observed damaging / digging under the fence. Fence needs to be maintain in working order at all times to prevent future damage in the Eastern Suburbs Banksia Scrub EEC, within the managed park.	Minimum of 4 visits per year.	<5%	Maintain weed density at <5%.	**Maintenance weeding** – trained bush regenerators. **Maintenance of fences –** Botanic Gardens and Centennial Parklands.
Buffer	Medium	Buffer plantings located on the western side of York Road.	**Maintenance weeding -** target annual weeds before seeding to prevent germination. Maintenance of buffer plantings and conduct infill planting where required to ensure success of buffer and to create habitat complexity. **Maintain delineation –** maintain existing delineation and install sediment fencing where necessary. Permanent delineation could be installed in the long-term, for example wooden sleepers, to create a more visually aesthetic landscape. However, care must be taken to ensure that delineation used does not prevent a trip hazard to pedestrians. **Buffer planting –** if required to enhance resilience, visuals and habitat complexity.	Minimum of 6 site visits per year.	<5%	Maintain weed density at <5%.	**Maintenance weeding and buffer planting** – trained bush regenerators. **Maintain delineation –** parks staff.
All Zones	Required	Ecological monitoring across all zones.	Undertake regular monitoring which can be incorporated into site visits, to ensure bush regeneration works are progressing within the scope of this action plan and EAP4 objectives. Monitoring actions include: • Establish two fixed photo monitoring point within the remnant and two within the buffer zone. • Establish one fixed quadrat or transect survey location to assess species composition, weed density and abundance and native regeneration. Provide annual reports summarising findings to Waverley Council.	Monitoring events to occur at regular intervals throughout the works with annual reports provided to Waverley Council.	N/A	Submission of annual reports to Council.	Trained bush regenerators.

15 PRIORITY ACTIONS ACROSS THE WAVERLEY COUNCIL LGA

Maintenance weeding should be conducted across all zones and all years, including those with high weed densities, to ensure that none deteriorate beyond their current condition. In particular herbaceous weeds should be treated prior to seeding. The following table provides the priority actions for each site to improve remnant conditions, expand areas of revegetation and strengthen existing habitat corridors, thereby addressing the Waverley Council Environmental Action Plan Version 4 2018-2030 (EAP4) biodiversity targets.

Table 15-1. 2022 to 2027 Priority actions within each site and year within the Waverley Council LGA

Priority Actions					
Site	**2022 – 2023 FY**	**2023 – 2024 FY**	**2024 – 2025 FY**	**2025 – 2026 FY**	**2026 – 2027 FY**
North Clifftop Remnants	Creation of a permanent edge between mown lawn and Buffers 1, 2 and 3 to reduce maintenance weeding of exotic grass encroachment. Targeted weeding of Buffer 2. Buffer 2 – Once established begin buffer planting of low growing shrub, sedge and rush species. Species list can be found in Appendix F. Creation and retention of habitat should be ongoing every year in conjunction with bush regeneration work.	Targeted weeding of Buffer 2. Maintenance and monitoring of establishing buffer plantings in Buffer 2. Infill planting where required to fulfil 80% survival rate KPI. Maintenance of buffer planting edge. Trial sandstone capping halos at Bay St. Continue into following years with additional planting and halos if successful.	Begin targeted weeding of Z1 remnant. Ropes work to target infestations of *Asparagus aethiopicus,* and *Coprosma repens* on the cliff edge. Sandstone capping and planting of Buffer 3 at Clarke Reserve. Installation of buffer plantings adjacent to D1a remnant. Buffer planting of low growing shrub, sedge and rush species. Species list can be found in Appendix F. Create and maintain a permanent edge between mown lawn and newly installed buffer plantings. Continue maintenance weeding across all buffer zones.	Maintenance and monitoring of establishing buffer plantings adjacent to D1a. Infill planting where required to fulfil 80% survival rate KPI. Begin targeted weeding of D1a remnant. Ropes work to target infestations of *Asparagus aethiopicus,* and *Coprosma repens* on the cliff edge. Continue targeted weeding within Z1. Continue maintenance weeding across all buffer zones.	Targeted weeding within remnant Z5 to ensure no net-loss. Ropes work may be required due to access. Continue targeted weeding within Z1 and D1a. Continue maintenance weeding across all buffer zones.

Priority Actions					
Site	**2022 – 2023 FY**	**2023 – 2024 FY**	**2024 – 2025 FY**	**2025 – 2026 FY**	**2026 – 2027 FY**
Diamond Bay Reserve	Prioritise weed treatment in D1b beginning in the D1b core which exhibits higher resilience and lower weed density. Extend targeted weeding to the east of the D1b remnant. Targeted weeding within Buffer 2.1, Buffer 3, Buffer 4.2, D3c and D2b to reduce and maintain at <5% weed density. Targeted weeding to stay on top of dominant weeds in D3b. Prioritise targeted weeding in Buffer 2.2. Monitor for native regeneration. Retain and create habitat in D1b, D2b and D3b. Contain weeds as habitat in buffers until their staged removal. Control dominant native in Buffer 2.1 and 3.1. Creation and retention of habitat should be ongoing every year in conjunction with bush regeneration work.	Continue targeted weeding within Buffer 2.2, Buffer 3, D1b core and D2b to reduce and maintain at <5% weed density. Buffer planting in Buffer 2.2 if natural regeneration is low. Extend Buffer 2.2 to the south to connect with Buffer 3.1. Plant low growing shrub and sedge species. Species list can be found in Appendix F. Maintain permanent delineation between buffer plantings and turf. Ropes work in D1b and D2b to target *Asparagus aethiopicus* and woody weeds on cliff edge. Begin targeted weeding in Buffer 1.1. Install buffer planting create a buffer between the turf and the D1b remnant. Once controlled begin buffer planting of low growing shrub and sedge species. Species list can be found in Appendix F. Retain and create habitat in D1b, D2b and D3b. Contain weeds as habitat in buffers until their staged removal.	Maintenance and monitoring of establishing buffer plantings in Buffer 1.1 and 2.2. Ropes work in D1b to target *Asparagus aethiopicus* and woody weeds on cliff edge. Continue maintenance weeding within Buffer 2, Buffer 3, D1b, D2a and D2b to maintain at <5% weed density. Create planted buffer along northern edge of Buffer 1 and D1b. Create and maintain delineation between buffer and turf. Retain and create habitat in D1b, D2b and D3b. Control dominant native in Buffer 3.2.	Maintenance and monitoring of establishing buffer plantings in Buffer 2.2 and 3.1. Begin mosaic clearing (primary works) in Buffer 4.3. Continue targeted weeding in this zone and previously cleared areas. Install terracing or coir logs and mulch along the length of the slope. Allow initial flush of exotics and install native plant species. Low growing shrubs should be installed along the upper slope to maintain residents' views. Targeted weeding to stay on top of dominant weeds in Buffer 3.2, D2a, D3a and D3b, and any sites needing rope access such as west D1b. Containment and staged removal of any woody weeds that are providing habitat. Buffer planting to establish and replace habitat gradually. Maintenance weeding across all low weed density zones.	Maintenance and monitoring of establishing buffer plantings in Buffer 4.3. Install buffer plantings between the north and south patches of Buffer 4.2 to join the two. Plant low growing shrub and sedge species. Species list can be found in Appendix F. Maintenance weeding across all low weed density zones.

Priority Actions					
Site	**2022 – 2023 FY**	**2023 – 2024 FY**	**2024 – 2025 FY**	**2025 – 2026 FY**	**2026 – 2027 FY**
Eastern Reserve	Create and maintain permanent delineation between buffer plantings and turf to reduce future maintenance weeding. Targeted weeding within Ea, Buffer 2, Buffer 4, northern section of Eb, southern section of Ec and core of Ed to reduce and maintain at <5% weed density. Ropes work where necessary. Maintain and repair sediment fence in Buffer 5 creating delineation between high density weeds remnant Ec. Preserve rocky areas as habitat by removing invasive vines and weeds. Creation and retention of habitat should be ongoing every year in conjunction with bush regeneration work.	Continue targeted weeding within Ea, Buffer 2, Buffer 4, northern section of Eb, southern section of Ec and Ed to reduce and maintain at <5% weed density. Ropes work where necessary. Begin targeted weeding in Buffer 6. Continue to preserve rocky areas as habitat by removing invasive vines and weeds. Retain logs as habitat particularly in Buffer 6. Consider in fill planting for remnant Eb if natural regeneration not occurring following weed removal.	Maintenance weeding across all low weed density zones. Continue targeted weeding in Buffer 6 and monitor for natural native regeneration. Begin targeted weeding in Ec, Eb and eastern edge of Ed starting around stands of higher quality vegetation. Continue to preserve rocky areas as habitat by removing invasive vines and weeds. Retain logs as habitat particularly in Buffer 6. Monitor and repair sediment fence between Buffer 5 and remnant Ec.	Continue targeted weeding in Buffer 6 and monitor for natural native regeneration. Infill buffer planting where required if low success of natural regeneration. Install buffer planting in south of zone. Low growing shrubs should be installed along the upper slope to maintain residents' views. Continue targeted weeding in Ec, Eb and eastern edge of Ed pushing out from higher quality and upslope vegetation. Maintenance weeding across all low weed density zones. Ropes work where necessary. Continue to preserve rocky areas as habitat by removing invasive vines and weeds.	Maintenance and monitoring of establishing buffer plantings in Buffer 6. Continue targeted weeding in Ec, Eb and eastern edge of Ed pushing out from higher quality and upslope vegetation. Ropes work where necessary. Maintenance weeding across all low weed density zones. Ropes work where necessary. Continue to preserve rocky areas as habitat by removing invasive vines and weeds. Retain logs as habitat particularly n remnant Ed and Buffer 6. Monitor and repair sediment fence between Buffer 5 and remnant Ec.
Caffyn Park	Create and maintain permanent delineation between native vegetation and turf to reduce future maintenance weeding. Establish a No Mow Zone within Buffer 1 and F6 and monitor for native regeneration. Targeted weeding within Buffer 1 and F6 to reduce and maintain at <5% weed density. Maintenance weeding across all other zones to maintain <5% weed density. Creation and retention of habitat should be ongoing every year in conjunction with bush regeneration work. Trim ferns along walkway for pedestrian access (F5).	Infill planting of low shrubs and ground covers to increase diversity within the western zone of F1. Continue targeted weeding within Buffer 1 and F6 to reduce and maintain at <5% weed density. Maintenance weeding across all other zones to maintain <5% weed density.	Maintenance and monitoring of establishing buffer plantings in F1. Maintenance weeding across all zones. Control dominant natives in F1 and F5.	Infill planting in Buffer 1 of ground cover species if little native regeneration. Maintenance weeding across all zones. Trial flame weeding.	Maintenance and monitoring of establishing buffer plantings in Buffer 1. Maintenance weeding across all zones.

Priority Actions					
Site	**2022 – 2023 FY**	**2023 – 2024 FY**	**2024 – 2025 FY**	**2025 – 2026 FY**	**2026 – 2027 FY**
Raleigh, Rodney and Weonga Reserves	Create and/or maintain permanent delineation between buffer vegetation zones and turf to reduce future maintenance weeding. Begin targeted weeding in Buffer 1.1, targeting woody weeds and vines. (Cut and paint, and scrape and paint method). Begin targeted weeding in Buffer 4.1, Buffer 5, R1 and R3 to reduce and maintain at <5% weed density. Creation and retention of habitat should be ongoing every year in conjunction with bush regeneration work. Maintain and create delineation of buffers and remnants.	Continue targeted weeding in Buffer 1.1 to reduce and maintain at <5% weed density. Begin targeted weeding in remnant Z6. Contain weeds in Buffer 3. Continue targeted weeding in Buffer 4.1, Buffer 5, R1 and R3 to reduce and maintain at <5% weed density. Ropes work where necessary. Begin targeted weeding in Buffer 4.2 starting at higher quality vegetation in the adjacent Buffer 4.1 working towards remnant R2. Maintenance weeding across all low weed density zones. Maintenance of delineation with turf.	Continue targeted weeding in Buffer 4.2 working towards remnants R2 and R7. Begin targeted weeding in remnant R2. Ropes work where necessary. Continue targeted weeding in Buffer 4.1, Buffer 5, R1 and R3 to reduce and maintain at <5% weed density. Ropes work where necessary. Maintenance weeding across all low weed density zones. Maintenance of delineation between turfed areas and remnants and buffers.	Continue targeted weeding in Buffer 4.2 working towards remnant R2 and R7 to reduce and maintain at <5% weed density. Buffer planting in Buffer 4.2 extending east from Buffer 4.1. Install coir log or terracing, mulch along the length of the slope. Allow initial flush of exotics and install native plant species. Continue targeted weeding in remnant R2. Ropes work where necessary.	Maintenance and monitoring of establishing buffer plantings in Buffer 4.2. Begin buffer planting of low growing shrubs and sedges, west and north of R3 to create a buffer for the remnant and create connectivity. Create and maintain delineation between buffer plantings and turf. Continue targeted weeding in Buffer 4.2 working towards remnant R2 and R7 to reduce and maintain at <5% weed density. Infill planting where required to fulfil 80% survival rate KPI.
Loombah Road Cliffs	Control of storm water runoff across L1b and Buffer 1. Replace and maintain sediment fencing and remove excess debris within channel to prevent overland flooding. Begin targeted weeding in L1b and Buffer 1 to reduce and maintain at <5% weed density. Repeated weeding is recommended to exhaust the seed bank, particularly of perennial herbaceous weeds. Creation and retention of habitat should be ongoing every year in conjunction with bush regeneration work.	Thinning of mesic canopy species, and ground covers where necessary to increase recruitment of *Acacia terminalis* subsp. *Eastern Sydney* seedlings. Begin targeted weeding in Buffer 2 starting from the higher quality vegetation in Buffer 1. Gain access to previously inaccessible remnants such as L18, L16 and L14. Assessment and biannual targeted weeding. Maintenance weeding across Buffer 1 and L1b.	Continue targeted weeding in Buffer 2 to reduce and maintain at <5% weed density. Begin targeted weeding in L1a, L25a and L27a. Ropes work where necessary. Maintenance weeding across Buffer 1, L1b, L25b and L27b. Thinning of mesic canopy species, and ground covers where necessary. Continue targeted weeding in L16 and L14 if access is possible.	Continue targeted weeding in Buffer 2 to reduce and maintain at <5% weed density. Buffer planting in Buffer 2 extending north east from Buffer 1 to connect L1c remnant patch. Install coir log or terracing, mulch along the length of the slope. Allow initial flush of exotics and install native plant species. Maintenance weeding across Buffer 1, and L1b Continue targeted weeding in L18, L16 and L14 if access possible. Ropes work where necessary.	Maintenance and monitoring of establishing buffer plantings in Buffer 2. Infill planting if required to attain survival rate of >80% KPI. Maintenance and targeted weeding across all zones. Thinning of mesic canopy species, and ground covers where necessary to increase recruitment of *Acacia terminalis* subsp. *Eastern Sydney* seedlings.

Priority Actions					
Site	**2022 – 2023 FY**	**2023 – 2024 FY**	**2024 – 2025 FY**	**2025 – 2026 FY**	**2026 – 2027 FY**
Hugh Bamford Reserve	Prioritise targeted weeding across zones H1a, H1b, H1c and Buffer 5 to reduce and maintain weed density at <5%. Infill planting in H1c and control of dominant *Leptospermum laevigatum.* Ropes work within H1a and H1b will be required to continue the treatment of *Chyrsanthemoides monilifera* along the edge of the cliff. Maintain delineation with turf and native vegetation. Installation of a sediment fence between Buffer 2 and Buffer 3 to contain high density weeds in Buffer 3. Targeted weeding in H2a and Buffer 2. Creation and retention of habitat should be ongoing every year in conjunction with bush regeneration work.	Maintenance and monitoring of establishing infill planting in H1c. Continue targeted and maintenance weeding across zones H1a, H1b, H1c and to reduce and maintain weed density at <5%. Ropes work where necessary. Continue targeted weeding in Buffer 2 and Buffer 9. Begin primary weeding in Buffer 3. Works should start and focus around patches of higher quality vegetation and buffer plantings and expand around these areas.	Continue primary weeding in Buffer 3. Begin buffer planting in cleared areas of Buffer 3. Install terracing or coir logs and mulch along the length of the slope. Allow initial flush of exotics and install native plant species. Continue primary weeding in Buffer 9, expanding east from the playing field, to reduce and maintain vegetation at <5% weed density in the core. Continue maintenance weeding across H1 and H2a remnants. Ropes work where necessary.	Maintenance and monitoring of establishing buffer plantings in Buffer 3. Once plants have established in Buffer 3 enough to prevent erosion and provide habitat, begin primary weeding of Buffer 4 and follow with planting after a few flushes of weeds. Continue primary weeding in Buffer 9 expanding east from the playing field to reduce and maintain vegetation at <5% weed density in the core. Ropes work within Buffer 9 will be required to continue the treatment of *Chyrsanthemoides monilifera* along the edge of the cliff.	Continue buffer planting in newly cleared areas of Buffer 4. Install terracing or coir logs and mulch along the length of the slope. Allow initial flush of exotics and install native plant species. Continue targeted and maintenance weeding in all low density zones (H2, Buffer 2, H1, Buffer 1 and Buffer 5) to maintain at <5% weed density. Ropes work where necessary.
Bondi Golf Course & Williams Park	Prioritise targeted weeding in G2 to reduce and maintain at <5% weed density. Create and maintain delineation in G2 and G3. Begin targeted weeding in G3 to reduce and maintain at <10% weed density. Creation and retention of habitat should be ongoing every year in conjunction with bush regeneration work.	Continue maintenance weeding in G2 to maintain at <5% weed density and maintain delineation. Continue targeted weeding in G3 to reduce and maintain at <10% weed density. Install low growing shrub and sedge species in the southern section of G3. Create and maintain permanent delineation with turf to prevent encroachment and reduce maintenance. Create new planted buffer (Buffer 1).	Maintenance and monitoring of establishing infill plantings in G3. Infill planting where required to fulfil 80% survival rate KPI. Continue maintenance weeding across G2 and G3 to maintain at <5% weed density. Begin targeted weeding in G1 and G4, targeting woody weeds and vines where accessible to reduce biomass. Maintain delineation with turfed areas.	Continue targeted weeding in G1 and G4 to control reoccurring species and exotic ground covers. Begin buffer planting in G1 of low growing shrub and sedge species. Create permanent delineation between the buffer plantings and turf. Continue maintenance weeding across G2 and G3 to maintain at <5% weed density. Maintain delineation with turf across all zones.	Maintenance and monitoring of establishing infill plantings in G1. Infill planting where required to fulfil 80% survival rate KPI. Begin buffer planting in G4 of low growing shrub and sedge species. Create permanent delineation between the buffer plantings and turf. Continue maintenance weeding across G2 and G3 to maintain at <5% weed density.

