Park Improvement and Habitat Linkage Plan

Bayside City Council

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Template 2.8.1

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1. Introduction

Bayside City Council (Council) has funded a new project in 2021/22 to develop and implement a Park Improvement and Habitat Linkage Plan (the Plan).

This project will help deliver two actions from the Bayside Biodiversity Action Plan (BAP) 2018-2027:

- BAP Action 7: Identify opportunities for the establishment of habitat corridors and/or islands to link important conservation areas.
- BAP Action 18: Undertake supplementary plantings and habitat augmentation works to improve wildlife corridors on public land (i.e. parks, areas of foreshore, roadside reserves, libraries).

The objective of the Plan is to assist in increasing the diversity of indigenous and native plantings in Council-owned open space outside the conservation reserve system, and strengthen the connections between natural areas, which in turn will create additional habitat for native fauna. A key outcome sought from this plan is to identify where vegetation planting can be implemented or improved to link areas of open space and provide habitat corridors and to prioritise areas for immediate planting on Council's land.

Eco Logical Australia Pty Ltd (ELA) has been engaged by Council to develop the Plan, with the following objectives:

- Complete a landcover classification to identify habitat across the municipality, and potential barriers which may affect the movement of species between habitats.
- Least-cost spatial modelling to map linkages between areas of core habitat, representing the extent to which habitat are connected or not.
- Identification of priority locations for on-ground plantings to improve habitat connectivity.
- Provide guidance on the approach and a species composition of on-ground plantings based on land use context.

A detailed project method is included in Appendix A.

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2. Project background

2.1. Strategic context

This Plan has been developed within a matrix of related local, regional, state and national plans. Importantly, the Plan shares the two foundation principles of Protecting Victoria's Environment – Biodiversity 2037 plan through cost efficiency and complementarity. Cost efficiency is important to provide maximum returns to Bayside community and the environmental outcomes sought. Complementarity is important to provide benefits to as many species as possible and support as many of the local ecosystem services as possible for Bayside.

In reviewing the context and understanding the key drivers and values within Bayside, a range of plans and previously prepared reports have been reviewed and considered (Table 1). Where relevant this information has been used to inform the connectivity analysis, identification of priority habitat and linkages and develop the planting specifications.

The Bayside Habitat and Linkage Improvement Plan fits within Council's Better Place Strategic Planning Framework and provides detailed information that supports Bayside Biodiversity Action Plan 2018-2027 and the new Urban Forest Strategy 2021. This Plan relates to the Bayside Council and Community aspirations to protect, retain and enhance Bayside's habitat.

Table 1. Strategic context

Scale	Plan
Council	Bayside Biodiversity Action Plan June 2018-2027 (Bayside City Council 2018)
	Urban Forest Strategy 2021
	Bayside Street and Park Tree Selection Guide 2016
	Bayside Climate Emergency Action Plan 2020 – 2025
	Bayside Native Vegetation Works Program – Stage 1 (Ecology Australia 2008)
	Bayside Native Vegetation Works Program - Stage 2 (Ecology Australia 2013)
	Bayside Fauna Survey (Practical Ecology 2012)
	Burning regime advice for Bayside City Council's inland reserves (Ecology Australia 2015)
	Plant Bayside (Bayside City Council 2015)
	Grey Headed Flying Fox Food Species List (ARCUE 2012)
	Bushland Strategy – June 2002 (Bayside City Council 2002)
	Bayside's Flora and Fauna – a compilation of surveys (Pavey 1996)
Region	Melbourne East 2020 Regional Plan
	Melbourne Water undertook habitat corridor and fauna movement resistance modelling work for the South East region, which includes the Bayside municipality (O'Malley et al. 2012)
State	Protecting Victoria's Environment – Biodiversity 2037
National	Strategy for Nature 2019-2030
	Australia's Biodiversity Conservation Strategy 2010-2030 (Natural Resource Management Ministerial Council 2010)

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2.2. Bayside's Biodiversity

The biodiversity of Bayside is present in parks, reserves, and open spaces and across the municipality within an urban context. These are described in detail in the Bayside Biodiversity Action Plan 2018-2027, the Bayside Fauna Survey 2012, and the Bayside Native Vegetation Plan (Bayside City Council 2018, Practical Ecology 2012, Ecology Australia 2008). There is an estimated 18.56% vegetation cover across Bayside (Bayside 2022). Native species co-exist with many introduced species in open spaces and pockets of remnants, interspersed with mixed use streetscapes and wetlands and waterbodies. Previous analysis identified 223 fauna species as having been recorded in Bayside (199 native, 24 introduced species) with the majority of records for bird sightings, followed by mammals (Practical Ecology 2012). Eight ecological vegetation classes are mapped in Councils' reserves (Ecology Australia 2008).