Priority Actions					
Site	**2022 – 2023 FY**	**2023 – 2024 FY**	**2024 – 2025 FY**	**2025 – 2026 FY**	**2026 – 2027 FY**
South Clifftop Remnants	Prioritise targeted weeding in remnants and buffers with <30% weed density to reduce and maintain weed density to <5%. **South Bondi (Map 10-2)** Create and maintain buffer edge around native vegetation (spraying) in Buffer 3.1 and 3.2. Permanent delineation to stop future encroachment of exotic grasses into buffer plantings and reduce maintenance. Control dominant natives *Acacia longifolia* to allow for regeneration of ground cover species. Targeted weeding to reduce and maintain at <5% weed density. Monitor for native regeneration. **Gaerloch to South Bondi (Map 10-3)** Install and maintain sediment fence in Buffer 5, above remnant Z13a to contain high density weeds upslope. Creation and retention of habitat should be ongoing every year in conjunction with bush regeneration work.	Continue targeted weeding in remnants with <30% weed density to reduce and maintain weed density to <5%. **South Bondi (Map 10-2)** Continue targeted weeding in Buffer 3.1 and 3.2 and in Z12a and Z12f to reduce and maintain at <5% weed density. Install infill planting in Buffer 3 where native regeneration is lacking to increase resilience and habitat complexity. Continue controlling dominant natives. Extend targeted weeding above Z12c and prepare for planting. **Gaerloch to South Bondi (Map 10-3)** Begin targeted weeding in Buffer 8 to reduce and maintain weed density at <5%. Prioritise weeding in Z14a - Z14c to control infestations of *Coprosma repens, Gazania tomentosa* and exotic grasses.	Maintenance weeding across all low weed density zones. **South Bondi (Map 10-2)** Maintenance and monitoring of establishing buffer plantings in Buffers 3.1, 3.2, 6 and 7. Continue targeted weeding in Z12a and Z12f to reduce and maintain at <5% weed density. Install buffer plantings above remnant Z12c. Install terracing or coir logs and mulch along the length of the slope. Allow initial flush of exotics and plant low lying native heath. Extend targeted weeding north and south of Z11c and prepare for planting. **Gaerloch to South Bondi (Map 10-3)** Begin primary weeding in previously unworked zones in Buffer 6 and Buffer 7. Target woody weeds such as *Coprosma repens.* Prepare for planting. Install coir logs and jute matting along the length of the slope. Allow initial flush of exotics and plant low lying native heath. Continue targeted weeding in Buffer 8 to reduce and maintain weed density at <5%. Monitor for native regeneration. Install buffer plantings where areas of native regeneration is low. Install coir logs and jute matting. Planting low growing shrubs to maintain residents' views. Continue weeding in Z14a to reduce and maintain weed density at <5%.	Maintenance weeding across all low weed density zones. **South Bondi (Map 10-2)** Maintenance and monitoring of establishing buffer plantings in Buffer above Z12c. Install buffer plantings above remnant Z11c. Install terracing or coir logs and mulch along the length of the slope. Allow initial flush of exotics and plant low lying native heath. **Gaerloch to South Bondi (Map 10-3)** Continue primary weeding in previously unworked zones in Buffer 6 and Buffer 7. Target woody weeds such as *Coprosma repens.* Prepare for planting. Install coir logs and jute matting along the length of the slope. Allow initial flush of exotics and plant low lying native heath. Continue targeted weeding in Buffer 8 to reduce and maintain weed density at <5%. Continue buffer planting along the slope to connect the corridor. Continue weeding in Z14a to reduce and maintain weed density at <5%.	Maintenance weeding across all low weed density zones. **South Bondi (Map 10-2)** Maintenance and monitoring of establishing buffer plantings in adjacent to Z11c. Begin targeted works in Z11a and Z11b beginning in previously worked zones of Z11c. Ropes work where necessary. **Gaerloch to South Bondi (Map 10-3)** Begin primary and targeted weed works in Buffer 5 starting at higher quality vegetation or upslope vegetation. Monitor for natural regeneration. Maintenance and monitoring in recently revegetation zones. Contain runoff in Buffer 4 and install sediment fencing to control weed propagule dispersion. Once controlled begin targeted weeding.

Priority Actions					
Site	**2022 – 2023 FY**	**2023 – 2024 FY**	**2024 – 2025 FY**	**2025 – 2026 FY**	**2026 – 2027 FY**
Tamarama Marine Drive	Continue frequent targeted sweeps of the core of the T1 remnant and Buffers 1 and 3, targeting re-occurring exotic species. Continue targeted weeding in this zone and previously cleared areas. Once controlled begin buffer planting mesic species. Species list can be found in Appendix F. Prioritise weed treatment of the northern section of the T1 remnant as it contains high density weeds (>70%), to ensure weed species do not encroach into the remnant. Creation and retention of habitat should be ongoing every year in conjunction with bush regeneration work.	Target and control edge effect from the road on the eastern edge of T1. Maintenance and monitoring of establishing buffer plantings in Buffer 4. Infill planting where required to fulfil 80% survival rate KPI. Continue frequent targeted sweeps of the core of the T1 remnant and Buffers 1, 3 and 4.	Begin targeted weeding of Buffer 2 and continue to manage and target reoccurring weeds. Continue monitoring and bush regeneration of all zones.	Begin primary works in Buffer 5. Install terracing or coir logs and mulch along the length of the slope. Allow initial flush of exotics and install native plant species. Low growing shrubs should be installed along the upper slope to maintain residents' views. Continue maintenance weeding and watering. Continue monitoring and bush regeneration of all zones.	Maintenance and monitoring of establishing buffer plantings in Buffer 5. Infill planting where required to fulfil 80% survival rate KPI. Continue monitoring and bush regeneration of all zones.
Calga Reserve & Bronte Cutting	Prioritise targeted weeding in B2, B8, Buffer 3.2, Buffer 4 and Buffer 5 to reduce and maintain weed density at <5%. Maintain or create delineation with turf. Begin targeted weeding in B1 focusing on controlling *Hydrocotyle bonariensis* and exotic vines. Ropes work to target *Asparagus aethiopicus* and *Gazania tomentosa* on cliff edge. Control or removal of *Wollastonia uniflora* in all buffer vegetation, particularly in the southern end of Buffer 2. Creation and retention of habitat should be ongoing every year in conjunction with bush regeneration work.	Continue maintenance weeding in B2, B8, Buffer 3.2, Buffer 4 and Buffer 5 to reduce and maintain weed density at <5%. Continue targeted weeding in B1 focusing on controlling *Hydrocotyle bonariensis* and exotic vines. Hand removal of *Hydrocotyle bonariensis* around natives. Ropes work to target *Asparagus aethiopicus* and *Gazania tomentosa* on cliff edge. Containment of Buffer 3.1. Begin targeted weeding in Buffer 6.	Continue targeted weeding in B1 focusing on controlling *Hydrocotyle bonariensis* and exotic vines. Ropes work to target *Asparagus aethiopicus* and *Gazania tomentosa* on cliff edge. Containment of Buffer 3.1. Continue targeted weeding in Buffer 6 to reduce and maintain at <5% weed density. Begin targeted weeding in Buffers 1 and 2 focusing around patches of higher quality vegetation with regeneration potential.	Continue targeted weeding in B1 to reduce and maintain weed density at <5%. Ropes work where necessary. Continue targeted weeding in Buffer 1 to reduce and maintain at <5% weed density. Continue targeted weeding in Buffer 2 focusing around patches of higher quality vegetation with regeneration potential. Install new sections of buffer planting in Buffer 1 to create connectivity through the whole zone. Coir logging and jute matting preferred. Installation of low lying shrub and sedge species to maintain residents' water views.	Maintenance and monitoring of establishing buffer plantings in Buffer 1. Infill planting where required to fulfil 80% survival rate KPI. Continue to target weeding in Buffer 2, target areas for revegetation. Install new sections of buffer planting in Buffer 2 to create connectivity through the whole zone. Coir logging and jute matting preferred. Installation of low lying shrub and sedge species to maintain residence' water views.

Priority Actions					
Site	**2022 – 2023 FY**	**2023 – 2024 FY**	**2024 – 2025 FY**	**2025 – 2026 FY**	**2026 – 2027 FY**
Waverley Cemetery Cliffs	Prioritise targeted weeding in C1a, C2a, C2c and C2b to reduce and maintain weed density at <5%. Target vines (*Ipomoea indica*) and hand removal of *Parietaria judaica* and *Rumex sagittatus*. Control of *Hydrocotyle bonariensis* by means of spot spraying and containment of larger infestations. Hand removal and hand application of herbicide where root zones are accessible and minimal soil disturbance can be achieved. Control or eradication of *Wollastonia uniflora* within buffer zones. Maintenance and monitoring of establishing buffer plantings in Buffer 3. Continued installation of buffer plantings in previously cleared sections in the north of Buffer 3. Creation and retention of habitat should be ongoing every year in conjunction with bush regeneration work.	Continue targeted weeding in C1a, C2a, C2c and C2b to reduce and maintain weed density at <5%. Begin ropes work to target infestations of *Asparagus aethiopicus* on the cliff edge in C2a and C2b. Maintenance and monitoring of establishing buffer plantings in Buffer 3. Containment of weeds in Buffer 1.	Continue targeted weeding in C1a, C2a, C2b, C2c, Buffer 2, Buffer 3, and Buffer 4 to reduce and maintain weed density at <5%. Continue ropes work to target infestations of *Asparagus aethiopicus* on the cliff edge in C2a and C2b. Begin primary weeding in Buffer 5. Works should start and focus around patches of higher quality vegetation in the north of the zone.	Continue primary weeding in Buffer 5. Control reoccurring species in previously worked areas. Begin buffer planting in Buffer 5 where previously cleared. Install coir log or terracing, mulch along the length of the slope. Allow initial flush of exotics and install native heath plant species. Begin targeted weeding in C1b, in areas now made accessible from works completed in Buffer 5. Begin targeted weeding in Buffer 1. Works should start and focus around patches of higher quality vegetation in the south of the zone of C2a. Target woody weeds such as *Coprosma repens, Watsonia meriana* and *Canna x generalis.* Maintenance weeding across all low weed density zones.	Maintenance and monitoring of establishing buffer plantings in Buffer 5. Control reoccurring species in previously worked areas. Continue primary weeding and buffer planting in Buffer 5. Install coir logs or terracing, mulch along the length of the slope. Allow initial flush of exotics and install native heath plant species. Continue targeted weeding in C1b. Focus on woody weeds and vines around higher quality vegetation. Continue targeted weeding in Buffer 1. Works should start and focus around patches of higher quality vegetation. Ropes work to target infestations of *Coprosma repens* and *Asparagus aethiopicus* on the cliff edge. Maintenance weeding across all low weed density zones.

Priority Actions					
Site	**2022 – 2023 FY**	**2023 – 2024 FY**	**2024 – 2025 FY**	**2025 – 2026 FY**	**2026 – 2027 FY**
York Road Bushland	Repair and maintain fences in working order to prevent damage caused by feral species within the Eastern Suburbs Banksia Scrub. Maintenance weeding in Y2 and Buffer to maintain weed density at <5%. Creation of permanent delineation, such as wooden sleepers in Buffer zone to reduce future maintenance. Maintenance and monitoring of establishing buffer plantings in Buffer. Creation and retention of habitat should be ongoing every year in conjunction with bush regeneration work.	Infill planting in Buffer zone if natural recruitment is low. Plant low lying shrubs and groundcovers to enhance resilience, visuals and habitat complexity. Maintenance weeding in Y2 and Buffer to maintain weed density at <5%. Maintenance of fence.	Maintenance and monitoring of establishing buffer plantings. Maintenance weeding in Y2 and Buffer to maintain weed density at <5%. Maintenance of fence.	Continue monitoring and bush regeneration of all zones.	Continue monitoring and bush regeneration of all zones.

Table 15-2. 2027 to 2031 Priority actions within each site and year within the Waverley Council LGA

Site	2027 – 2028 FY	2028 – 2029 FY	2029 – 2030 FY	2030 – 2031 FY
North Clifftop Remnants	Continue targeted weeding within Z1, D1a and Z5. Continue maintenance weeding across all buffer zones.	Continue targeted weeding within Z1, D1a and Z5. Continue maintenance weeding across all buffer zones.	Continue targeted weeding within Z1 D1a and Z5. Continue maintenance weeding across all buffer zones.	Continue targeted weeding within Z1 D1a and Z5. Continue maintenance weeding across all buffer zones.
Diamond Bay Reserve	Maintenance and monitoring of establishing buffer plantings in Buffer 4.2 and 4.3. Continue mosaic clearing (primary works) in Buffer 4.3. Continue targeted weeding in this zone and previously cleared areas. Install terracing or coir logs and mulch along the length of the slope. Allow initial flush of exotics and install native plant species. Low growing shrubs should be installed along the upper slope to maintain residents' views. Maintenance weeding across all low weed density zones.	Maintenance and monitoring of establishing buffer plantings in Buffer 4.2 and 4.3. Targeted weeding to stay on top of dominant weeds in D3a and D3b, and any sites needing rope access such as west D1b. Maintenance weeding across all low weed density zones.	Maintenance and monitoring of establishing buffer plantings in Buffer 4.3. Continue mosaic clearing (primary works) in Buffer 4.3. Continue targeted weeding in this zone and previously cleared areas. Install terracing or coir logs and mulch along the length of the slope. Allow initial flush of exotics and install native plant species. Low growing shrubs should be installed along the upper slope to maintain residents' views. Targeted weeding to stay on top of dominant weeds in D3a and D3b, and any sites needing rope access such as west D1b. Maintenance weeding across all low weed density zones.	Maintenance and monitoring of establishing buffer plantings in Buffer 4.3. Targeted weeding to stay on top of dominant weeds in D3a and D3b, and any sites needing rope access such as west D1b. Maintenance weeding across all low weed density zones.
Eastern Reserve	Continue targeted weeding in Ec, Eb and Ed pushing out from higher quality and upslope vegetation. Ropes work where necessary. Maintenance weeding across all low weed density zones. Ropes work where necessary. Begin primary weed works within Buffer 5 pushing out from higher quality vegetation in Ec and Ed. Install terracing or coir logs and mulch along the length of the slope. Allow initial flush of exotics and install native plant species. Low growing shrubs should be installed along the upper slope to maintain residents' views. Continue to preserve rocky areas as habitat by removing invasive vines and weeds.	Continue primary weed works in Buffer 5 and previously cleared areas. Install terracing or coir logs and mulch along the length of the slope. Allow initial flush of exotics and install native plant species. Low growing shrubs should be installed along the upper slope to maintain residents' views. Continue targeted and maintenance weeding across all low weed density zones. Ropes work where necessary. Continue to preserve rocky areas as habitat by removing invasive vines and weeds. Monitor and repair sediment fence between Buffer 5 and remnant Ec.	Maintenance and monitoring of establishing buffer plantings in Buffer 5. Continue targeted and maintenance weeding across all low weed density zones. Ropes work where necessary. Continue to preserve rocky areas as habitat by removing invasive vines and weeds.	Maintenance and monitoring of establishing buffer plantings in Buffer 5. Continue targeted and maintenance weeding across all low weed density zones. Ropes work where necessary. Continue to preserve rocky areas as habitat by removing invasive vines and weeds.

Site	2027 – 2028 FY	2028 – 2029 FY	2029 – 2030 FY	2030 – 2031 FY
Caffyn Park	Extension of No Now Zone in Buffer 1 to extend beyond the most western F6 remnant. Create and maintain permanent delineation between native vegetation and turf to reduce future maintenance weeding.	Continue monitoring and bush regeneration of all zones.	Continue monitoring and bush regeneration of all zones.	Continue monitoring and bush regeneration of all zones.
Raleigh, Rodney and Weonga Reserves	Maintenance and monitoring of establishing buffer plantings west of R2. Continue targeted weeding in remnant R2. Ropes work where necessary. Continue targeted and maintenance weeding across all zones to reduce and maintain at <5% weed density. Ropes work where necessary. Maintenance weeding across all low weed density zones. Maintenance of delineation between turfed areas and remnants and buffers. Create connectivity planting adjacent to R3 and connecting to Buffer 5.	Begin primary weeding in Buffer 3, starting at the higher quality vegetation in the north and previously worked vegetation in the south of Buffer 4.2. Allow initial flush of exotics and install native plant species. Continue primary weeding in Buffer 3 extending out from previously worked vegetation. Allow initial flush of exotics and continue installing native plant species. Continue targeted and maintenance weeding across all zones to reduce and maintain at <5% weed density. Ropes work where necessary.	Maintenance and monitoring of establishing buffer plantings in Buffer 3. Continue primary weeding in Buffer 3 extending out from previously worked vegetation. Allow initial flush of exotics and continue installing native plant species. Continue targeted and maintenance weeding across all zones to reduce and maintain at <5% weed density. Ropes work where necessary. Maintenance weeding across all low weed density zones. Maintenance of delineation with turf.	Continue targeted and maintenance weeding across all zones to reduce and maintain at <5% weed density. Ropes work where necessary. Maintenance weeding across all low weed density zones. Maintenance of delineation with turf.
Loombah Road Cliffs	Maintenance and targeted weeding across all zones. Thinning of mesic canopy species, and ground covers where necessary. Ropes work where necessary.	Maintenance and targeted weeding across all zones. Thinning of mesic canopy species, and ground covers where necessary. Ropes work where necessary.	Maintenance and targeted weeding across all zones. Thinning of mesic canopy species, and ground covers where necessary. Ropes work where necessary.	Maintenance and targeted weeding across all zones. Thinning of mesic canopy species, and ground covers where necessary. Ropes work where necessary.
Hugh Bamford Reserve	Maintenance and monitoring of establishing buffer plantings in Buffer 3 and 4. Once planting in Buffer 4 has established enough to prevent erosion and provide habitat begin primary works in Buffer 5 and follow with planting after a few flushes of weeds. Continue targeted and maintenance weeding in all low density zones (H2, Buffer 2, H1, Buffer 1 and Buffer 9) to maintain at <5% weed density. Ropes work where necessary.	Continue buffer planting in newly cleared areas of Buffer 5. Install terracing or coir logs and mulch along the length of the slope. Allow initial flush of exotics and install native plant species. Continue targeted and maintenance weeding in all low density zones (H2, Buffer 2, H1, Buffer 1 and Buffer 9) to maintain at <5% weed density. Ropes work where necessary.	Maintenance and monitoring of establishing buffer plantings in Buffer 3, 4 and 5 has established enough to prevent erosion and provide habitat begin staged primary works in Buffer 6 and 7. Follow with planting after a few flushes of weeds. Continue targeted and maintenance weeding in all low density zones (H2, Buffer 2, H1, Buffer 1 and Buffer 9) to maintain at <5% weed density. Ropes work where necessary.	