'Open spaces in urban areas have a very important function for biodiversity as they can be some of the few remaining places where a variety of ecosystems are able to continue to exist. These areas provide a reminiscent glimpse of the vegetation that would have covered a municipality prior to European settlement' (Bayside Biodiversity Action Plan 2018-2027). Bayside parks, reserves and open spaces are also used for foraging by species inhabiting and/or migrating across the municipality.

Bayside has 77.09 hectares of open space specifically managed for conservation, comprising 56.72 hectares along 17 kms of foreshore and 20.37 hectares in the eight inland reserves' (Table 2). Figure 1 displays the key reserves along with landcover mapped completed as part of this study. The Bayside Native Vegetation Works Program 2008 assessed 14 reserves and identified vegetation types, site condition, landscape value and habitat score. This information has informed the habitat connectivity model in conjunction with canopy height model and the landcover mapping.

Table 2. Bayside's conservation reserves

Foreshore reserves	Bushland reserves
• Beaumaris Foreshore – north • Black Rock – south • Brighton Dunes • Picnic Point • Red Bluff • Ricketts Point Hinterland (landside) and Foreshore • Sandringham Foreshore – south	• Balcombe Park • Bay Road Heathland Sanctuary • Cheltenham Park Flora and Fauna Reserve • Donald MacDonald Reserve • George Street Reserve • Gramatan Avenue Heathland Sanctuary • Long Hollow Heathland • Highett Grassy Woodland Reserve

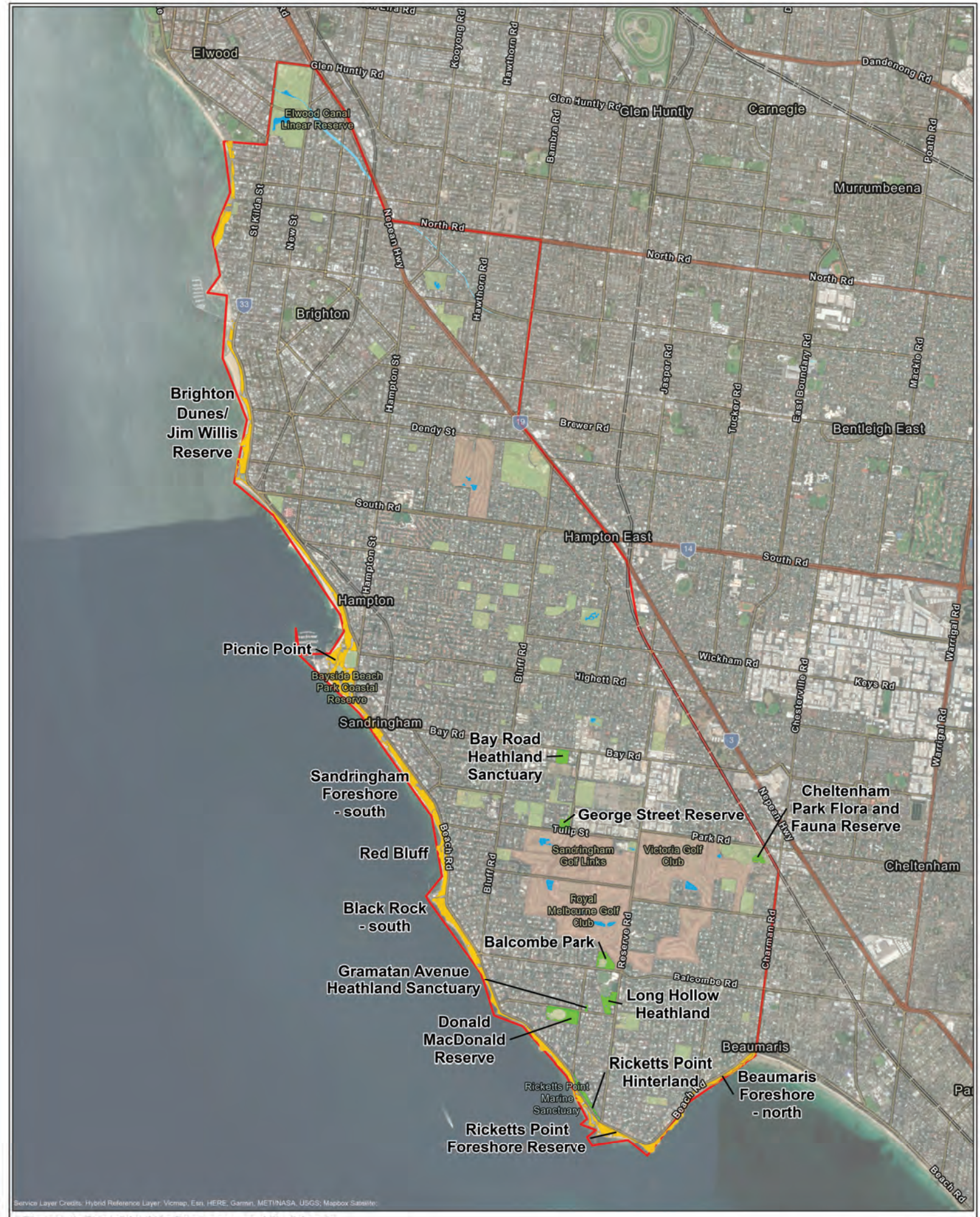

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Figure 1: Bayside City Reserves and Parklands

- Bayside LGA boundary
- **Priority reserves**
  - Heathlands
  - Foreshore reserve
- **Other reserves and parkland**
  - Other reserves and parkland
  - Golf courses
- Watercourse open channel
- Canal
- Waterbody

0 0.5 1 2
Kilometres

Datum/Projection: GDA2020 MGA Zone 55

21MEL19992-KR Date: 12/05/2022

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The Department of Environment, Land, Water and Planning (DELWP) has developed a Strategic Biodiversity Score model that highlights locations of importance for Victoria's biodiversity relative to other locations across the landscape. Within Bayside, several of the larger inland and foreshore conservation reserves have a Strategic Biodiversity Score of over 90% – indicating they are highly significant, with great biodiversity value. These areas include: Beaumaris Foreshore (97%), Brighton Dunes Foreshore (93%), Picnic Point Foreshore (83%-98%), Red Bluff Foreshore (91%), Ricketts Point Foreshore (96%), and Bay Road Heathland Sanctuary (100%). To maintain these high Strategic Biodiversity Scores, appropriate management of biodiversity values is required now and into the future. Necessary management actions include weed control, restricting dogs from high biodiversity areas such as heathland reserves and Ricketts Point foreshore and improving buffers and wildlife corridors across the municipality.

The Bayside municipality is located within the Sandbelt region of south-eastern Melbourne, which is part of the Brighton Coastal Plain geomorphological unit - a broad coastal plain or low plateau of sandy soil 30 to 40 m above sea level that extends from Brighton to Springvale. The vegetation of the foreshore was, and largely still is dominated by Coastal Headland Scrub, Coastal Dune Scrub, Coastal Dune Grassland, or Coast Banksia Woodland Ecological Vegetation Classes (EVCs). Without exception, the foreshore is the most defining feature of Bayside's character, which covers a total of 99 hectares (including public and private land) along the Port Phillip Bay coastline.

Inland from the coast, the land would have been dominated by Heathy Woodland, Sand Heathland, Damp Sands Herb-rich Woodland and Grassy Woodland EVCs prior to European settlement. These areas have largely been converted to residential land with only a small number of bushland remnants remaining to provide habitat for the only surviving heathland and woodland remnants in the municipality where they were once abundant.

Port Phillip Bay is relatively healthy, however water quality fluctuates with rainfall and the impact of polluted waterways or outlets that discharge into the Bay. Elster Creek is the only substantial waterway in Bayside and provides important habitat for the range of flora and fauna, despite being highly modified from its natural form, containing sections of concrete channel and underground pipe.