Site	2027 – 2028 FY	2028 – 2029 FY	2029 – 2030 FY	2030 – 2031 FY
Bondi Golf Course & Williams Park	Maintenance and monitoring of establishing infill plantings in G1 and G4. Infill planting where required to fulfil 80% survival rate KPI. Continue targeted weeding in G1 and G4 to control reoccurring species and exotic ground covers. Begin ropes work to target *Chyrsanthemoides monilifera* along the edge of the cliff. Continue maintenance weeding across G2 and G3 to maintain at <5% weed density.	Continue targeted weeding in G1 and G4 to control reoccurring species and exotic ground covers. Ropes work where necessary. Continue maintenance weeding across G2, G3 and buffer planting to maintain at <5% weed density.	Continue targeted weeding in G1 and G4 to control reoccurring species and exotic ground covers to reduce weed density to <5%. Ropes work where necessary. Continue maintenance weeding across G2, G3 and buffer planting to maintain at <5% weed density.	Continue targeted weeding in G1 and G4 to control reoccurring species and exotic ground covers to reduce weed density to <5%. Ropes work where necessary. Continue maintenance weeding across G2, G3 and buffer planting to maintain at <5% weed density.
South Clifftop Remnants	Maintenance weeding across all low weed density zones. **South Bondi (Map 10-2)** Continue targeted works in Z11a and Z11b to target reoccurring weeds. Ropes work where necessary. **Gaerloch to South Bondi (Map 10-3)** Continue primary weeding Buffer 6 and Buffer 7. Continue buffer planting along the slope to connect the corridor. Continue primary and targeted weed works in Buffer 5 starting at higher quality vegetation or upslope vegetation. Monitor for natural regeneration. Install infill planting where natural regeneration is low. Install terracing or coir logs and mulch along the length of the slope. Allow initial flush of exotics and install native plant species. Continue targeted weeding in Buffer 4 and monitor for native regeneration. Infill planting where recruitment is low to maintain connectivity.	Maintenance weeding across all low weed density zones. **South Bondi (Map 10-2)** Continue targeted works in Z11a and Z11b to reduce and maintain at <5% weed density. Ropes work where necessary. **Gaerloch to South Bondi (Map 10-3)** Maintenance and monitoring of establishing buffer plantings in Buffers 4, 5, 6 and 7. Reduce and maintain at <5% weed density. Continue primary and targeted weed works in Buffer 5, and extend revegetation where necessary.	Maintenance weeding across all low weed density zones. **South Bondi (Map 10-2)** Continue targeted works in Z11a and Z11b to reduce and maintain at <5% weed density. Ropes work where necessary. **Gaerloch to South Bondi (Map 10-3)** Maintenance and monitoring of establishing buffer plantings in Buffer 5.	Maintenance weeding across all low weed density zones. **South Bondi (Map 10-2)** Continue targeted works in Z11a and Z11b to reduce and maintain at <5% weed density. Ropes work where necessary. **Gaerloch to South Bondi (Map 10-3)** Maintenance and monitoring of establishing buffer plantings in Buffer 5.
Tamarama Marine Drive	Continue monitoring and bush regeneration of all zones.	Continue monitoring and bush regeneration of all zones.	Continue monitoring and bush regeneration of all zones.	Continue monitoring and bush regeneration of all zones.

Site	2027 – 2028 FY	2028 – 2029 FY	2029 – 2030 FY	2030 – 2031 FY
Calga Reserve & Bronte Cutting	Maintenance and monitoring of establishing buffer plantings in Buffer 2. Infill planting where required to fulfil 80% survival rate KPI. Continue targeted weeding in Buffer 2, to reduce and maintain at <5% weed density. Ropes work to control *Lantana camara* and *Asparagus aethiopicus* on cliff edges.	Maintenance and targeted weeding across all zones. Focus on controlling *Hydrocotyle bonariensis.* Ropes work where required to target reoccurring weeds on cliff edge.	Maintenance and targeted weeding across all zones. Focus on controlling *Hydrocotyle bonariensis.* Ropes work where required to target reoccurring weeds on cliff edge.	Maintenance and targeted weeding across all zones. Focus on controlling *Hydrocotyle bonariensis.* Ropes work where required to target reoccurring weeds on cliff edge.
Waverley Cemetery Cliffs	Maintenance and monitoring of establishing buffer plantings in Buffer 5. Control reoccurring species in previously worked areas. Finish primary weeding and buffer planting in Buffer 5. Installation of final buffer/infill planting where necessary in order to meet >80% survival rate KPI. Continue targeted weeding in C1b. Focus on woody weeds and vines around higher quality vegetation. Begin ropes work to target woody weeds and vines on cliff edge. Continue targeted weeding in Buffer 1 to reduce and maintain at <5% weed density. Ropes work to target infestations of *Coprosma repens* and *Asparagus aethiopicus* on the cliff edge. Maintenance weeding across all low weed density zones.	Maintenance and monitoring of establishing buffer plantings in Buffer 5. Control reoccurring species in previously worked areas. Continue targeted weeding in C1b. Focus on woody weeds and vines around higher quality vegetation. Begin ropes work to target woody weeds and vines on cliff edge. Reduce and maintain weed density at <5%. Continue targeted weeding in Buffer 1 to reduce and maintain at <5% weed density. Ropes work to target infestations of *Coprosma repens* and *Asparagus aethiopicus* on the cliff edge. Maintenance weeding across all low weed density zones.	Continue targeted weeding in C1b to reduce and maintain at <5% weed density. Maintenance weeding across all low weed density zones.	Continue targeted weeding in C1b to reduce and maintain at <5% weed density. Maintenance weeding across all low weed density zones.
York Road Bushland	Continue monitoring and bush regeneration of all zones.	Continue monitoring and bush regeneration of all zones.	Continue monitoring and bush regeneration of all zones.	Continue monitoring and bush regeneration of all zones.

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GLOSSARY

Term	Definition
Adaptive management	Responding and altering management actions or plans in response to events or changes to the environment or the success or failure of previous efforts.
Best practice	Industry standards or the best known approach.
Bionet	NSW Bionet Atlas is the repository for biodiversity data managed by DPIE. It contains records of species sightings including threatened species.
Buffer planting	As defined by SBRC within the Waverley Flora Survey 2020, buffer vegetation is considered as plantings consisting almost entirely of local native plant species, within 50 m of remnant vegetation, which occur in park settings on Council or Centennial Parklands managed land.
Bush regeneration	The practice of restoring bushland from a weed affected or degraded to a natural functioning ecosystem.
Connectivity planting	Revegetated areas or proposed revegetated areas that connect two or more areas of vegetation. Usually for the purposes of habitat connectivity.
Cultivars	A plant variety that has been produced in cultivation by selective breeding.
Delineation	Defining the physical border or boundary to show boundaries for management and control of weeds.
Genetic integrity	Maintenance of the genetic elements and variation of a species.
Infill planting	Planting into areas of existing native vegetation to increase diversity or prevent weeds establishment.
Intact soils	Original undisturbed soils that are likely to still contain the original native seedbank.
Local provenance	Plants, seeds or plant populations containing local genetic variation.
Microhabitats	A habitat of limited extent differing from the surrounding habitat usually with unique conditions.
Monocot	A plant species containing a single cotyledon. Typically referred to as grasses within this report
Planted native vegetation	Native vegetation that is not considered to be from the original pre-1788 vegetation, thus not considered to be remnant vegetation. This includes buffer planting, connectivity planting and any other native planted vegetation.
Priority Weeds	Weeds are defined as state or regional level priority weeds within the *Biosecurity Act 2015* and the *Greater Sydney Strategic Weed Management Plan 2017-2022*. Priority weeds are given specific requirements based on their priority under the Act.
Regeneration	The process of growing a plant naturally from the seedbank.
Remnant vegetation	As defined by SBRC within the Waverley Flora Survey 2020, remnant vegetation is considered as: - the original (pre-1788) vegetation which has survived to this day. It includes both undisturbed and disturbed remnant vegetation. - including vegetation which has colonised disturbed areas, where there was no remnant vegetation for a period. - vegetation that has survived and spread by natural processes, including seed dispersal and vegetative spread. - vegetation that does not include plantings of local species or plants originating from such plantings.
Soil seedbank	The natural storage layer of seeds within the soil. Seeds within the seedbank. They are often dormant awaiting some sort of stimulation to promote regeneration.
Vegetation community	Assemblage of associated plant species within a designated geographical unit.

ACRONYMS AND ABBREVIATIONS

Term	Definition
BAP	Biodiversity Action Plan
BC Act	NSW *Biodiversity Conservation Act 2016*
CEEC	Critically Endangered Ecological Community
DPIE	Department of Planning, Industry and Environment
EAP4	Environmental Action Plan Version 4 2018
EEC	Endangered Ecological Community
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
ESBS	Eastern Suburbs Banksia Scrub
FY	Financial Year
LGA	Local Government Area
PCT	Plant Community Type
PoD	Prohibition on Dealings
RRM	Regional Recommended Measure
SBRC	Sydney Bush Regeneration Company
TEC	Total Earth Care
WoNS	Weeds of National Significance

APPENDIX A – RECOMMENDED ACTION METHODOLOGIES

ACHIEVING EAP4 OBJECTIVES

This BAP is a strategic working document to outline works required to achieve Council's EAP4 targets. Recommendations include targeted and prioritised weed control, erosion and stormwater controls, buffer planting of adjacent areas to the remnant vegetation, infill planting of remnant bushland, fauna habitat creation, delineation of remnant areas and restricted public access. These recommendations are aimed at protecting and improving the condition of existing remnant bushland, to work towards achieving no loss of remnant vegetation and improving remnant condition towards 40% of remnant vegetation being in good condition by 2040. This appendix details general methodologies for recommended actions.

All works should be subject to monitoring so that alternative strategies can be implemented if a methodology is displaying limited success. Ecological monitoring should be conducted on a yearly basis in order to determine if the Key Performance Indicators (KPIs) within this BAP are being met and whether the actions are on track to meet the EAP4 targets. In general monitoring actions include:

- The establishment of photo-points in each accessible zone;
- The establishment of fixed quadrats or transect survey locations to assess species composition, weed density and abundance and native regeneration; and
- Observations of fauna, appearance of new species to the site, loss of species, native recruitment, condition and change in extent of remnant vegetation.

RESPONSIBILITIES

It is important to note that trained bush regenerators are required to conduct the recommended actions within remnant vegetation. However, Council Park's staff can be trained to undertake some tasks within buffers or connective planting. Responsible personnel have been defined within the actions table for each site.

DELINEATION

The creation and maintenance of permanent delineation, either between buffer plantings or remnant vegetation and adjacent areas of turf, is of priority. This aims to reduce future maintenance of exotic grasses and ensures that exotic grasses such as *Stenotaphrum secundatum* (Buffalo Grass) do not outcompete native vegetation. Suitable delineation techniques include the creation of spray edges, mulch edge or the installation of physical edges such as steel edging or timber sleepers. Physical delineation can also serve to deter the public from entering vegetated areas and hence reduce the transport of weed seeds and prevent trampling of vegetation. However, physical delineation can be costly and requires maintenance. Spray edging is a cheaper alternative. A buffer area of approximately 50 – 200cm should be sprayed around the remnant or buffer patches adjacent to turf with a monocot specific herbicide. Any other non-monocotyledonous weeds should be removed by hand. Alternatively a mulch edge can be established with a minimum of 300mm of mulch. It would need to be topped up annually or biannually. Any regrowth of native species, particularly those indigenous to the adjacent vegetation community, should be retained in order to expand localised occurrences, particularly in areas that can provide connectivity between vegetation patches.

Delineation is of particular importance in marsh communities such as the remnant vegetation communities described as Sea-cliff Grassland and Sea-cliff Sedgeland which are dominated by coastal clifftop marsh species, including *Ficinia nodosa*. These communities typically display low diversity and are easily outcompeted by exotic grasses and groundcovers.

Delineation between the buffer planting and the remnant vegetation must be maintained. This is in order to encourage expansion of remnant vegetation where viable and allows for ease in tracking changes to the remnant, for example if natural regeneration is observed beyond the delineated remnant edge.

STIMULATING NATURAL REGENERATION

The native seedbank should be stimulated to promote germination before resorting to other restoration methods such as planting or seeding areas. This helps maintain the genetic integrity of the remnant vegetation. It may also encourage germination of species only present in the seedbank. *Platysace lanceolata* germinated at Hugh Bamford Reserve following soil scarification (SBRC 2020) and smoke treatments promoted the first recorded germination of *Commersonia hermanniifolia* at Caffyn Park (Council pers. comm.). Germination from the native seedbank is encouraged through actions that may replicate natural disturbance events including:

- exposure to light
- soil disturbance
- smoke
- fire

This can be achieved through the following techniques:

- Weed management opening up areas to light and exposing soils.
- Selective removal of over-mature or over abundant species which would usually be removed by fire. This will open up the canopy and will encourage germination from the native seedbank.
- Disturbance of the soil surface using raking or scarification to stimulate the native seedbank.
- Treatment of the soil using smoke water or the use of smoke tents. Smoke is known to be the trigger for native germination rather than the heat or flames for some species. It is best that this method is trialled and adapted where appropriate.
- Flame weeding will also provide heat to the soil and seedbank similar to a natural burn which is also known to encourage native regrowth.
- Ecological burning
- Soil seedbank translocation

The depth of soil disturbance required can be determined by how intact the soils are. Where the soil is more intact or original the greater the seedbank is likely to be near the surface. Intact soils may require less depth of disturbance. Therefore, burning or flame weeding may be sufficient to stimulate natural regeneration of intact soils. While soils that are less intact may be better suited for scarification (sandstone) or tiling (sand). The more intact the soils are and species rich the ground layer is the less requirement there is to disturb the soil at all.

Weed species may also be encouraged to germinate with some of these methods. Therefore, it is critical that regular (atleast monthly for several years) weed maintenance is undertaken following the use of these techniques in order to give native seedlings a chance to become established. If there is insufficient funding to support follow up weed management the "do nothing" approach would be better than triggering natural regeneration as this could lead to a loss of resilience if the natives are lost before setting new seed.

PLANTING AND HABITAT CREATION

Planting in the form of buffer planting, connectivity planting and infill planting into remnants can improve diversity, create habitat and connectivity, control weeds and erosion and reduce edge effects on remnant vegetation. However, it is important planting is implemented correctly as it can have negative impacts on remnant vegetation in the following ways:

- Shading – which reduces light at ground level which can decrease natural regeneration
- Decreased soil moisture – particularly at moist sites, decreases seedling survival.
- Competing with remnant plants – leading to loss of remnant vegetation.
- Invasion of remnant vegetation – encroaching plantings may the remnant undistinguishable from the buffer or connectivity planting, reducing the significance of the remnant vegetation.
- Introduction of weeds or plant pathogens – via nursery soil mix and tubestock. I.e., Myrtle Rust or Phytophthera.

The above impacts can be prevented through:

- Appropriate site specific species selection – choosing species that will not out compete or overcrowd remnant vegetation and are appropriate for the site conditions.
- Appropriate planting density and location – to prevent overcrowding or encroachment on remnant vegetation
- Purchase plants from a nursery with accredited hygiene protocols – to prevent the introduction of weed seeds and pathogens through soil from tubestock.

Buffer Planting

Buffer planting can be used to reduce the edge effects, including weed and turf encroachment into the remnant and expand fauna habitat. Dense plantings may also help reduce unauthorised public access to the remnant and delineate remnants from disturbed areas whilst also improving the aesthetics of the area.

Native buffer planting supports natural native regeneration processes by providing more inhabitable soil types through positive feedback mechanisms (Ba et al. 2018; Suding et al. 2013), increasing resilience of remnant vegetation and decreasing competition from weed species. Buffer planting also aims to provide habitat for native fauna through increasing available sheltering and foraging resources.

Previously, buffer plantings aimed to leave a gap between plantings and remnant vegetation in order to encourage natural expansion of remnant vegetation. However, in some circumstances, these gaps have facilitated further weed invasion, or the edges between the buffer planting and the remnant vegetation have been neglected. Methodology may need to be reconsidered to address this issue and look at filling in the gaps with suitable buffer plantings where regeneration is low. Where the native seedbank of the remnant vegetation is viable or recruitment from the adjacent remnant may have the ability to expand beyond the edges of the remnant, gaps can be incorporated into buffer plantings to allow space for

natural regeneration and expansion of remnant vegetation. However, weed control should be rigorous in these gaps and along the edge of the remnant, in order to increase the likelihood of natural regeneration by making the conditions favourable for native growth. When installing buffer planting, species should be carefully selected to reduce the potential for dominant natives smothering remnant patches. For example, as previously discussed *Wollastonia uniflora* has not been a suitable choice of species.

If differentiation of the non-remnant plantings from the remnant is desired the buffer planting should include a low diversity of varying species to the remnant species. This will preserve the integrity of the remnant. This has been successful next to existing remnants where buffer plantings have included *Lomandra longifolia*, *Westringia fruticosa* and *Acacia longifolia* var. *sophorae* which are easily differentiated from the remnant. *Acacia longifolia* var. *sophorae* must only be planted with caution as it can form a monoculture and may die off within a few years. Most buffer planting species suited to the coastal environment of the Waverley LGA are low growing shrubs, sedges, rushes and ground cover species. However if a greater diversity of buffer planting species is used it may provide more resilience to climate change and generally improve local biodiversity. There is a higher chance that a more diverse buffer will integrate with the remnant and share genetics as there is a higher chance of planting a species that may also be present in the remnant. If local provenance stock is used in buffers this may assist in improving the resilience of the remnant.

Council Parks Staff could be trained to undertake maintenance of the buffer and connectivity planting areas which would reduce the need to engage bush regeneration contractors. Maintenance is likely to require general weed management and selective control of dominant natives. Where weeds or natives are removed a minimum layer of 100mm of mulch can be used to assist in the suppression of weeds. Infill planting with natives can assist this process. Maintenance of buffer edges may be required.

Connectivity Planting

Connectivity planting serves to create a continuous habitat corridor throughout the LGA, by planting in order to connect patches of fragmented remnant vegetation and fauna passageways, supporting healthy gene flow. See Figure A-1 for recognised habitat and habitat corridors within the LGA. Native flora species planted in these areas should be selected based on their habitat potential as shelter and food sources for the local fauna. Habitat should also be created through the inclusion of features such as dead logs and sandstone rocks.

Infill Planting

Infill or supplementary planting into a remnant is a less desirable option than natural regeneration, but may be required in areas where regeneration potential has been lost as a result of years of negative impacts, fragmentation and weed invasion.

Infill planting should only be used after two years of bush regeneration works have been undertaken. Infill planting must use remnant tube stock species propagated from local provenance material to protect the genetic integrity of the remnant, support local fauna and to provide character of place. Local provenance can be considered anything along the coast from the Northern Beaches LGA to the Sutherland Shire LGA. Similar to that of the distribution of Eastern Suburbs Banksia Scrub (ESBS). This would allow for some genetic diversity whilst still protecting genetic integrity.