Bayside also has significant coastal cliffs in the Beaumaris area where many fossils dated to six million years ago have been found, including various molluscs and the bones of whales, sharks, rays, dolphins, birds and marsupials.

In addition to public open space, the private and public golf courses that enhance the character of Bayside also comprise areas of indigenous vegetation that provide habitat, seed collection banks, educational resources and wildlife corridors through the municipality. Tree-lined streets and established gardens (some of which are native) also contribute to the landscape character and biodiversity values of Bayside. The Bayside Urban Forest Strategy 2022 identifies 60,000 trees planted or managed by Council. Biennial monitoring of trees indicate that Bayside comprises approximately 45,000 native and non-native street trees, plus approximately 15,000 trees in parks and reserves.'

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2.3. Habitat connectivity

The urbanisation of our cities inevitably leads to habitat loss and fragmentation, reducing connectivity of animal and plant populations and impairing essential ecological processes such as pollination, dispersal, recolonisation, and gene flow (Fischer and Lindenmayer 2007, Saunders *et al*. 1991). The result is that biodiversity is often limited to small, isolated habitat elements within urban settings, which may be unable to support many native species.

Despite the challenges, many modified landscapes contain critical populations of threatened species or communities. The restoration, preservation, and enhancement of biodiversity within modified landscapes therefore becomes increasingly important, and in turn poses a significant challenge to conservation management (Seto et al. 2012).

One method of mitigating the threat to remaining populations is through the protection and restoration of ecological connectivity - enabling species to move through the landscape and utilise as many of the remaining habitat elements as possible (Noss 1987, Doerr et al 2010, Mackey and Hugh 2010). These corridors are recognised as critical for addressing the impacts of habitat fragmentation and more intensive land use (Bierwagen 2007, Minor and Urban 2008). Identifying, protecting and improving wildlife corridors is likewise critical to the preservation of local and regional biodiversity.

> *Connectivity is not just the physical presence of connected vegetation, it is the absence of barriers that enable species to travel (Clarke et al 2010)*

2.3.1. Modelling connectivity

The ecological connectivity network concept is built upon habitat patches and linkages that follow least-cost paths (Lechner et al. 2015, 2017). Patches are areas of core habitat of sufficient size and structure to support faunal populations. Linkages are the least-cost paths within the landscape that species can use to disperse between habitat patches, effectively connecting them in a fragmented landscape. The linkage represents the shortest, least-hostile path between two patches utilising stepping-stones (areas of refuge) that a species may use to facilitate movement. These stepping-stones may be patches of vegetation which are too small to be considered a habitat patch (e.g. a street tree) or other non-habitat features which could be used as short-term refuge (e.g. garden beds).

In order to accurately represent the difficulty, or 'cost', of travelling across different land cover types, 'resistance' is incorporated into the model. For many species, parklands are considered to have no resistance, however, as it does not act as a stepping-stone a species will only move so far across this land type before it decides this risk is too high and 'turns back' – define as the maximum 'inter-patch' distance as species will travel. As the land cover changes so too does the risk or cost of the movement, which in turn reduces the distance a species will travel to reach another area of habitat. Urban landscapes, for example, may not prevent dispersal completely, however they may make movement more difficult, resulting in lower dispersal distances. Where the resistance is so great the species cannot move through the landscape, such as across a busy highway or watercourse, it is considered to be impenetrable and is referred to as a 'barrier'.

For the purpose of this study, a detailed landcover classification has been completed to identify various land uses which may act as habitat, stepping-stones or resistance to movement (Table 3; **Error! Reference source not found.**).

Core habitat patches were established by aggregating unmanaged vegetation within 30 metres and splitting where roads or other features that may pose a barrier to movement. All remaining patches over 0.5ha were retained and identified as core habitat (Figure 3).

To model existing connectivity for mobile species capable of traversing urban landscape (e.g. small birds and arboreal mammals), an inter-patch distance of 1000 metres was used (Figure 3). Resistance values have been applied to the various landcover types to represent the difficult of traversing these features, with 0 representing no resistance, up to a maximum of 500 (representing 5 times the resistance). Unlimited least-cost paths were also modelled for comparison.

Table 3. Landcover classifications used in connectivity modelling for Bayside

Category	Land Cover Class	Habitat/stepping-stone	Resistance value
Infrastructure	Building Footprint	No	500
Transport (Roads)	Arterial – Highway	No	400
	Arterial – Other	No	300
	Non-Arterial Road	No	200
Transport (Rail)	Rail Corridor	No	200
Transport (Other)	Tracks/Footpaths	No	100
Water	Water – Watercourse open channel	No	100
	Water – Canal	No	100
	Water – Waterbody	No	100
	Water – Ocean	No	100
Vegetation Cover	High Vegetation (greater than 7m)	Yes	0
	Medium Vegetation (3 to 7m)	Yes	0
	Low vegetation (1 to 3m)	Yes	0
	Ground cover (less than 1m)	No	100
	Non-vegetated	No	200

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3. Habitat and linkage improvement plan

Ecological connectivity strengthens the overall function of Bayside's important biodiversity nodes as well as providing more green landscapes with associated social benefits, place character and visual amenity. Habitat links allow for movement of individuals and genes, supporting critical life cycle events and ecosystem functions (e.g. pollination, recruitment and effective habitat patch size). In urbanised landscapes such as Bayside, there are physical and functional constraints that mean improving connectivity is fine scale and within multipurpose green space.

The Bayside landscape is characterised as a 'relictual landscape' with discreet patches of habitat retention interspersed with fragmented patches and linear coastal reserves within an urban city. This project has identified and mapped potential habitat linkages between habitat patches and with the foreshore based on methods outlined in Appendix A.

The Plan is focused on extending and diversifying the native species planted within the identified linkages as part of overall urban biodiversity management. The Plan provides a strategic framework for systematically augmenting indigenous plantings in bushland reserves, parklands, streetscapes and wetlands, waterbodies and creek corridors.

The Plan applies the following management principles

- Habitat improvement is guided by the physical location, nature of existing habitat and local pressures at each location.
- Increasing overall native species richness at each location using local, endemic species to provide a diversity of structural, habitat niches – groundcovers, low shrubs, tall shrubs, small trees and taller trees.
- Diversity of species planted at each location is important to avoid excessive abundance or in-situ plant competition even with native species that can lead to poor ecological outcomes.
- Improving ground level habitat, midstorey habitat and arboreal habitat are complimentary in delivering balanced species composition and minimising pest species establishment eg feral birds and native insect population dynamics.
- Applying habitat and linkage improvement across a diversity of habitat types eg riparian, coastal dunes, open grasslands, closed shrublands, open woodlands with strengthen the overall ecological network across the municipality and result in greater resilience to change or acute pressures in one location.
- Community awareness and engagement in caring for shared, open spaces is encouraged.
- Plantings require active maintenance initially and will be designed to persist and thrive within a landscape with minimal maintenance in the long term.

This section provides the priorities for connectivity within Bayside and presents management specifications and planting guidance for on-ground works at these locations.

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3.1. Habitat linkages

The analysis provides an overview of existing or potential connectivity across the landscape for terrestrial species which may be able to persist and disburse in urban landscapes, but are often limited due to habitat fragmentation and barriers.

The highest cover of potential habitat was identified within the south of the municipality where the proximity of numerous golf courses, bushland and foreshore reserves and parks provide connectivity via street plantings and backyards (Figure 2; Management area 1). These linked habitats extended from Beaumaris Foreshore reserve at the southern edge of the city through to Bay Road.

A second large cluster of interconnected, inland habitat was identified in the centre of the City extending from Brighton Golf Course and Dendy Park through numerous small reserves and parks to Highett Road (Figure 2; Management area 2). Like the southern cluster, this location exhibited multiple linkage pathways through streets and private land.

Whilst the modelling indicated both the southern and central clusters were connected, it showed a potential pinch point likely to restrict movement to more mobile species (Figure 2; Management area 4). Habitat patches were limited in this location, with movement relying on traversing large distances across residential and commercial areas. Investment in this location represents the greatest opportunity to improve landscape-scale connectivity across the municipality.