It is often argued whether a remnant can still be considered remnant if it has received infill planting. It is ultimately a subjective matter however, based on the previous flora condition surveys if infill planting is conducted in remnants it may mean that the vegetation is no longer considered to be remnant and could impact EAP4 targets. However, in some cases it may be the only way to assist in preserving the remnant where the seedbank may be lacking diversity or is required to prevent weed incursion. Infill planting would improve the condition of the remnant and potentially its resilience, although based on previous flora condition surveys it is unlikely to contribute to EAP4 targets and may reduce the area of remnant vegetation according to the previous assessment methods. Therefore it is essential that infill planting only be used once other options have been exhausted and only local provenance species suitable to the site and the vegetation community present be used. Appendix F includes a list of species that can be used for planting at each site.

Species Selection

The planting species list provided in Appendix F, has been generated from species characteristic of communities mapped within Waverley Council LGA remnant vegetation, or as occupying similar ecological niches based on *The Native Vegetation of the Sydney Metropolitan Area* (OEH 2016b, OEH 2016c). The vegetation communities as described by SBRC 2020 and the species currently present within the buffer planting zones were also taken into consideration.

Only local provenance stock must be planted and cultivars or popular horticultural plants must not be planted in buffer or connectivity planting or within remnants. The availability of

local provenance species may affect species selection and ultimately dictate the diversity of the buffer or connectivity planting.

It was noted that in buffer plantings at some sites within the LGA, *Acacia longifolia* subsp. *sophorae* had become dominant and outcompeted other planted native species. The planting of this species has become problematic in some buffer plantings installed in 2016. In areas that this is likely to occur, it is recommended that no more than 20% of the trees and shrubs planted include *Acacia longifolia* subsp. *sophorae.* However, *Acacia longifolia* subsp. *sophorae* should not be excluded from plantings entirely as in some areas the quick establishment of *Acacia longifolia* subsp. *sophorae* can be useful where there is a requirement to quickly outcompete weeds or provide habitat. This may be the case for Bay Street. Where this approach is used it is important to follow up with thinning and replacement of *Acacia longifolia* subsp. *sophorae* individuals with other species to create diversity over time (approximately 18 – 24 months from planting) or once the plant, or area it is protecting has become more established.

Habitat Creation and Retention

Due to the urban landscape that surrounds the bushland and native vegetation remnants of the Waverley LGA it is essential that fauna habitat is retained, expanded or created where possible to continue to support the native fauna of the area that also serve as important pollinators to our native vegetation.

Weed thickets such as Lantana are known to provide valuable habitat to small bird species and refuge for reptiles in the urban landscape. As such, the retention of these weeds can also be critically important for fauna where available habitat is limited. Rather than removing these they can be contained and managed as habitat. Where weed thickets are to be removed they should be done in a staged manner to allow replacement habitat to be planted and establish before removing additional weed habitat.

It is important that other habitat features such as logs, dead branches, bush rock and hollows are retained where possible. These are all important habitat features that may provide shelter or nesting habitat for birds or shelter for reptiles. Logs and branches also contribute to the organic composition of the soil which can provide food for important invertebrates and plants. While bush rock and sandstone can provide microhabitats for invertebrates and reptiles.

It is important to manage weeds on sandstone cliffs or escarpments where feasible, as they may contain crevices suitable for microbat habitat. Ensuring that they remain clear of weeds, will allow access to any suitable crevices for roosting or breeding. The management of weeds over other rocky surfaces and drainage lines is important for maintaining habitat for reptiles and frogs. Reptiles require exposed rocks for basking in the sun while frogs need access to drainages lines and rocky pools for breeding, both of which can easily become overrun with weeds, particularly vines.

Habitat can also be created or expanded through the placement of additional logs, hollows or rocks in remnant or planted vegetation. Where trees are trimmed or removed in other parts of the LGA logs or hollows could be reused and placed in areas of retained vegetation.

Connectivity planting is another method of expanding but also connecting habitat as discussed above. It will create improved access for fauna to move between different patches of vegetation and improve gene flow. It may also assist in expanding suitable habitat for recruitment of the remnant vegetation. Species selection for connectivity planting is essential for fauna to ensure the structure is suitable habitat for local fauna species as well as providing suitable foraging resources.

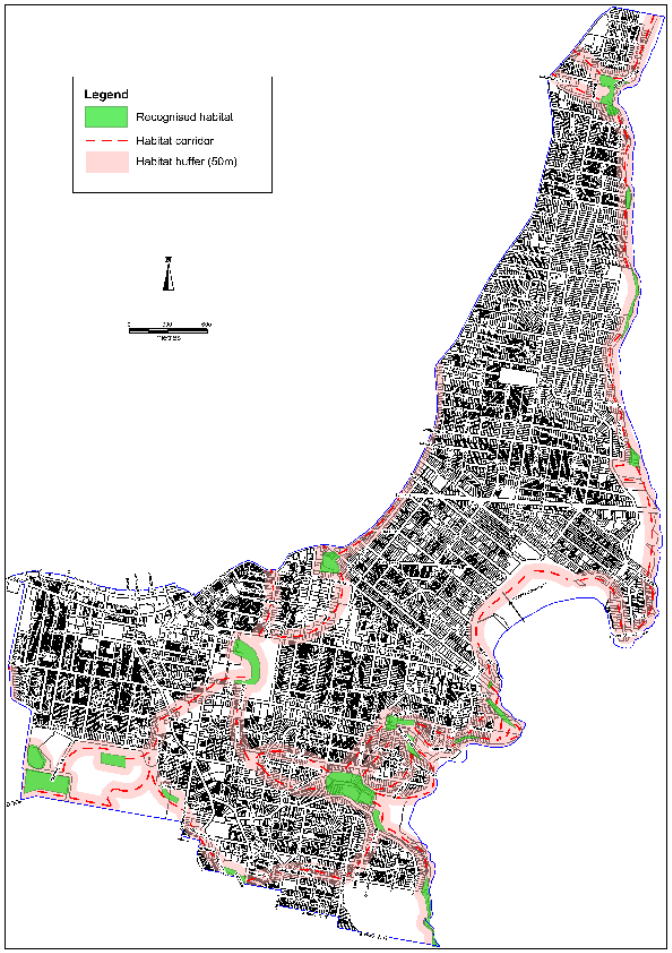

Figure A-1. Recognised habitat and habitat corridors within the Waverley Council LGA (Waverley Council, 2012)

TARGETED SEASONAL AND MAINTENANCE WEEDING

Targeted weeding is a method that can also be employed where limited resources do not allow for control of every weed species on site. Targeted weeding is to be prioritised in zones which currently display low weed density (ie. less than 30% weed density). Targeted weeding should occur in both remnant vegetation and buffer plantings. The net aim is to reduce and maintain weed density in these zones to below 5% within the first two years. In some circumstances, ropes work is a priority to properly access root zones of persistent weed species and to reduce future establishment and encroachment. Sometimes targeted weeding may need to be restricted to the removal of propagules, such as seeds or aerial tubers from plants, rather than removal of the entire plant. The secondary target is to work within areas of high weed density, focusing on patches of native vegetation with higher resilience. Zones should also be identified which display potential for further rehabilitation to increase connectivity and promote native regeneration.

The glyphosate ban implemented by Waverley Council has resulted in a requirement for more frequent site visits and a reduction in the area of weeds that can be treated in each of these visits, thus significantly increasing the cost of weed control. In general, across all sites bush regeneration should occur at least fortnightly by qualified and experienced bush regenerators. Follow up weed treatment will also need to be more frequent and carried out prior to:

- weeds setting seed - aiming to exhaust the exotic seedbank in the soil
- weeds recolonising areas previously treated
- weeds outcompeting natives.

Best practice treatment methods including herbicide options and rates (excluding Glyphosate) have been included in Appendix D for priority weeds and those identified as problem weeds within the LGA by Council

Dominant Weeds

The dominant weed species recorded at the BAP sites during the 2020 site surveys are detailed Appendix C. Across the Waverley Council LGA, the persistent and dominant weeds are:

- *Rumex sagittatus* (Turkey Rhubarb);
- *Anredera cordifolia* (Madeira Vine);
- *Asparagus aethiopicus* (Asparagus Fern);

- *Coprosma repens* (Mirror Bush);
- *Gazania tomentosa* (Gazania);
- *Hydrocotyle bonariensis* (Large leaf Pennywort);
- *Ipomoea cairica* (Coast Morning Glory);
- *Ipomoea indica* (Morning Glory);
- *Lantana camara* (Lantana);
- *Parietaria judaica*(Pellitory); and
- *Stenotaphrum secundatum* (Buffalo Grass).

Additionally, *Salpichroa origanifolia* (Pampas Lily-of-the-valley) has historically been an issue to manage and has dominated plantings particularly at Rodney Reserve and Diamond Bay. It has also become established in plantings at the south-west corner of Gaerloch.

Weed treatments are site specific, however in general woody weeds are to be removed by cut and paint methodology to allow root systems to remain intact, preventing erosion. In cases where post-emergence herbicide alternatives are used, follow-up treatment will need to be more frequent. Where there are low densities of *Hydrocotyle bonariensis* and *Gazania tomentosa,* success has been seen in hand removal techniques where root systems are accessible, particularly around natives in ecologically sensitive areas. Although, where there are high densities of these species, particularly *Hydrocotyle bonariensis*, hand removal can cause the species to regrow more prolifically than before or dependent on the location of the roots, removal may impact adjacent native species. Treatment must be done on a site specific basis.

Containment

Where zones are in extremely poor condition with more than 70% weed density, the priority is to contain these areas by means of sediment fencing to reduce weed propagule dispersion into areas of good condition. These areas are not a priority for weed treatment. Upon the removal of the weeds there is likely to be little native regeneration and these areas will likely provide valuable habitat for birds in cases where dense thickets such as of *Lantana camara* are present. These areas should be removed mosaically overtime and gradually planted in order to maintain habitat.

Weed treatment methods

An integrated approach is considered best practice for managing weeds and improving remnant bushland condition. Weed management within remnants must be carried out by suitably qualified and experienced bush regenerators. Methods may include the following:

Manual Weed Treatment/Removal

Manual removal, or hand weeding, is an effective form of weed control for small areas when all viable parts of the plant are removed from the soil (roots, fruiting material and rhizomes) where practical, or treated in situ via cut and paint (with herbicide) technique.

All weeds removed by hand must be handled according to best practice bush regeneration techniques to prevent dispersal of propagules from the removed weeds. All reproductive material must be bagged and taken off site and discarded in a waste facility. If off-site disposal is not practicable hanging the plant in a tree will ensure the plant properly dries out.

This approach is preferred in areas where significant native plants exist as using herbicide may result in inadvertent poisoning of native species. Hand weeding is beneficial where a low impact on existing vegetation is a priority. This approach is most suitable for shallow rooted annuals, perennials and juvenile plants that can be removed by hand with minimal soil disturbance. In many cases this is the preferred method of weed removal in sensitive areas.

Digging out a weed uses similar approaches to hand pulling. This method involves removing the entire plant including the roots and underground bulbs. Some species like Asparagus have spreading roots systems with an underground woody rhizome which has regeneration potential, therefore the entirety of the rhizome crown must be dug out.

Herbicides Treatments

All herbicides should be used according to recommendations on the herbicide label.

Appropriate Personal Protective Equipment (PPE) should be worn and consideration given to time of day, likelihood of rainfall, wind direction and likely impact on native species as per guidelines on the label. Use of glyphosate will be appropriate for most species. Glyphosate is usually the preferred herbicide for use in environmentally sensitive areas as it is rapidly broken down by microbes in the soil so residue is short lived and will not affect remnant and planted native individuals in the long term following application. Alternative herbicides to glyphosate generally have long half-lives where residuals remain in the soil longer which is particularly not preferable in areas of sandy soils such as the Waverley LGA. Species specific alternative herbicides are included in Appendix D. These alternative herbicides are known to be more harmful to humans and fish than glyphosate. Organic herbicides generally consists of acids, such as Pelargonic acid, or botanical oils, have contact type activity, meaning the herbicide does not translocate to the roots of the plant. These herbicides only cause damage to the leaves and stems of the plant, but will not kill the entire plant and therefore are not

viable for a long term solution for reducing the biomass of invasive weeds (Neal & Senesac, 2018; Marble et al., 2020).

It is important to note that there can be legal restrictions and permit requirements for use of specific herbicides for specific plants, and chemical labels and permit requirements always need to be researched prior to herbicide application.

Manual and mechanical removal will be an appropriate form of control for some species, and all chemical treatment should be carried out in accordance with best practice guidelines.

Best practice treatment methods including herbicide options and rates (excluding Glyphosate) have been included in Appendix D for priority weeds and those identified as problem weeds within the LGA by Council.

Herbicide Spray

Herbicide spray utilises herbicides to control weeds. The herbicide is absorbed through the leaves. Foliar application is best practiced in areas where exotic grasses and ground covers are dominant. Unlike hand weeding situations which require minimal impacts to surrounding vegetation foliar spraying is typically broader scale. Unwanted over spray often kills neighbouring native plants and reduces regeneration potential. When controlling exotic groundcovers adjacent to natives it may be beneficial to hand weed or pull back the weed to create an area of bare ground between the two. This will reduce accidental overspray and damage to natives, encouraging natives to colonise the bare ground.

Cut and Paint

This method involves cutting the stem or trunk of the weed just above ground level and immediately applying non-residual herbicide to the remaining stem or trunk. This is an effective herbicide application method for woody weeds. It is also practical in sensitive areas as only individual stems are treated. Cut and paint methods retain root structure which can be beneficial for soil stabilisation, which is imperative for the majority of the steep clifftop remnants in the Waverley LGA.

Scrape and Paint

The scrape and paint method involves scraping the trunk or stem of a weed and applying herbicide to the fresh wound. This method is most effective to remove exotic vines not easily eradicated using cut and paint or hand removal, as it allows for greater surface areas to be treated. It increases the amount of herbicide application which may be needed to kill aerial or ground tubers. Care it to be taken not to scrape too deep or the entire circumference of the stem otherwise a 'ring-barking' effect may result, and the weed may regrow beneath the ring-bark.

Other herbicide free weed treatment methods

Flame Weeding

Small or young annual weeds, particularly broad-leaved weeds can be controlled through the use of fire, which also encourages native regrowth. Small scale burning can be achieved using propane torch kits to flame weeds. Weeds are lit and rapidly extinguished. Flame weeding must be carried out in accordance with Work Health and Safety Guidelines and best practise guidelines. This could be a useful alternative around edges or buffer edge where they may be dominated by annual weeds.

Ecological Pile Burns

Many native Australian plant species require fire to germinate. If an area is not burnt for a long time some plant species may age and eventually die without reproducing. On the other hand if an area is burnt too frequently plants may not be able to reach reproductive maturity and so the seedbank will be depleted. Ecological burns are carried out to replicate the natural fire cycle, in line with the guidelines for the present vegetation community. They also aid weed control. It is important after a burn to conduct regular weed control to allow the native seed bank to regenerate.

Burning should be conducted as small pile burns within vegetation patches in accordance with the NSW RFS Standards for Pile Burning. As the patches are isolated, the entirety of a patch should not be burned as any fauna using the area may not be able to disperse into neighbouring vegetation.

Where ecological pile burns have been recommended they are to be planned, guided and implemented as per an approved Fire Management Plan prepared by a qualified and experienced Bushfire Consultant. In preparing a Fire Management Plan, Council can plan and implement ecological burns in a staged and safe manner with sufficient time to consult with the community, especially within the immediate vicinity of the vegetation to be burnt.

Alternatives to Ecological Pile Burns

The undertaking of ecological or hazard reduction burns can have the potential to elicit opposition from the community and in some cases can encounter delays during the approval process. In the case where it may not be possible to undertake an ecological burn other

techniques can be used to stimulate the native seedbank and control weeds in a similar manner to what a burn may have achieved. These techniques include:

- Disturbance of the soil surface using raking or scarification to stimulate the native seedbank.
- Treatment of the soil using smoke water or the use of smoke tents. Smoke is known to be the trigger for native germination rather than the heat or flames for some species. It is best that this method is trialled and adapted where appropriate.
- Selective removal of over-mature or over abundant species which would usually be removed by fire. This will open up the canopy and will encourage germination from the native seedbank.
- Flame weeding will also provide heat to the soil and seedbank similar to a natural burn which is also known to encourage native regrowth.

The above mentioned techniques are best used in areas where a remnant seedbank is known or expected. Suitable sites include Hugh Bamford Reserve and the York Road Remnant.

Biological Controls

The control of weeds through biological controls is to use predators, parasites or microbial pathogens to suppress pests. Biological controls have not been identified as suitable for these sites due to the lack of susceptible weed species. However, the CSIRO are often trialling biological controls. As new studies develop suitable biological controls may be available for the LGA.

Change Soil pH

Soil pH can be altered to make the conditions less favourable for annual weed species, in turn reducing recruitment overtime. One way to achieve this is through the addition of sugar to the soil. This can be a successful method when treating large areas of *Bidens pilosa.*

Alternative treatment methods for Hydrocotyle bonariensis

Management of *Hydrocotyle bonariensis* has been an ongoing issue at many sites within the Waverley LGA including Waverley Cemetery Cliffs and Diamond Bay. Often treatment is unsuccessful and the species continues to threaten remnant vegetation. Some hand weeding has encouraged more expansive and rigorous growth. A combination of methods may be required in some areas, particularly in sensitive areas such as drainage lines or frog habitat where the use of herbicide should be prevented. The following alternative methods should be trialled to treat *Hydrocotyle bonariensis* using plots, in order to assess the suitability to the specific site*:*

- **Methodical hand weeding:** involves careful systematic hand weeding in methodical patches. Hand weeding has been done at some sites but if not done correctly it can accelerate the problem. Hand weeding must be done with the utmost care as the species will regenerate from any broken vegetative parts left in the soil. Mattocks should not be used. Hand weeding should involve digging in front the plume of *Hydrocotyle* to find the start of the runners. The runners should be followed and dug back towards the plume. All snapped roots must be removed. This can be very time consuming and expensive. Hand weeding may still be required in combination with other methods or in sensitive areas of frog habitat where chemical use is not suitable.
- **Crunch spraying:** the leaves of the Hydrocotyle must be crunched by hand to break the cuticle of the leaf and sprayed with herbicide individually using a small spray bottle with herbicide. This method is also slow and can be costly.
- **Iron-sulphate application:** Iron-sulphate can be applied to the leaves. Broad-leaved plants typically absorb more iron-sulphate and burn off.

The methods should be trialled to assess the suitability at the specific sites. The trials must be monitored, assessed and adapted if necessary.