Whilst the foreshore represents a relatively continuous stretch of land uninterrupted by built infrastructure, habitat was not contiguous along its length, with several locations identified as having long or absent linkages (Figure 2; Management area 3). In particular, land separating Brighton Beach, Picnic Point, Sandringham Foreshore/Black Rock (south) and Ricketts Point contained limited vegetation cover and habitat and is likely to restrict movement for lower mobile species (e.g. small mammals and birds, reptiles and insects). Connectivity ends north of Brighton Beach as development along the foreshore has resulted in a removal of almost all coastal vegetation.

The last two, small clusters of interconnected habitats are in the north of the City associated with Elsternwick Park (Figure 2; Management area 5) and Landcox Park (Figure 2; Management area 6). Both areas have limited natural habitats, relying on modified vegetation associated with several small parks and reserves. Linkages between these locations rely on vegetation along streets, Elster Creek and residential backyards. Given their limited structural diversity and lack of connectivity to other habitats within the City or adjoining areas, these are considered to be primarily of value to common, more mobile species only.

A detailed presentation of the habitat connectivity modelling showing core habitat patches, least-cost pathways and priority habitat and linkages location boundaries is provided in Appendix A.

3.2. Priority locations

Drawing on the outputs of the connectivity analysis and review of existing data, reports and plans, priority habitats and the associated fauna connectivity (or lack thereof) were identified for the purpose of planning and management actions, including native plantings scheduled for Autumn 2021. Locations for habitat and connectivity improvements within the Bayside landscape are shown in Figure 2.

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Both management areas and priority locations within each have been listed in order of importance in Table 5 (with the highest priority for on-ground works being '1' for habitat areas and 'a' for linkages). The table also provides a reference to the relevant works specifications that have been developed for different land use contexts and is discussed in more detail in Section 3.3. The total area and distance for modelled core habitat, and habitat and linkage areas is provided in Table 4.

Priority habitat locations are primarily associated with parks or reserves which currently support high-quality habitat values (i.e. bushland or foreshore reserves) or have the potential to provide core habitat with further investment through on-ground plantings and complimentary habitat structures. In some instances, these locations represent multiple parks or reserves in close proximity to each other.

In addition, priority habitats have also been identified within Golf Courses which support extensive open spaces and a diversity of vegetation types. Whilst much of this land is under private management, these areas represent a major opportunity for the improvement in habitat extent and function within the municipality.

The specific siting of plantings within priority habitat locations will require further on-ground review in consultation with relevant stakeholders and land managers. Guidance on the nature of on-ground works is provided in Section 3.3.

Locations of priority linkages identified across the municipality have been restricted to public land, with the exception of limited instances within privately owned golf-courses. These a primarily associated with public road reserves with the objective being to increase the functional diversity of vegetation within these areas to improve connectivity for broader range of species. In some instances, it may not be feasible to increase the density or extent of vegetation within a roadside, in which case an adjacent road reserve may need to be considered as an alternative location.

Table 4. Total area and distance for core habitat, and habitat and linkage improvement areas within Bayside

Area	Area (ha)	Length (km)
Core habitat	226	NA
Habitat improvement areas	318	NA
Linkage improvement areas	197	48.5

Figure 2: Habitat improvement locations

- Bayside LGA boundary
- Core habitat patches
- Habitat Improvement Areas
- Linkage Improvement Areas
- Management Areas

Priority Reserves
- Priority Reserves

Other reserves and parkland
- Other reserves and parkland
- Golf courses
- Watercourse/ Waterbody

0 0.5 1 2
Kilometres

Datum/Projection: GDA2020 MGA Zone 55

21MEL19992-KR Date: 12/05/2022

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Table 5. Bayside's habitat and linkage improvement priorities

Priority	Management area	Habitat improvement priorities	Linkage improvement priorities
1	Southern Golf Clubs, heathland reserves, and parks to south of Bay Road	1. George Street Reserve/Tjilajirrin Reserve/Sandringham Golfcourse (S1, S2, S3) 2. Cheltenham Park Flora and Fauna Reserve/ Cheltenham Park/Cheltenham Golf Course (S1, S2) 3. Balcombe Park Reserve/Balcombe Park (S1, S2, S3) 4. Long Hollow Heathland/Beaumaris Reserve (S1, S2, S3) 5. Bay Road Heathland Sanctuary/Merindah Park/Pobblebonk Park (S1, S2, S3) 6. Donald McDonald Reserve/Gramatan Ave Heathland Sanctuary (S1, S2) 7. Bayside City Council Gardens (S1, S2, S3) 8. Banksia Reserve (S2)	a. Sandringham Golfcourse/Victoria Golf Club/Royal Melbourne Golf Club/Cheltenham Golf Course (S2, S3, S4) b. Sandringham Golfcourse to Ricketts Point foreshore via Fern st/Eliza St and/or Tulip Street/Harold Street (S3) c. MacDonald Reserve to Foreshore via Fifth St and/or Surf Ave (S3) d. Beaumaris Reserve to Beaumaris Foreshore via Victor Street/Dalgetty Rd/Cloris Ave/Griffiths St/Gibbs St/Oak St/Cromb Ave/Tramway Parade/Ray St/Bodley St (S3)
2	Brighton Golf Course and Dendy Park and numerous small reserves and parks north of Highett Road	2. Brighton Golfcourse (S2, S4) 3. Dendy Park (S2) 4. R J Sillitoe Reserve/Wishart Reserve/W L Reserve (S2) 5. Moorabin West Reserve/A W Oliver Reserve/Basterfield Park (S2) 6. Boss James Reserve/A F Peterson Reserve (S2) 7. Thomas Street Reserve (S2)	a. Brighton Golf Course to Dendy Park via Dendy Street (S3) b. Dendy Park to W L Simpson Reserve via Letchworth Ave/ Arnold Rd/South Rd/Olive St/Smith St/Ludstone St/Bluff Rd/Chislehurst Rd/Bluff Rd (S3) c. W L Simpson Reserve to A F Peterson Reserve via Bluff Rd/Summit Avenue/Widdop Cres/O'Conner Cres/June St d. Brighton Golf Course to Thomas Street Reserve via South Road/Kingston Street/Ludstone St/Earlsfield Rd/Fewster Rd (S3)
3	Coastal reserves/foreshore	8. Ricketts Point foreshore (S1) 9. Picnic Point foreshore (S1) 10. Beaumaris foreshore (S1) 11. Black rock (south) foreshore (S1) 12. Sandringham foreshore (S1) 13. Brighton Beach foreshore (S1)	Relatively intact – improve connectivity and habitat extent along Brighton Beach Foreshore reserve. a. Black Rock (south) foreshore to Ricketts Point (S1) b. Sandringham foreshore to Picnic Point foreshore (S1) c. Black Rock (south) foreshore to Ricketts Point (S1) d. Brighton Beach foreshore to Picnic Point foreshore (S1)
4	A F Peterson Reserve to Bay Road Heathland Sanctuary landscape link	Not applicable	A F Peterson Reserve to Bay Road Heathland Sanctuary via Highett Road, Ashwood Avenue, Miller St, Marchant St, Lannsell Ave, Bay Road, Highland Ave, Ashwood Avenue Park, Advantage Road Park (S3, S2)

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Priority	Management area	Habitat improvement priorities	Linkage improvement priorities
5	Elsternwick Park and surrounds	14. Esternwick Park South (S2, S4) 15. Elster Canal path and adjoining land, including Cross Street Reserve and Lewis Reserve (S2) 16. Kamesburgh Gardens (S2)	a. Elster Canal to Kamesburgh Gardens via Brickwood Street (S3) b. Esternwick Park to Kamesburgh Gardens via Head Street/New Street (S3) c. Kamesburgh Gardens to Foreshore via North Road (S3)
6	Landcox Park and surrounds	17. Landcox Park (S2) 18. Hurlingham Park (S2) 19. Little Brighton Reserve (S2)	a. Landcox Park to Hurlingham Park via Sunnyside Avenue/Union Avenue/Francis Street (S3) b. Landcox Park to Little Brighton Reserve via Union Street and/or Elster Creek (S2, S3)

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3.3. Management specifications

The on-ground implementation of management priorities will be influenced by a range of factors, including land tenure and use, ownership arrangements, the nature and extent of vegetation and the target species requirements. This section provides management objectives for the land use types present within Bayside, with reference to key actions and example planting layouts. This should be read in conjunction with previous management guidance and recommendations provided in the Bayside Fauna Survey (Practical Ecology 2012), Bayside Native Vegetation Works Program – Stage 1 and 2 (Ecology Australia 2013) and Urban Forest Strategy (Bayside City Council 2021).