OTHER BIODIVERSITY MANAGEMENT OPTIONS

Control of Dominant Natives

Some remnants have become dominated by one or two native flora species due to lack of fire or lack of natural disturbance events. These dominant species can over crowd or over shadow areas preventing recruitment from the seedbank. At Loombah Road *Homalanthus populifolius* is starting to dominate the canopy and over shadow the ground layer while *Commelina cyanea* is dominating the ground layer and preventing recruitment which can prevent or deplete the diversity of the remnant. Therefore, it is necessary to thin the canopy of *Homalanthus populifolius* by selectively removing individual mature plants or saplings. The *Commelina cyanea* can be raked back in areas to expose the soil and encourage germination of the seedbank. Some of this is already occurring at this site and as a result is assisting the recruitment of *Acacia terminalis* subsp. *Eastern Sydney.*

Other sites may require management of young *Banksia integrifolias* to prevent overshadowing of the ground layer. Parts of Hugh Bamford Reserve could benefit from the management of *Kunzea ambigua* and *Leptospermum laevigatum* if an ecological burn cannot be conducted. Many buffer planting areas throughout the LGA require the selective removal of *Acacia longifolia* and *Wollastonia uniflora* which have become dominant and are over-crowding areas of the buffer. At several sites throughout the LGA, *Wollastonia uniflora* had previously been planted within the buffer planting zones (Apunga 2019). This has exhibited invasive behaviours and is severely smothering natives reducing the overall diversity and resilience of the buffer vegetation. This species can be a "weedy native" in some locations, however it can be effectively used in areas that are not easily maintained and areas where other natives may have limited success (ie. clifftops or areas of poor soil quality).

Where the removal of species in the buffers creates a cleared area, infill planting of other species will most likely be required to prevent weed encroachment and as it is unlikely to contain a seedbank for natural recruitment if recently established.

Sandstone Capping

Where areas are depleted of organic material and lack substrate to plant into, sandstone capping can be used to provide a substrate for direct seeding or planting. It is also a useful method to prevent weed recruitment in areas of high density weeds that are to be cleared.

Sandstone capping can be conducted by clearing areas entirely dominated by weeds where there is unlikely to be any native seedbank remaining. All weed biomass should be removed and then the surface should be graded and a flush of weeds allowed to come up and be treated prior to capping. A minimum of 300mm of crushed sandstone is required to suppress weeds. The addition of light layer (25mm) of native tree mulch can assist in the establishment of Mycorrhizal fungi but must be thin enough to avoid providing suitable habitat for weeds from neighbouring sources to establish. In areas without an adjacent weed source heavier mulch can be used. Sandstone capped areas can then be planted into or direct seeded.

Where sandstone capping is to occur on slopes or may be subject to significant wind erosion terracing, coir logs, jute matting or jute mesh may be required to ensure the retention of the sandstone capping.

Sandstone capping is recommended if planting is desired along cliff edges and rock shelves to protect small fragmented patches of remnant vegetation, particularly between Tamarama and Bronte beaches. Currently areas adjacent to the remnant patches consist of weed species that are encroaching on the remnants. These weeds have established in minimal substrate, typical of cliff line and rock shelf vegetation. These areas could be cleared of weeds and capped with sandstone. Due to the steep slopes and exposure to the ocean winds it would require a combination of jute mesh and coir logs to ensure the capping isn't weathered away. The coir logs would need to be drilled into the rock shelf to stabilise them therefore stability of the rocks and the possible presence of Aboriginal heritage must be considered with any work along the cliffs or rock shelves. Due to the nature of the cliff line and rock shelf sites it is recommended that this method is first trialled as the harsh conditions of the site could impact its success.

Sandstone capping can also be used to cap soil contaminated with asbestos, such as Clarke Reserve. In these cases a marker layer usually consisting of geotextile fabric must be laid before a minimum layer of 300mm of crushed sandstone is added. This must only be planted into with small shrubs and grasses so that their roots do not penetrate the marker layer.

Avoid using crushed sandstone where weed species with underground stems (i.e. tubers, bulbs, corms or rhizomes) are present. Many of these species have the potential to grow through the crushed sandstone and make eradication or control more difficult.

See the soil seedbank translocation case study for an example of sandstone capping application. Given the proposed sites within the Waverley LGA have unique conditions sandstone capping should be trialled at a small scale first.

Soil Seedbank Translocation

Soil seedbank translocation is a process involving the removal and transfer of the O, A and B soil horizons from a donor site to a recipient site with a depth of approximately 500 mm. The soil horizons removed may vary depending on the soil and vegetation type. Sea-cliff vegetation communities within the LGA may require a depth of <100mm to be successful translocated. By translocating these soil horizons, the aim is to capture the propagules of the native plant community so it can regenerate at the recipient site. Therefore, preserving a vegetation community that would have otherwise been lost to development. To generate growth from the soil seedbank usually some form of disturbance is required by either physical disturbance to the soil, fire, heat, smoke or other physical condition changes to the surrounding environment. Some species may initially establish from asexual reproduction of plant parts including rhizomes, roots and stems. Species present both in the donor site and the recipient site are likely to have a variety of adaptations to fire events and in general these adaptations are usually relied upon as means of translocating viable plant material during soil translocation. The physical nature of translocating soil is often enough to promote new

growth from the seed bank, however some species will continue to remain dormant until a fire event.

This method could be utilised where an area of remnant vegetation is being cleared for development either within the LGA, neighbouring LGAs or elsewhere is Sydney. Sites within the Waverley LGA have the potential to become recipient sites for a soil seedbank translocation for an Endangered or Critically Endangered Ecological Community such as Eastern Suburbs Banksia Scrub where clearing may occur in neighbouring LGAs such as Randwick LGA. It is recommended that Waverley Council open conversations with neighbouring Councils or Councils with similar vegetation communities such as Northern Beaches Council and Sutherland Shire Council to consider including soil seedbank translocation in their DA conditions where appropriate and where Waverley Council can provide recipient sites. Costs of soil seedbank translocations and maintenance for the purpose of development would then be the responsibility of the developer.

Soil seedbank translocations would not be suitable for the majority of coastline vegetation where it is highly exposed and likely to be subject to strong winds and erosion, resulting in a loss of the translocated soil. Sites that could be used as recipient sites within the Waverley LGA may include Tower Street Reserve and Jensen Avenue.

CASE STUDY – Soil Seedbank Translocation of Duffys Forest EEC

In 2010 Total Earth Care prepared a Soil Seedbank Translocation Plan and began to undertake the translocation of an area of Duffys Forest EEC that would have otherwise been lost to development in Belrose. The recipient site was previously a decommissioned works depot that was cleared of vegetation. The location, geology and close proximity to the donor site and to other areas of Duffy Forest EEC made it a perfect candidate as a recipient site.

Five years of monitoring was undertaken following the translocation to assess its success and collect information that could assist in future translocations. The monitoring showed clear changes in the structure and diversity of the community over time which is to be expected with successional changes in a regenerating community.

Approximately 50% (29 species) of the species noted on the donor site were found regenerating on the recipient site. An additional 33 species were found regenerating on the recipient site but not observed on the donor site. The emergence of species at the recipient site is most likely due to the biological traits of individual species including their required triggers for germination which can include fire and disturbance. The site is mostly free of weeds species and has been self-sustaining for approximately 14 years.

Additionally, a recipient site across the road from this underwent a soil seedbank translocation of Duffys Forest EEC a few years prior. It included the addition of crushed sandstone to cap areas of poor substrate and to suppress weeds. The site had a similar outcome and both sites are recognised as the best example of soil seedbank translocation in Sydney.

The general process of translocating the ecological communities of Waverley would be similar to that of Duffys Forest. However, the depth of soil to be translocated may vary depending on the community characteristics and soil composition.

Figure A-2. Before (2010) on left and after (2020) translocation on right.

Direct Seeding

Direct seeding is utilised as an alternative to planting tubestock where native seed is directly spread around an area. The form of the regrowth is a more natural replication of a vegetation community. Areas to be direct seeded must first be prepared by spraying the weed species

present. Weed seed must be allowed to germinate and then spraying to be repeated. If the soil is showing signs of compaction, the ground should then be disturbed for example via ripping and tilling to loosen the soil substrate. Mulch should then be installed at a depth of 300mm and then seed should be spread evenly across the area. Tubestock can be installed to supplement the direct seeding. An alternative to spreading seed is to hydro seed under jute mat, following the preparation of the site in the same manner.

Direct seeding in areas with slopes or on cliff lines will require jute mesh to prevent loss of seed or soil to erosion or wind otherwise seed will likely be lost prior to germination being possible. This method could be used along the Bronte to Tamarama cliff line in conjunction with sandstone capping. This method again requires elevated costs at the start but should result in reduced maintenance requirements in the long term. It should also be noted that direct seeding often requires more maintenance and weeding than planting.

CASE STUDY – Norah Head Restoration and Rehabilitation Project

In 2011 work began on a 14 ha site at Norah Head Lighthouse. Initial works involved the primary treatment of Bitou Bush (*Chrysanthemoides monilifera* ssp. *rotundata*) and Lantana (*Lantana camara*). These were treated with foliar spray and hand weeding near natives. A few flushes of weeds from the seedbank were promoted and treated. Direct seeding of Weeping Grass (*Microleana stipoides*), Kangaroo Grass, (*Themeda triandra*), Beach Bean (*Canavalia rosea*), Coastal Wattle (*Acacia longifolia* var. *sophorae*), Pigface (*Carpobrotus glaucescens*), and Flax Lily (*Dianella caerulea*) was undertaken across 0.2 ha in the first 2 years. Coir logs were used for erosion control.

After two years the control of Bitou Bush (*Chrysanthemoides monilifera* ssp. *rotundata*) was substantial and the direct seeded ground covers had thrived. Other ground cover species, vines and shrubs were beginning to regenerate shortly after. (AABR 2020)

Figure A-3. Before and after weed treatment and direct seeding.

APPENDIX B – METHODOLOGY USED FOR PREPARING THIS PLAN

BACKGROUND RESEARCH

A review of the previous Biodiversity Action Plan (TEC 2014), existing Plans of Management, bush regenerator contractor works reports, previous mapping, relevant legislation and policy and Plans of Management was undertaken for incorporation into the Biodiversity Action Plan. This included;

- Review of the following relevant documentation:
  - Waverley Council Environmental Action Plan (Version 4) 2018 – 2030 (WC 2018);
  - Waverley Council Environmental Action Plan (Version 3) 2012 – 2020 (WC 2012);
  - Waverley Council Biodiversity Action Plan 2014-2020 (TEC 2014),
  - The Biodiversity Study of the Waverley Local Government Area (AMBS2011);
  - Waverley Flora Study Report 2020 (SBRC 2020) including associated data and mapping data;
  - Waverley Flora Study Report 2010 (SBRC 2010);
  - Draft Williams Park and Hugh Bamford Reserve Plan of Management, November 2019 (Waverley Council 2019);
  - Waverley Aboriginal Heritage Study, by Domini Steele Consulting Archaeology 2009;
  - Bush regenerator contractor works reports for most sites. (2017-2019);
  - Waverley Council's Biodiversity DCP Mapping; and
  - Any relevant / available Recovery Plans, Plans of Management and Local / State / Commonwealth Government Plans, Polies, Guidelines and Strategies.
- Consultation with Council Urban Ecology Team to clarify questions that arose from the background review, site visits and Council's specific targets and objectives expected of the Actions Plans produced.

SITE ASSESSMENT

Site assessments were conducted by TEC's ecologists and senior restoration ecologist and divisional head of TEC's Bush Regeneration division on 9th April 2020 and 17th June 2020. One of Waverley Council's project staff attended some sites with TEC.

Specifically, field surveys involved:

- Verification of existing data with reference to species inventories and community / remnant mapping from The Waverley Flora Study Report (2020) (SBRC). Flora field surveys also included targeted searches for plant species of conservation significance according to the "random meander" method of Cropper (1993);
- Plant species were identified according *to Field Guide to the Native Plants of Sydney* (Robinson, 2016), *Weeds of the South East, An Identification Guide for Australia* (Richardson et al, 2006), and PlantNET (Botanic Gardens Trust, 2008), with reference to recent taxonomic changes;
- Identification and recording of management issues and opportunities for the restoration of the identified vegetation remnants and surrounding landscape. This included weed sources and management, stormwater and erosion impacts and management, vandalism and un-authorised access management, fire, assisted regeneration techniques and other vegetation management measures; and
- Incidental fauna observations were recorded during the flora field survey effort.

WEED DENSITY ASSESSMENT

Weed densities were assessed based on the National Trust of Australia (NSW) method. This is a rapid assessment that classifies areas into four categories. For this assessment and to assist with prioritising management actions the categories have included a weed percentage cover. Weed density maps of each site have been provided in this plan.

Weed density assessments were conducted on 9th April 2020 and 17th June 2020. Weed densities and generally vegetation condition are likely to vary depending on when weed management work has occurred on site in relation to the assessment timing, seasonal variations, rainfall and other climatic changes.

The weed density maps included in this plan are only current to the time they were produced. As the plan is implemented the weed density is likely to change with bush regeneration works, seasonal timing and conditions. However, they provide a good basis for the start of works and demonstrate how particular areas need to be prioritised.

DATA ANALYSIS AND PLAN PREPARATION

In order to prepare the Biodiversity Action Plans the following processes were undertaken following completion of the site assessments;

- Consolidation of all field data and development of site specific Management Action Plants for each remnant vegetation. Consultation between TEC Ecological Consulting, Bush Regeneration and Environmental Rehabilitation and Construction management staff on recommended plans and appropriate restoration techniques.

- Preparation of Management Action Plans and Site Maps that clearly and concisely present the restoration programs, outlining bush regeneration and weed control areas, revegetation and rehabilitation areas, methods and techniques, opportunities for fauna habitat creation, opportunities for expansion, restoration and conservation of habitat corridors, and protection of areas of high conservation significance.

APPENDIX C – WEED SPECIES OF THE WAVERLEY LGA

Table C-1. Weed species present at each site (X – Observed on site, XX – Dominant weed on site, A – Observed by Council on site.)

							Site													
Scientific Name	**Common Name**	**WONS**	**State Priority**	**Regional Priority**	**Duties for Priority Weeds in Greater Sydney**	**Regional Concern/Value at Risk**	**North Cliff-top Remnants**	**Diamond Bay Reserve**	**Eastern Reserve**	**Caffyn Park**	**Raleigh, Rodney and Weonga Reserves**	**Loombah Rd Cliffs**	**Hugh Bamford Reserve**	**Bondi Golf Course & Williams Park**	**South Clifftop Remnants**	**Tamarama Marine Drive**	**Calga Reserve and Bronte Cutting**	**Waverley Cemetery**	**York Road**
Acacia saligna	Golden Wreath Wattle					Environment				X					X					
Rumex sagittatus	Rambling Dock					Environment	XX	X	X		X	XX	XX	X	X	XX	X			
Agave spp.	Agave spp.													X	XX					
Ageratina adenophora	Crofton Weed					Environment, Agriculture						X	X		X	X	X			
Ageratina riparia	Mistflower					Environment, Agriculture							X					X		
Aloe spp.	Aloe spp.						X								X					
Ambrosia psilostachya	Perennial Ragweed										X	XX			X					
Anredera cordifolia	Madeira Vine	Yes	Asset protection		PoD		XX	X			X	XX			X	XX	XX			
Arundo donax	Giant Reed			Asset protection	RRM										X					
Asparagus aethiopicus	Asparagus Fern	Yes	Asset protection		PoD		XX	XX	XX		X	X	XX	XX	XX	X	XX	XX	X	
Aster novi-belgii	Michaelmas Daisy						X						X		X	X				
Avena spp.	Wild Oats						X											X		
Bidens pilosa	Cobbler's Pegs						X		X	X	X		X		X	X	X	X	X	
Brassica juncea	Indian Mustard									X										
Bryophyllum delagoense	Mother of millions					Environment, Agriculture, Human health			X	X			XX		X					
Canna x generalis	Canna Lily						X	X	X		X		X		X			X		
Celtis sinensis	Chinese Elm					Environment, Agriculture				X					X					
Cenchrus clandestinus	Kikuyu Grass						X		X	X	X		X		X					

							Site												
Scientific Name	**Common Name**	**WONS**	**State Priority**	**Regional Priority**	**Duties for Priority Weeds in Greater Sydney**	**Regional Concern/Value at Risk**	**North Cliff-top Remnants**	**Diamond Bay Reserve**	**Eastern Reserve**	**Caffyn Park**	**Raleigh, Rodney and Weonga Reserves**	**Loombah Rd Cliffs**	**Hugh Bamford Reserve**	**Bondi Golf Course & Williams Park**	**South Clifftop Remnants**	**Tamarama Marine Drive**	**Calga Reserve and Bronte Cutting**	**Waverley Cemetery**	**York Road**
Centaurium tenuiflorum	Branched Centaury																X		
Cestrum parqui	Green Cestrum			Asset protection	RRM							X	X		X				
Chenopodium album	Fat Hen							X											X
Chlorophytum comosum	Spider Plant						X	X											
Chrysanthemoides monilifera subsp. rotunda	Bitou Bush	Yes	Containment		PoD, B Zone; The Bitou Bush Biosecurity Zone is established for all land within the State except land within 10 kilometres of the mean high water mark of the Pacific Ocean between Cape Byron in the north and Point Perpendicular in the south.			X					XX	XX						
Cirsium vulgare	Spear Thistle						X												
Colocasia esculenta	Taro														X				
Conyza spp.	Fleabane						X				X	X				X	X	X	X
Coprosma repens	Mirror Bush					Environment	XX	XX	XX		X	X		XX	XX			XX	
Cotoneaster glaucophyllus	Cotoneaster glaucophyllus											XX							
Cyperus alternifolius	Umbrella papyrus														X				

							Site												
Scientific Name	**Common Name**	**WONS**	**State Priority**	**Regional Priority**	**Duties for Priority Weeds in Greater Sydney**	**Regional Concern/Value at Risk**	**North Cliff-top Remnants**	**Diamond Bay Reserve**	**Eastern Reserve**	**Caffyn Park**	**Raleigh, Rodney and Weonga Reserves**	**Loombah Rd Cliffs**	**Hugh Bamford Reserve**	**Bondi Golf Course & Williams Park**	**South Clifftop Remnants**	**Tamarama Marine Drive**	**Calga Reserve and Bronte Cutting**	**Waverley Cemetery**	**York Road**
Cyperus eragrostis	Umbrella Sedge																X	X	
Delairea odorata	Cape Ivy					Environment									X		X	X	
Digitaria spp.	Couch						X		X		X			X	X				
Ehrharta erecta	Panic Veldtgrass						X		X	X	X		X	X	X	X	X	X	X
Eleusine indica	Crowsfoot Grass														X				
Erythrina crista-galli	Cockspur Coral Tree					Environment	X	X			X								
Fumaria bastardii	Bastards Fumitory						X												
Gazania tomentosa	Gazania						XX		XX		X		X	X	XX		XX		
Hedera helix	English Ivy											X	X				X		
Hydrocotyle bonariensis	Largeleaf Pennywort						XX	X	XX		XX		X		XX		XX	XX	
Hypochaeris radicata	Catsear														X		XX		
Ipomoea cairica	Coast Morning Glory					Environment	X	XX	XX		X	X	XX		XX		XX	XX	
Ipomoea indica	Morning Glory					Environment, Human health		XX	XX			XX	XX		XX	XX	X		
Kalanchoe spp.	Kalanchoe spp.						X												
Lagunaria patersonia	Norfolk Island Hibiscus										X		X		X	X			
Lantana camara	Lantana	Yes	Asset protection		PoD		X	XX	X	X	X	X	XX	X	X	XX		X	
Lobularia maritima	Sweet Alyssum						X				X		X	X	X		X		
Lolium perenne	Perennial Ryegrass																		X
Lonicera japonica	Japanese Honeysuckle					Environment	X	X	X				XX						
Lysimachia arvensis	Scarlet Pimpernel													X				X	X
Medicago polymorpha	Burr Medic						X												
Melinis repens	Red Natal Grass																		XX

							Site													
Scientific Name	**Common Name**	**WONS**	**State Priority**	**Regional Priority**	**Duties for Priority Weeds in Greater Sydney**	**Regional Concern/Value at Risk**	**North Cliff-top Remnants**	**Diamond Bay Reserve**	**Eastern Reserve**	**Caffyn Park**	**Raleigh, Rodney and Weonga Reserves**	**Loombah Rd Cliffs**	**Hugh Bamford Reserve**	**Bondi Golf Course & Williams Park**	**South Clifftop Remnants**	**Tamarama Marine Drive**	**Calga Reserve and Bronte Cutting**	**Waverley Cemetery**	**York Road**
Metrosideros excelsa	New Zealand Christmas Bush						X	X											
Modiola caroliniana	Red-flowered Mallow																X		
Monstera deliciosa	Fruit Salad Plant						X	X				X							
Narcissus jonquilla	White daffodil						X											X	
Nerium oleander	Oleander											X							
Nothoscordum borbonicum	Onion Weed															X			
Olea europaea subsp. cuspidata	African Olive			Containment	RRM; An exclusion zone is established for all lands in Blue Mountains City Council and Central Coast local government areas. The remainder of the region is classified as the core infestation area.		XX				XX	XX	XX						
Opuntia spp.	Opuntia spp.		Asset protection		PoD: All Opuntia species except for *Opuntia ficus-indica* (Indian fig)														
Opuntia stricta	Common Prickly Pear		Asset protection		PoD		X	X									X		
Osteospermum spp.	South African daisy						X		X				X		X			X	
Oxalis spp.	Oxalis spp.						X			X		X			X		X	X	X

							Site												
Scientific Name	**Common Name**	**WONS**	**State Priority**	**Regional Priority**	**Duties for Priority Weeds in Greater Sydney**	**Regional Concern/Value at Risk**	**North Cliff-top Remnants**	**Diamond Bay Reserve**	**Eastern Reserve**	**Caffyn Park**	**Raleigh, Rodney and Weonga Reserves**	**Loombah Rd Cliffs**	**Hugh Bamford Reserve**	**Bondi Golf Course & Williams Park**	**South Clifftop Remnants**	**Tamarama Marine Drive**	**Calga Reserve and Bronte Cutting**	**Waverley Cemetery**	**York Road**
Parietaria judaica	Pellitory					Environment, Human health	XX	X	X		XX	X	XX		XX	X	X	XX	
Passiflora spp.	Passionfruit								XX				X						
Pelargonium spp.	Geranium						XX		X	X	X			X	X		X		
Phoenix canariensis	Canary Island Date Palm					Environment	X		X									X	
Phytolacca octandra	Inkweed															X			
Plantago lanceolata	Lamb's Tongues						X		X	X			X	X	X		X	X	X
Rhaphiolepis indica	Indian Hawthorn					Environment		X											
Ricinus communis	Castor Oil Plant															X			
Rorippa nasturtium-aquaticum	Watercress														X				
Rubus fruticosus sp. agg.	Blackberry complex	Yes	Asset protection					X				X							
Salpichroa origanifolia	Pampas Lily of the Valley					Environment		A			A								
Senecio madagascariensis	Fireweed	Yes	Asset protection		PoD									X					
Senna pendula var. glabrata	Senna					Environment		X				XX	X			XX			
Silybum marianum	Variegated Thistle						X		X					X	X		X		
Solanum lycopersicum	Tomato plant														X				
Solanum nigrum	Black-berry Nightshade						X	X	X		X				X	X	X	X	X
Sonchus oleraceus	Common Sowthistle						X							X	X		X		
Sporobolus africanus	Parramatta Grass																	X	X
Sporobolus spp.	Rat's Tail Couch						X												
Stellaria media	Common Chickweed								X		X				X				X
Stenotaphrum secundatumm	Buffalo Grass						XX		XX		X			XX	XX			X	

							Site												
Scientific Name	**Common Name**	**WONS**	**State Priority**	**Regional Priority**	**Duties for Priority Weeds in Greater Sydney**	**Regional Concern/Value at Risk**	**North Cliff-top Remnants**	**Diamond Bay Reserve**	**Eastern Reserve**	**Caffyn Park**	**Raleigh, Rodney and Weonga Reserves**	**Loombah Rd Cliffs**	**Hugh Bamford Reserve**	**Bondi Golf Course & Williams Park**	**South Clifftop Remnants**	**Tamarama Marine Drive**	**Calga Reserve and Bronte Cutting**	**Waverley Cemetery**	**York Road**
Strelitzia nicolai	Giant Bird of Paradise						X	X		X					X		XX		
Taraxacum officinale	Dandelion						X						X	X	X		X	X	X
Taraxacum spp.	Dandelion						X		X						X		X	X	
Tradescantia fluminensis	Wandering Jew											X							
Trifolium spp.	Clover						X			X	X			X	X		X	X	X
Tropaeolum spp.	Nasturtium						X		X							X			
Vicia sativa subsp. sativa	Common Vetch								X					X				X	
Watsonia meriana	Wild Watsonia					Environment			X									X	
Yucca spp.	Yucca						X												

X – Observed on site
XX – Dominant weed on site
A – Observed by Council on site.

APPENDIX D – WEED TREATMENT AND TIMING FOR PRIORITY WEEDS

Scientific Name	Common Name	Best Practice Treatment Methods	Herbicide and application rate	Treatment Timing
Anredera cordifolia	Madeira Vine	Individuals to be dug out, cut & paint with Vigilant II, foliar spray with Starane Advance or Off Label Permit 13914 for riparian zones spot spray with Grazon Extra	Picloram 44.7g/km or; Fluroxypyr 333 g/L at a rate of 300 to 600 ml per 100 L water or; Grazon Extra 400mL per 100 L of water	All year round
Arundo donax	Giant Reed	Individuals to be dug out by hand and mechanical removal of large specimens	NIL	All year round
Asparagus aethiopicus	Asparagus Fern	Small single specimens to be crowned or Sprayed with Glyphosate/metsulfuron methyl	Glyphosate 360g/L & Metsulfuron-Methyl 600 g/kg	All year round
Cestrum parqui	Green Cestrum	Cut and painted with Vigilant II or foliar spray with Grazon Extra or Garlon 600	Picloram 44.7g/km, Grazon Extra 500mL per 100 L of water or; Garlon 600 - Triclopyr 600 g/L – 500ml per 100L of water	Late spring to early autumn
Chrysanthemoides monilifera subsp. monilifera	Boneseed	Small single specimens hand pulled or larger shrubs cut and painted with Vigilant II. Foliar spray with Brush Off and Pulse	Picloram 44.7g/km or; Metsulfuron-methyl 600 g/kg at a rate of 1 g per 1 L water plus organosilicone penetrant	All year round
Chrysanthemoides monilifera subsp. rotunda	Bitou Bush	Small single specimens hand pulled or larger shrubs cut and painted with Vigilant II. Foliar spray with Brush Off and Pulse	Picloram 44.7g/km or; Metsulfuron-methyl 600 g/kg at a rate of 1 g per 1 L water plus organosilicone penetrant	All year round
Hydrocotyle bonariensis	Largeleaf Pennywort	Methodical hand removal from the soil over serval seasons or leaf wipe with Vigilant II	Use “leaf wiping” application technique. Apply neat Vigilant II to at least 50% of the leaves of the plant by wiping the applicator along the middle of each leaf.	All year round
Lantana camara	Lantana	Hand pull small shoots. Cut and paint with Vigilant II or foliar sprayed with Grazon Extra or Starane Advance or Garlon 600	Grazon Extra 350 or 500 mL/100 L of water or; Fluroxypyr 333 g/L at a rate of 300 to 600 ml per 100 L water	Summer to autumn
Olea europaea subsp. cuspidata	African Olive	Cut & painted with Vigilant II	Picloram 44.7g/km	All year round
Opuntia spp.	Opuntia spp.	Removed by hand, Foliar spray with Grazon Extra or Garlon 600	Grazon Extra 500 mL/100 L of water	All year round

Scientific Name	Common Name	Best Practice Treatment Methods	Herbicide and application rate	Treatment Timing
Rubus fruticosus sp. agg.	Blackberry complex	Brush cut, crowned and scraped & painted with Vigilant II or Foliar spray with Grazon Extra	Garlon 600 Triclopyr 300g/L – 3 L per 100 L water Picloram 44.7g/km or; Grazon Extra 350 or 500 mL/100 L of water	Late spring to autumn
Senecio madagascariensis	Fireweed	Foliar spraying in accordance with off label permit 9907 & Grazon Extra Label, hand pulled or brush cut	Fluroxypyr 333 g/L at a rate of 300 to 600 ml per 100 L water or; Metsulfuron-methyl 600 g/kg at a rate of 10-20 g per 100 L water plus surfactant or; Grazon Extra 350mL per 100 L of water	All year round
Salpichroa origanifolia	Pampas lily of the valley	Seedlings can be removed by hand. Mature plants have horizontal roots up to 3m long and 1m deep. They can be removed by persistent digging over several seasons. Fruit should be cut and bagged. Foliar spot spray in accordance with off label permit 9907. Plants must be delineated from areas that may be slashed or mowed as this will encourage new vegetative growth.	Fluroxypyr 333 g/L at a rate of 300 to 600 ml per 100 L water or; Metsulfuron-methyl 600 g/kg at a rate of 10-20 g per 100 L water plus surfactant	All year round

APPENDIX E – FAUNA SPECIES RECORDED IN THE WAVERLEY LGA SINCE 2010 (DPIE 2020 – BIONET & AMBS 2011)

Class	Family	Scientific Name	Exotic	Common Name	BC Act Status	EPBC Act Status	Records	Source
Amphibia	Hylidae	*Litoria caerulea*		Green Tree Frog	P		1	Bionet
		Litoria dentata		Bleating Tree Frog	P		1	Bionet
		Litoria fallax		Eastern Dwarf Tree Frog	P		11	AMBS
	Myobatrachidae	*Crinia signifera*		Common Eastern Froglet	P		1	AMBS
		Limnodynastes peronii		Brown-striped Frog	P		1	Bionet
Aves	Acanthizidae	*Acanthiza chrysorrhoa*		Yellow-rumped Thornbill	P		1	Bionet
		Sericornis frontalis		White-browed Scrubwren	P		1	Bionet
	Accipitridae	*Accipiter novaehollandiae*		Grey Goshawk	P		1	Bionet
		Accipiter sp.		Unidentified goshawk	P		1	Bionet
	Alcedinidae	*Dacelo novaeguineae*		Laughing Kookaburra	P		59	Bionet
		Todiramphus sanctus		Sacred Kingfisher	P		12	Bionet
	Anatidae	*Anas castanea*		Chestnut Teal	P		1	AMBS
		Anas superciliosa		Pacific Black Duck	P		8	Bionet
		Chenonetta jubata		Australian Wood Duck	P		1	Bionet
		Cygnus atratus		Black Swan	P		7	Bionet
	Anhingidae	*Anhinga novaehollandiae*		Australasian Darter	P		2	Bionet
	Ardeidae	*Ardea ibis*		Cattle Egret	P		3	Bionet
		Ardea pacifica		White-necked Heron	P		3	Bionet
		Egretta novaehollandiae		White-faced Heron	P		1	Bionet
	Artamidae	*Cracticus nigrogularis*		Pied Butcherbird	P		1	Bionet
		Cracticus tibicen		Australian Magpie	P		173	Bionet
		Cracticus torquatus		Grey Butcherbird	P		6	Bionet
		Strepera graculina		Pied Currawong	P		78	Bionet
		Strepera sp.			P		11	Bionet

Class	Family	Scientific Name	Exotic	Common Name	BC Act Status	EPBC Act Status	Records	Source
	Cacatuidae	*Cacatua galerita*		Sulphur-crested Cockatoo	P		33	Bionet
		Cacatua sanguinea		Little Corella	P		9	Bionet
		Eolophus roseicapillus		Galah	P		3	Bionet
		Nymphicus hollandicus		Cockatiel	P		1	Bionet
	Campephagidae	*Coracina novaehollandiae*		Black-faced Cuckoo-shrike	P		2	Bionet
		Lalage sueurii		White-winged Triller	P		1	Bionet
	Charadriidae	*Vanellus miles*		Masked Lapwing	P		18	Bionet
	Columbidae	*Columba livia*	*	Rock Dove			60	Bionet
		Ocyphaps lophotes		Crested Pigeon	P		19	Bionet
		Ptilinopus superbus		Superb Fruit-Dove	V,P		1	Bionet
		Streptopelia chinensis	*	Spotted Turtle-Dove			15	Bionet
	Corvidae	*Corvus coronoides*		Australian Raven	P		44	Bionet
		Corvus mellori		Little Raven	P		4	Bionet
	Cuculidae	*Cacomantis flabelliformis*		Fan-tailed Cuckoo	P		2	Bionet
		Chalcites basalis		Horsfield's Bronze-Cuckoo	P		1	Bionet
		Chalcites lucidus		Shining Bronze-Cuckoo	P		2	Bionet
		Eudynamys orientalis		Eastern Koel	P		11	Bionet
		Scythrops novaehollandiae		Channel-billed Cuckoo	P		9	Bionet
	Falconidae	*Falco cenchroides*		Nankeen Kestrel	P		1	Bionet
		Falco peregrinus		Peregrine Falcon	P		6	Bionet
	Hirundinidae	*Hirundo neoxena*		Welcome Swallow	P		20	Bionet
		Petrochelidon ariel		Fairy Martin	P		1	Bionet
	Laridae	*Chroicocephalus novaehollandiae*		Silver Gull	P		21	Bionet
		Thalasseus bergii		Crested Tern	P	J	1	Bionet
	Maluridae	*Malurus cyaneus*		Superb Fairy-wren	P		8	Bionet
		Malurus lamberti		Variegated Fairy-wren	P		5	Bionet

Class	Family	Scientific Name	Exotic	Common Name	BC Act Status	EPBC Act Status	Records	Source
	Megapodiidae	*Alectura lathami*		Australian Brush-turkey	P		1	Bionet
	Meliphagidae	*Acanthagenys rufogularis*		Spiny-cheeked Honeyeater	P		1	Bionet
		Acanthorhynchus tenuirostris		Eastern Spinebill	P		1	Bionet
		Anthochaera carunculata		Red Wattlebird	P		14	Bionet
		Anthochaera chrysoptera		Little Wattlebird	P		2	Bionet
		Caligavis chrysops		Yellow-faced Honeyeater	P		1	Bionet
		Manorina melanocephala		Noisy Miner	P		164	Bionet
		Phylidonyris niger		White-cheeked Honeyeater	P		3	Bionet
		Phylidonyris novaehollandiae		New Holland Honeyeater	P		9	Bionet
	Monarchidae	*Grallina cyanoleuca*		Magpie-lark	P		15	Bionet
		Monarcha melanopsis		Black-faced Monarch	P		1	Bionet
	Oceanitidae	*Pelagodroma marina*		White-faced Storm-Petrel	P		1	Bionet
	Oriolidae	*Oriolus sagittatus*		Olive-backed Oriole	P		3	Bionet
		Sphecotheres vieilloti		Australasian Figbird	P		34	Bionet
	Passeridae	*Passer domesticus*	*	House Sparrow			4	Bionet
	Pelecanidae	*Pelecanus conspicillatus*		Australian Pelican	P		1	Bionet
	Phalacrocoracidae	*Phalacrocorax carbo*		Great Cormorant	P		4	Bionet
		Phalacrocorax varius		Pied Cormorant	P		9	Bionet
	Phasianidae	*Coturnix sp.*		Unidentified Quail	P		2	Bionet
	Pittidae	*Pitta versicolor*		Noisy Pitta	P		1	Bionet
	Podargidae	*Podargus strigoides*		Tawny Frogmouth	P		6	Bionet
	Podicipedidae	*Tachybaptus novaehollandiae*		Australasian Grebe	P		1	Bionet
	Procellariidae	*Ardenna grisea*		Sooty Shearwater	P	J	1	Bionet
		Ardenna pacifica		Wedge-tailed Shearwater	P	J	1	Bionet
		Ardenna tenuirostris		Short-tailed Shearwater	P	C,J,K	5	Bionet
		Pachyptila turtur		Fairy Prion	P		1	Bionet

Class	Family	Scientific Name	Exotic	Common Name	BC Act Status	EPBC Act Status	Records	Source
		Puffinus gavia		Fluttering Shearwater	P		1	Bionet
	Psittacidae	*Calyptorhynchus funereus*		Yellow-tailed Black Cockatoo	P		5	AMBS
		Platycercus elegans		Crimson Rosella	P		2	Bionet
		Platycercus eximius		Eastern Rosella	P		1	Bionet
		Trichoglossus chlorolepidotus		Scaly-breasted Lorikeet	P		1	AMBS
		Trichoglossus haematodus		Rainbow Lorikeet	P		717	Bionet
	Ptilonorhynchidae	*Ptilonorhynchus violaceus*		Satin Bowerbird	P		1	Bionet
	Pycononotidae	*Pycnonotus jocosus*	*	Red-whiskered Bulbul			1	AMBS
	Rallidae	*Gallinula tenebrosa*		Dusky Moorhen	P		2	Bionet
	Rhipiduridae	*Rhipidura leucophrys*		Willie Wagtail	P		12	Bionet
	Spheniscidae	*Eudyptula minor*		Little Penguin	P		10	Bionet
	Strigidae	*Ninox strenua*		Powerful Owl	V,P,3		2	Bionet
	Sturnidae	*Sturnus tristis*	*	Common Myna			22	Bionet
		Sturnus vulgaris	*	Common Starling			9	Bionet
	Sulidae	*Morus capensis*		Cape Gannet	P		3	Bionet
		Morus serrator		Australasian Gannet	P		1	Bionet
	Threskiornithidae	*Threskiornis molucca*		Australian White Ibis	P		21	Bionet
	Timaliidae	*Zosterops lateralis*		Silvereye	P		8	Bionet
	Turdidae	*Turdus merula*	*	Eurasian Blackbird			1	Bionet
	Tytonidae	*Tyto novaehollandiae*		Masked Owl	V,P,3		1	Bionet
Mammalia	Canidae	*Canis lupus familiaris*	*	Dog			2	Bionet
		Vulpes vulpes	*	Fox			8	Bionet
	Cervidae	*Cervus sp.*	*	Unidentified Deer			1	Bionet
	Delphinidae	*Delphinus delphis*		Common Dolphin	P		1	Bionet
	Felidae	*Felis catus*	*	Cat			4	Bionet
	Leporidae	*Oryctolagus cuniculus*	*	Rabbit			2	Bionet

Class	Family	Scientific Name	Exotic	Common Name	BC Act Status	EPBC Act Status	Records	Source
	Macropodidae	*Macropus giganteus*		Eastern Grey Kangaroo	P		1	Bionet
		Wallabia bicolor		Swamp Wallaby	P		1	Bionet
	Molossidae	*Mormopterus sp.*		Eastern Freetail Bat	P		2	AMBS
	Muridae	*Mus musculus*	*	House Mouse			1	Bionet
		Rattus fuscipes		Bush Rat	P		2	Bionet
		Rattus norvegicus	*	Brown Rat			10	Bionet
		Rattus rattus	*	Black Rat			5	Bionet
	Otariidae	*Arctocephalus sp.*		Unidentified Fur-seal	P		2	Bionet
		Seal sp.		Unidentified Seal	P		11	Bionet
	Phalangeridae	*Trichosurus vulpecula*		Common Brushtail Possum	P		279	Bionet
	Pseudocheiridae	*Pseudocheirus peregrinus*		Common Ringtail Possum	P		366	Bionet
	Pteropodidae	*Pteropus alecto*		Black Flying-fox	P		1	Bionet
		Pteropus poliocephalus		Grey-headed Flying-fox	V,P	V	79	Bionet
		Pteropus sp.		Flying-fox	P		39	Bionet
	Vespertilionidae	*Chalinolobus gouldii*		Gould's Wattled Bat	P		5	Bionet
Reptilia	Agamidae	*Intellagama lesueurii*		Eastern Water Dragon	P		3	Bionet
		Pogona barbata		Bearded Dragon	P		3	Bionet
	Chelidae	*Chelodina longicollis*		Eastern Snake-necked Turtle	P		7	Bionet
	Cheloniidae	*Caretta caretta*		Loggerhead Turtle	E1,P	E	4	Bionet
		Cheloniidae sp.		unidentified sea turtle	P		3	Bionet
	Colubridae	*Dendrelaphis punctulatus*		Common Tree Snake	P		1	Bionet
	Diplodactylidae	*Oedura lesueurii*		Lesueur's Velvet Gecko	P		1	Bionet
	Elapidae	*Cacophis squamulosus*		Golden-crowned Snake	P		1	Bionet
		Pelamis platurus		Yellow-bellied Seasnake	P		5	Bionet
		Pseudechis porphyriacus		Red-bellied Black Snake	P		4	Bionet
		Pseudonaja textilis		Eastern Brown Snake	P		2	Bionet

Class	Family	Scientific Name	Exotic	Common Name	BC Act Status	EPBC Act Status	Records	Source
	Gekkonidae	*Amalosia lesueurii*		Lesueur's Velvet Gecko	P		1	Bionet
		Phyllurus platurus		Broad-tailed Gecko	P		2	Bionet
	Scincidae	*Cryptoblepharus virgatus*		Cream-striped Shinning-skink	P		7	AMBS
		Eulamprus quoyii		Eastern Water-skink	P		7	Bionet
		Lampropholis delicata		Dark-flecked Garden Sunskink	P		7	Bionet
		Lampropholis guichenoti		Pale-flecked Garden Sunskink	P		3	Bionet
		Lampropholis sp.		unidentified grass skink	P		1	Bionet
		Saiphos equalis		Three-toed Skink	P		6	Bionet
		Saproscinus spectabilis		Pale-lipped Shadeskink	P		6	AMBS
		Tiliqua rugosa		Shingle-back	P		1	Bionet
		Tiliqua scincoides		Eastern Blue-tongue	P		27	Bionet
	Varanidae	*Varanus varius*		Lace Monitor	P		1	Bionet

* – Exotic

BC Act Status – E1 – Endangered, V – Vulnerable, P – Projected, 3 – Category 3 Protected Species

EPBC Act Status – E – Endangered, C – Migratory (Camba), J – Migratory (Jamba), K – Migratory (Kamba), V - Vulnerable

APPENDIX F – REVEGETATION SPECIES LIST

The following revegetation list includes recommended planting species for both buffer and remnant vegetation. The remnant planting species recommendations for infill planting are included in the two communities under "Remnant Vegetation Community", whilst the recommended species for buffer or connectivity planting are listed under each site. Please note that not all species are expected to be used in buffers or remnant vegetation. A broad list of suitable species options has been provided to allow for some flexibility in species choice and as some species may not always be available to source. Species have not been recommended for planting in buffers of sites that already contain that species in the remnant vegetation. The "x" indicates the species is recommended for planting at this site or remnant vegetation community.

			Remnant Vegetation Community		Site													
Family	**Scientific Name**	**Common Name**	Coastal Headland Banksia Heath	Coastal Cliff-top Marsh	North Clifftop Remnants	Diamond Bay Reserve	Eastern Reserve	Caffyn Park	Raleigh, Rodney & Weonga Reserves	Loombah Rd Cliffs	Hugh Bamford Reserve	Bondi Golf Course & Williams Park	South Clifftop Remnants	Tamarama Marine Drive	Calga Reserve & Bronte Cutting	Waverley Cemetery Cliffs	York Road Bushland
Aizoaceae	*Carpobrotus glaucescens*	Pigface		x	x				x				x		x		
	Tetragonia tetragonioides	New Zealand Spinach		x	x		x		x			X			x		
Apiaceae	*Actinotus helianthi*	Flannel Flower	x		x	x	x		x		x	X	x		x	x	
	Centella asiatica	Indian Pennywort						x			x						
	Platysace lanceolata	Slender Rice Flower	x	x	x	x	x	x	x			x	x		x	x	x
	Xanthosia pilosa	Woolly Xanthosia	x		x		x	x			x		x			x	
Convolvulaceae	*Dichondra repens*	Kidney Weed		x	x	x	x		x		x	x	x		x	x	
Cyperaceae	*Baumea rubiginosa*			x	x		x		x			x	x		x	x	
	Ficinia nodosa	Knobby Club-rush	x	x	x	x	x		x	x	x	x	x	x	x	x	
	Isolepis cernua	Nodding Club-rush		x	x		x		x			x	x		x	x	
	Machaerina juncea	Bare Twig-rush	x	x	x						x	x	x		x		
	Schoenus maschalinus			x	x		x		x			x	x		x	x	
Ericaceae	*Epacris longiflora*	Fuchsia Heath	x		x		x	x			x	x	x	x	x	x	x
	Leucopogon ericoides	Pink Beard-heath	x		x	x	x	x	x		x	x	x		x	x	
	Leucopogon juniperinus	Prickly Beard-heath						x		x	x			x			
	Leucopogon microphyllus		x		x	x	x		x		x	x	x		x	x	X
	Monotoca elliptica	Tree Broom-heath	x	x	x	x	x		x	x					x	x	

			Remnant Vegetation Community		Site													
Family	**Scientific Name**	**Common Name**	Coastal Headland Banksia Heath	Coastal Cliff-top Marsh	North Clifftop Remnants	Diamond Bay Reserve	Eastern Reserve	Caffyn Park	Raleigh, Rodney & Weonga Reserves	Loombah Rd Cliffs	Hugh Bamford Reserve	Bondi Golf Course & Williams Park	South Clifftop Remnants	Tamarama Marine Drive	Calga Reserve & Bronte Cutting	Waverley Cemetery Cliffs	York Road Bushland
Euphorbiaceae	*Phyllanthus hirtellus*							x		x	x						x
Fabaceae (Faboideae)	*Bossiaea heterophylla*	Variable Bossiaea	x		x	x			x		x	x	x		x	x	
	Dillwynia glaberrima		x		x	x	x		x	x	x	x	x		x	x	X
	Dillwynia retorta		x		x	x	x	x	x	x	x		x	x	x	x	
Fabaceae (Mimosoideae)	*Acacia longifolia*	Coastal Wattle	x	x	x				x					x		x	
	Acacia suaveolens	Sweet Wattle	x		x			x		x		x	x	x		x	
	Acacia ulicifolia	Prickly Moses	x		x	x	x	x	x	x	x	x	x	x	x	x	
Goodeniaceae	*Dampiera stricta*		x		x	x	x		x	x	x	x	x		x	x	
Haloragaceae	*Gonocarpus teucrioides*	Raspwort	x		x	x	x	x	x			x	x	x	x	x	x
Juncaceae	*Juncus kraussii*	Sea Rush		x			x		x			x			x	x	
	Juncus pallidus			x			x		x			x			x	x	
	Juncus usitatus	Common Rush		x			x		x			x			x	x	
Lamiaceae	*Westringia fruticosa*	Coastal Rosemary	x	x				x		x							x
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	x		x		x	x					x				
Myrtaceae	*Baeckea imbricata*		x	x						x			x				x
	Callistemon citrinus	Crimson Bottlebrush	x			x	x	x	x	x		x					x
	Callistemon linearis		x			x	x	x	x	x		x					x
	Darwinia fascicularis		x		x	x	x		x		X	x	x		x	x	
	Kunzea ambigua	Tick Bush	x			x	x		x		x	x		x		x	x
	Leptospermum polygalifolium	Yellow Tea-tree	x			x	x	x	x		x	x				x	x
	Leptospermum squarrosum		x			x	x		x	x	x	x		x		x	
	Melaleuca armillaris subsp. armillaris	Bracelet Honey-myrtle	x					x		x				x			

			Remnant Vegetation Community		Site													
Family	**Scientific Name**	**Common Name**	Coastal Headland Banksia Heath	Coastal Cliff-top Marsh	North Clifftop Remnants	Diamond Bay Reserve	Eastern Reserve	Caffyn Park	Raleigh, Rodney & Weonga Reserves	Loombah Rd Cliffs	Hugh Bamford Reserve	Bondi Golf Course & Williams Park	South Clifftop Remnants	Tamarama Marine Drive	Calga Reserve & Bronte Cutting	Waverley Cemetery Cliffs	York Road Bushland
	Melaleuca nodosa		x		x			x		x			x				
Phormiaceae	*Dianella caerulea*	Blue Flax-lily			x	x		x					x		x	x	
	Dianella congesta		x		x		x										x
	Dianella revoluta	Paroo Lily								x				x			
Poaceae	*Rytidosperma setaceum*				x		x		x			x	x		x	x	x
	Austrostipa mollis	Soft Speargrass			x		x		x	x		x	x	x	x	x	
	Dichelachne crinita	Longhair Plumegrass		x	x	x	x		x	x		x	x	x	x	x	x
	Paspalum vaginatum	Salt-water Couch		x			x		x			x					
	Spinifex sericeus	Hairy Spinifex		x			x		x			x			x	x	
	Sporobolus virginicus	Sand Couch		x		x	x		x			x			x		
	Themeda triandra			x	x		x		x			x	x		x	x	x
	Zoysia macrantha	Prickly Couch		x					x								
Proteaceae	*Banksia ericifolia*	Heath-leaved Banksia	x		x			x	x	x		x	x		x	x	x
	Banksia marginata	Silver Banksia	x		x	x	x	x	x	x		x	x		x	x	x
	Banksia serrata	Old-man Banksia	x			x	x	x	x	x		x		x			
	Grevillea speciosa	Red Spider Flower	x		x	x	x			x	x	x	x		x	x	x
	Hakea teretifolia	Needlebush	x			x			x		x	x					
Scrophulariaceae	*Veronica plebeia*	Trailing Speedwell						x		x				x			x
Sterculiaceae	*Lasiopetalum ferrugineum*		x		x	x	x	x	x		x	x	x		x	x	
Thymelaeaceae	*Pimelea linifolia*	Slender Rice Flower	x	x	x	x	x			x		x	x	x	x	x	

APPENDIX G – DOMINANT PROBLEM NATIVE SPECIES BY SITE

The following table includes a list of dominant native flora species within remnant and buffer sites that may require management in the form of thinning or trimming to improve the species diversity of the remnant and the buffers.

		Site												
Scientific Name	**Common Name**	**North Clifftop Remnants**	**Diamond Bay Reserve**	**Eastern Reserve**	**Caffyn Park**	**Raleigh, Rodney and Weonga Reserves**	**Loombah Rd Cliffs**	**Hugh Bamford Reserve**	**Bondi Golf Course & Williams Park**	**South Clifftop Remnants**	**Tamarama Marine Drive**	**Calga Reserve and Bronte Cutting**	**Waverley Cemetery**	**York Road**
Acacia longifolia subsp. sophorae	Coastal Wattle							X		X				
Banksia integrifolia	Coast Banksia		X		X						X			
Commelina cyanea	Native Wandering Jew						X				X			
Glochidion ferdinandi	Cheese Tree						X							
Hibiscus tiliaceus	Cottonwood Hibiscus				X									
Homalanthus populifolius	Bleeding Heart						X							
Leptospermum laevigatum	Coast Teatree							X						
Wollastonia uniflora	Sea Daisy	X	X			X		X		X		X	X	
Microlaena stipoides	Weeping Grass						X							
Pittosporum undulatum	Sweet Pittosporum						X							
Stephania japonica	Snake vine						X	X						

APPENDIX H – BUSHLAND REMNANT EXTENT AND CONDITION MAPPING 2020

1	Clifftops North - Clarke and Jensen Reserves	16	Willams Park, Bondi Golf Course (North)
2	Clifftops North - Kimberley St and Douglas Pde	17	Willams Park, Bondi Golf Course (South)
3	Clifftops North - Tower St and MacDonald St	18	Clifftops South - South Bondi
4	Clifftops North - Bay St and Sam Fiszman Park	19	Clifftops South - Hunter Park and Wilga St
5	Diamond Bay	20	Clifftops South - Marks Park
6	Eastern Reserve (North)	21	Clifftops South - Gaerloch Reserve
7	Eastern Reserve (Central)	22	Tamarama Remnant
8	Eastern Reserve (South)	23	Clifftops South – Tamarama Beach and Cliffs
9	Caffyn Park	24	Clifftops South – Tamarama to Bronte
10	Weonga Reserve	25	Bronte Pool and Bronte Cutting
11	Rodney Reserve	26	Calga Reserve
12	Raleigh Reserve (North)	27	Waverley Cemetery Boardwalk (North)
13	Raleigh Reserve (South)	28	Waverley Cemetery Boardwalk (South)
14	Loombah Cliffs	29	York Road ESBS
15	Hugh Bamford Reserve	30	Queens Park

WAVERLEY COUNCIL

Bushland Remnant Condition 2020

1. Clifftops North - Clarke and Jensen Reserves

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

Remnant Sector codes can be found by accessing Waverley's GIS at maps.waverley.nsw.gov.au

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Bushland Remnant Condition 2020

2. Clifftops North – Kimberley St and Douglas Pde

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Bushland Remnant Condition 2020

3. Clifftops North – Tower St and MacDonald St

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Created by Waverley Council Urban Ecology Team December 2021

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Bushland Remnant Condition 2020

4. Clifftops North – Bay St and Sam Fiszman Park

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Bay St

N

Sam Fiszman Park

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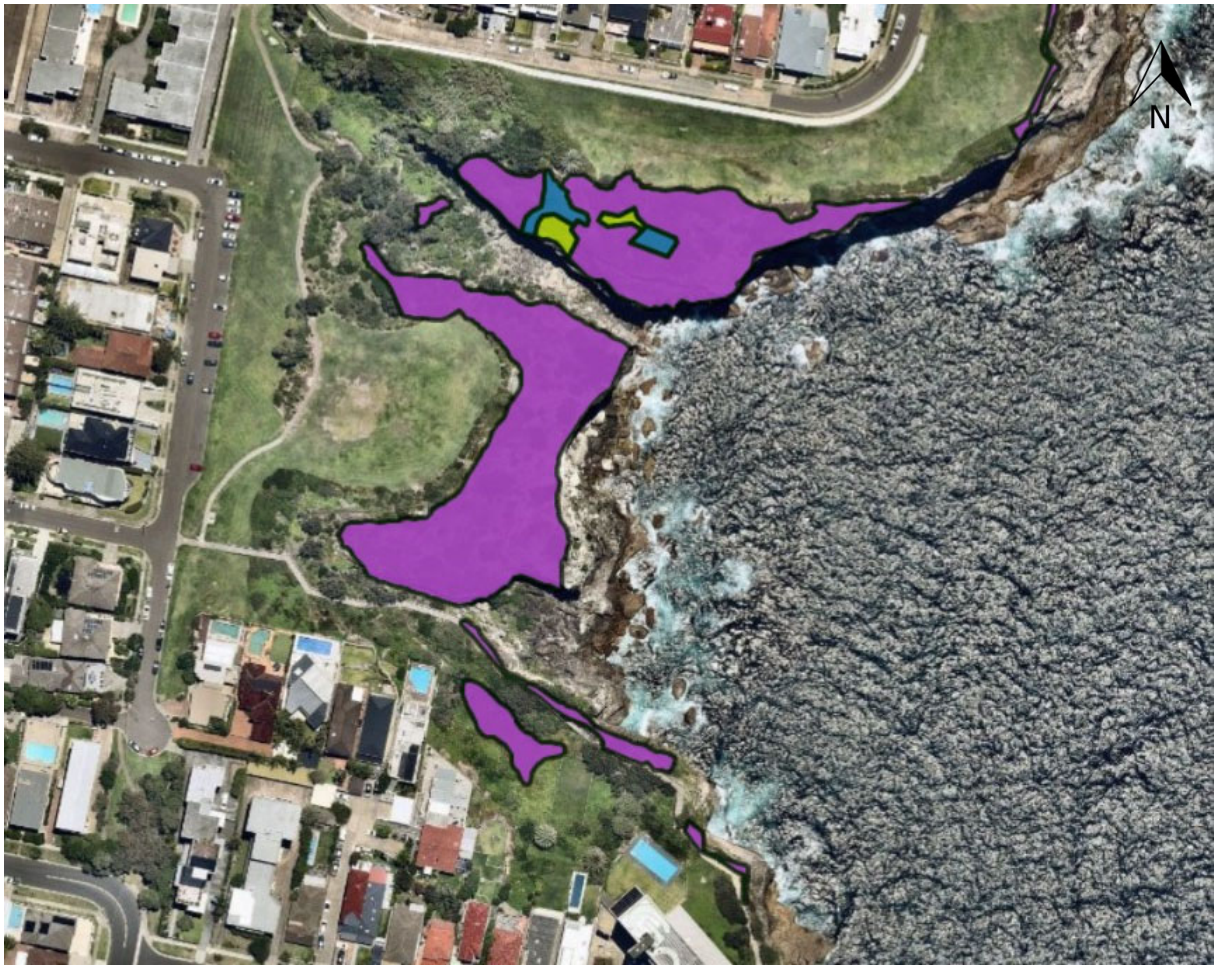
Bushland Remnant Condition 2020

5. Diamond Bay



Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Bushland Remnant Condition 2020

6. Eastern Reserve (North)

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Bushland Remnant Condition 2020

7. Eastern Reserve (Central)

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Bushland Remnant Condition 2020

8. Eastern Reserve (South)

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Bushland Remnant Condition 2020

9. Caffyn Park

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Bushland Remnant Condition 2020

10. Weonga Reserve

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Bushland Remnant Condition 2020

11. Rodney Reserve

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

Remnant Sector codes can be found by accessing Waverley's GIS at maps.waverley.nsw.gov.au

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Bushland Remnant Condition 2020

12. Raleigh Reserve (North)

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

Remnant Sector codes can be found by accessing Waverley's GIS at maps.waverley.nsw.gov.au

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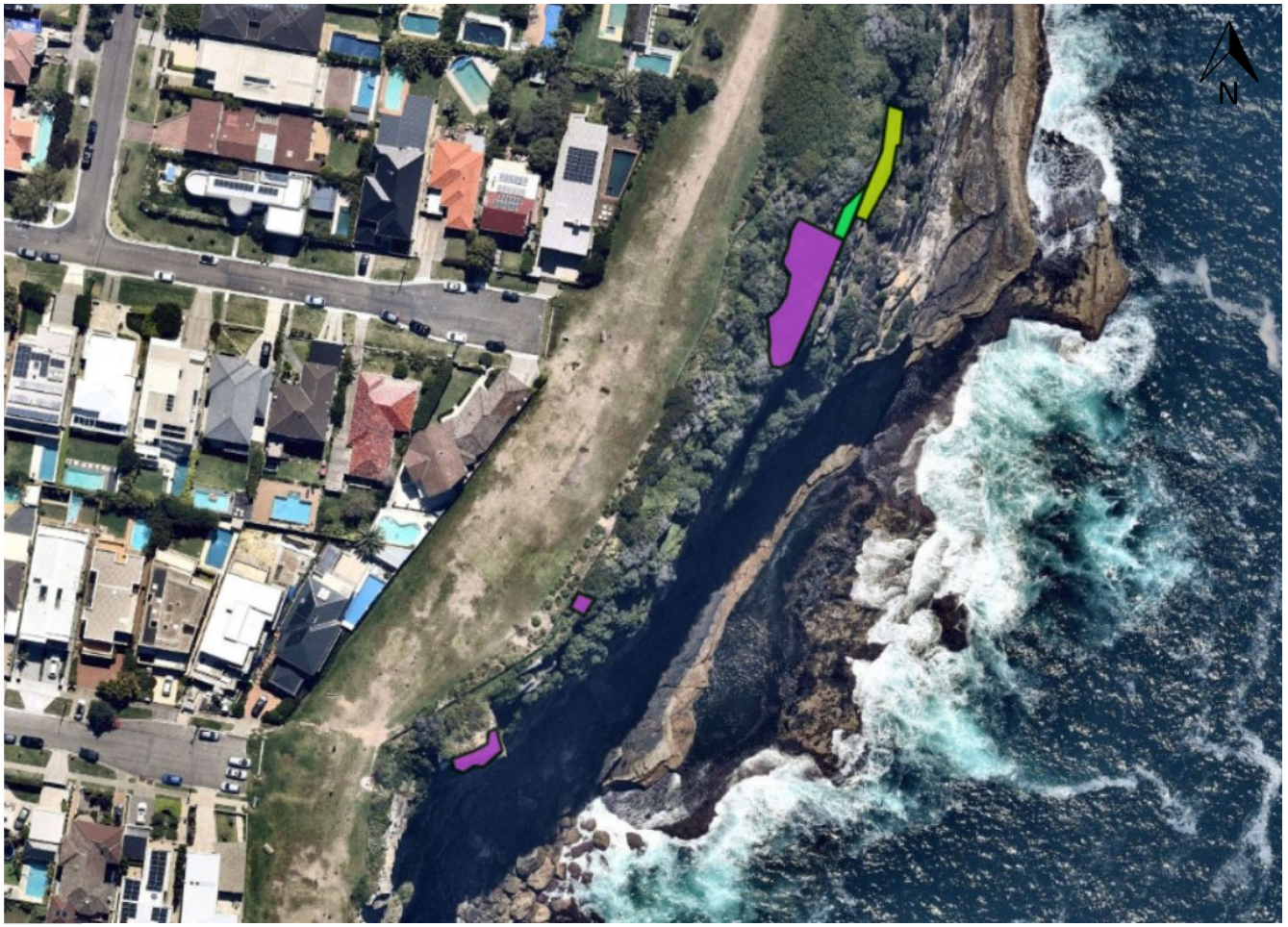

WAVERLEY COUNCIL

Bushland Remnant Condition 2020

13. Raleigh Reserve (South)

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

Remnant Sector codes can be found by accessing Waverley's GIS at maps.waverley.nsw.gov.au

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Bushland Remnant Condition 2020

14. Loombah Cliffs

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

Remnant Sector codes can be found by accessing Waverley's GIS at maps.waverley.nsw.gov.au

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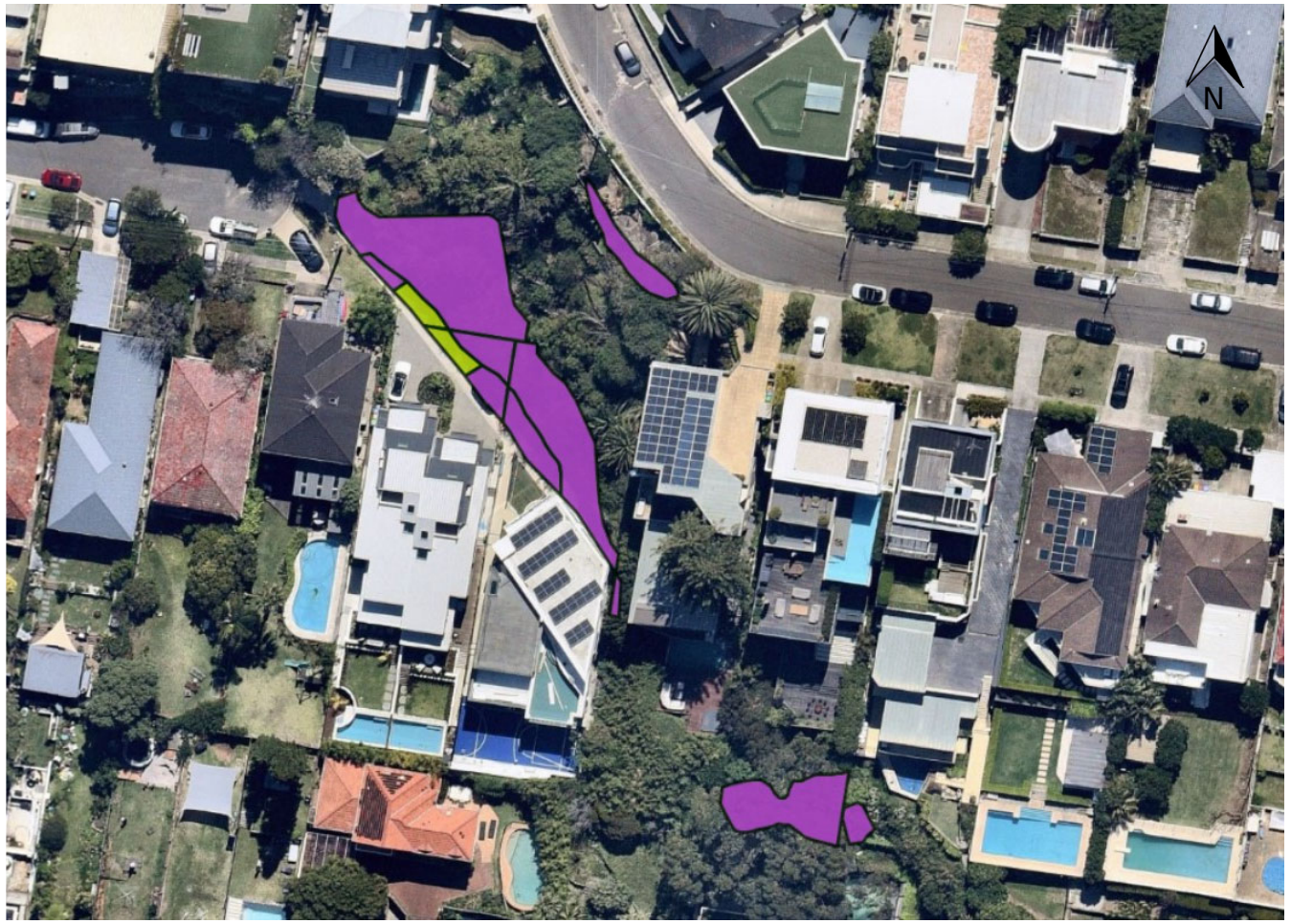

WAVERLEY COUNCIL

Bushland Remnant Condition 2020

15. Hugh Bamford Reserve

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

Remnant Sector codes can be found by accessing Waverley's GIS at maps.waverley.nsw.gov.au

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WAVERLEY COUNCIL

Bushland Remnant Condition 2020

16. Williams Park, Bondi Golf Course (North)

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

Remnant Sector codes can be found by accessing Waverley's GIS at maps.waverley.nsw.gov.au

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Bushland Remnant Condition 2020

17. Williams Park. Bondi Golf Course (South)

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

Remnant Sector codes can be found by accessing Waverley's GIS at maps.waverley.nsw.gov.au

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Bushland Remnant Condition 2020

18. Clifftops South – South Bondi

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Bushland Remnant Condition 2020

19. Clifftops South – Hunter Park and Wilga St

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

Remnant Sector codes can be found by accessing Waverley's GIS at maps.waverley.nsw.gov.au

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Bushland Remnant Condition 2020

20. Clifftops South – Marks Park

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Created by Waverley Council Urban Ecology Team December 2021

WAVERLEY COUNCIL

Bushland Remnant Condition 2020

21. Clifftops South – Gaerloch Reserve

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

Remnant Sector codes can be found by accessing Waverley's GIS at maps.waverley.nsw.gov.au

The information on this map is not a legal survey and is for graphical purposes only. While every effort has been made to ensure that these data are accurate and reliable, Waverley Council cannot guarantee the accuracy of the information contained on this map.

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Bushland Remnant Condition 2020

22. Tamarama Remnant

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Bushland Remnant Condition 2020

23. Clifftops South - Tamarama Beach and Cliffs

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Bushland Remnant Condition 2020

24. Clifftops South - Tamarama to Bronte

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Bushland Remnant Condition 2020

25. Bronte Pool and Bronte Cutting

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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Bushland Remnant Condition 2020

26. Calga Reserve

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

Remnant Sector codes can be found by accessing Waverley's GIS at maps.waverley.nsw.gov.au

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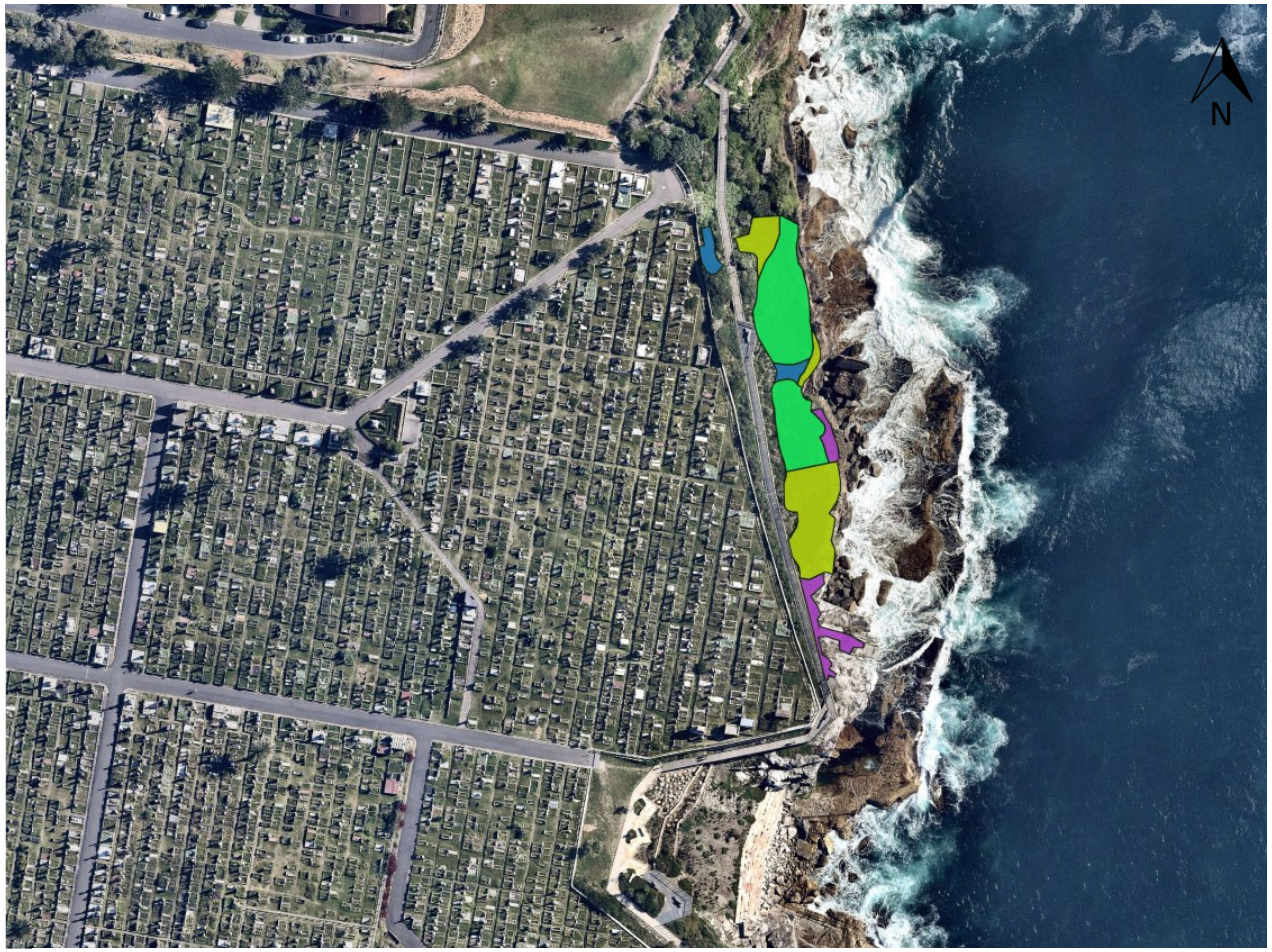
WAVERLEY COUNCIL

Bushland Remnant Condition 2020

27. Waverley Cemetery Boardwalk (North)

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good



Remnant Sector codes can be found by accessing Waverley's GIS at maps.waverley.nsw.gov.au

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WAVERLEY COUNCIL

Bushland Remnant Condition 2020

28. Waverley Cemetery Boardwalk (South)

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

Remnant Sector codes can be found by accessing Waverley's GIS at maps.waverley.nsw.gov.au

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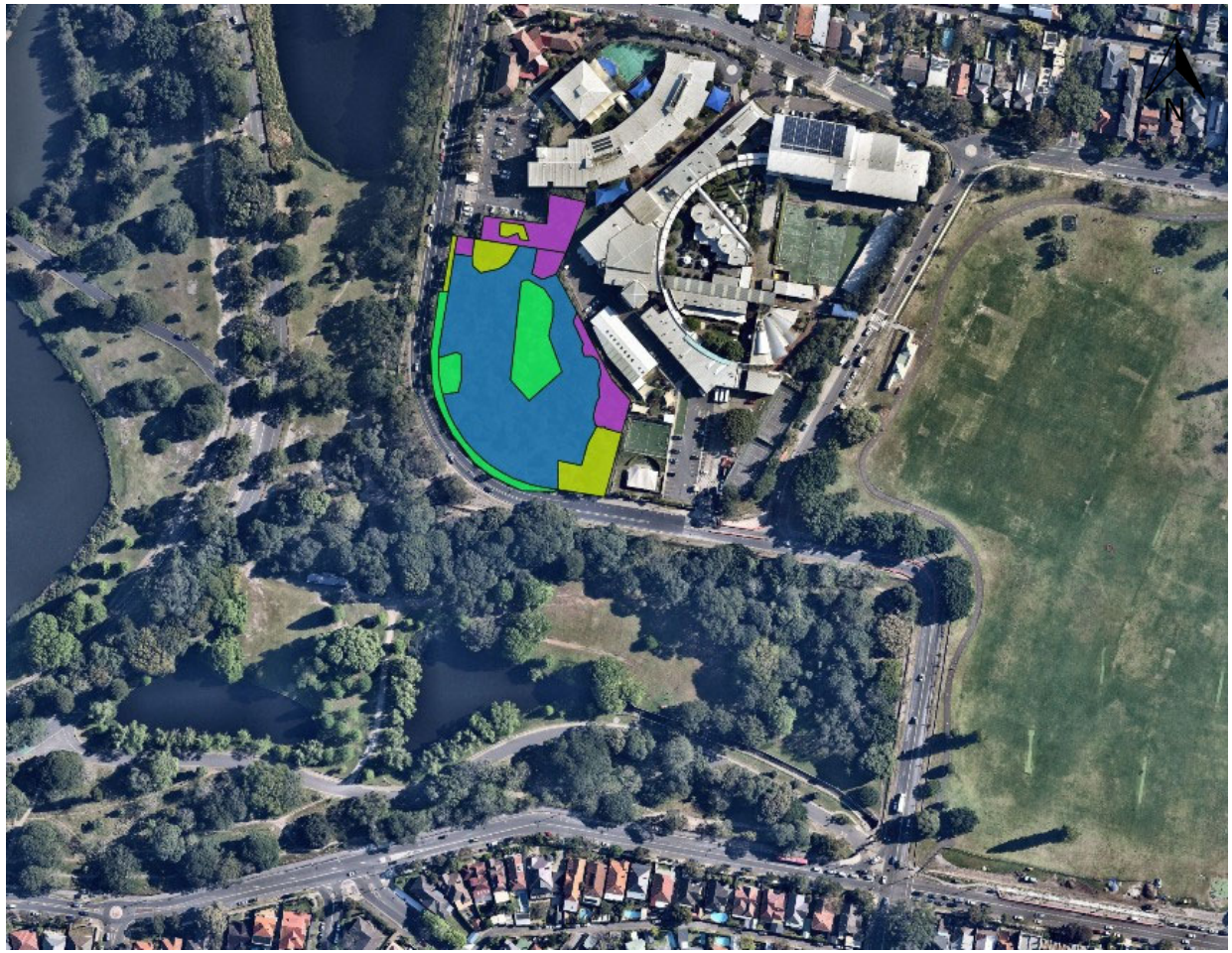
Bushland Remnant Condition 2020

29. York Road ESBS

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good



Remnant Sector codes can be found by accessing Waverley's GIS at maps.waverley.nsw.gov.au

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Bushland Remnant Condition 2020

30. Queens Park

Remnant Condition Code

- Very Poor
- Poor
- Fair
- Good

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