The objectives are designed to maximise benefits to a broad range of species across the municipality, recognising the needs of fauna guilds common in Bayside (Table 6).

Table 6. Habitat and dispersal requirements by faunal guild

Faunal guild	Needs	Example Bayside species
Invertebrates	Invertebrate species which rely on a diverse suite of plant species for foraging and refuge. For pollinating insects, flowering species critical that provide food resources throughout the year. Low to moderate dispersers within an urban context that can make use of a range of fine-scale habitats (e.g. backyard gardens).	Blue-banded bee Matchstick grasshopper Common Brown Butterfly
Reptiles and small ground mammals	Species which require complex ground cover, including graminoids and forbs, leaf litter, rocks and coarse woody debris, as well as small open spaces for basking or foraging. Low to moderate dispersers within urban landscapes which require complex structures to provide protection from predators and foraging resources.	Eastern blue-tongue lizard Eastern Three-lined Skink Garden Skink
Woodland birds	Species which rely on dense or complex mid-storey vegetation, of a scale suitable to support foraging and nesting resources. Low to moderate dispersers within urban landscapes reliant on dense vegetation with small gaps (50-100m) to use as stepping-stones.	Superb fairy wren White-browed Scrubwren Brown Thornbill
Amphibians	Species which are reliant on waterbodies of varying sizes and configuration for foraging and reproduction. Some species capable of occupying small habitats (such as rain-gardens). Require complex mixture of emergent, submerged, fringing and/or floating vegetation. Low to moderate dispersers requiring damp, complex habitats for refuge.	Spotted Marsh Frog Common Froglet
Tree-hollow dependant species	Includes a range of birds, bats and arboreal mammals which depend on tree hollows of varying sizes for nesting and refuge. High dispersal abilities in urban landscapes however often limited by availability of hollows and key food resources.	Red-rumped parrot Gould's wattled bat Common Brushtail Possum
Grey-headed flying fox	Highly mobile species in urban landscapes which maintain a few, limited camps across Greater Melbourne. Utilises habitats within Bayside for foraging, requiring a diversity of food species.	Grey-headed flying fox
Waterbirds	Species which require open water with complex, vegetated edges comprised of a mixture of emergent, submerged, fringing and/or floating vegetation with open or closed shrub and canopy layers surrounding. Highly mobile species which are limited by the availability of aquatic habitats.	Pacific Black Duck Little Black Cormorant White-faced Heron

S1: Conservation reserves

Conservation reserves play a key role in urban landscapes by providing quality habitat for flora and fauna (Plate 1). They can also provide insight into pre-European vegetation.

Habitat improvement objectives

- Expand on areas of remnant vegetation with plantings or managed recruitment to ensure gaps in vegetation are no greater than:
    - 20m for unmanaged groundcover.
    - 50m for shrub and tree canopy.
- Using the planting palette as a guide, ensure plantings include a mixture of species which provide a range of habitat resources (e.g. stringybarks vs. smooth bark, dense vs. open, species with different flowering times etc).
- Create contiguous, structurally complex habitats that provides a fine-scale mosaic of:
    - Open to dense tree canopy (5 – 20% cover)
    - Open to dense shrub-layer (5 – 30% cover), with mixture of tall (3-7m) and low (1-3m) strata.
    - Tall, dense ground covers of grasses, sedges, forbs or prostrate/small shrubs (>50% cover, >30cm height) interspersed with small open patches (1-2m^2) of bare ground, rocks, litter or logs.
- Identify suitable host trees for establishment of native mistletoes. Trees should be mature and where possible solitary to prevent browsing from Possums whilst plants are establishing. Using seed collected from local host-plants of the same species (based on existing data collected by Bayside City Council), seed onto host plants in accordance with practices recommended by Dr David Watson (Charles Sturt University).
- Maintain mixed-aged stands by ensuring adequate recruitment is occurring, and supplement with plantings when necessary.
- Retain and protect all hollow-bearing trees - where absent, create hollows or install artificial nesting structures. Where hollow-bearing native trees are removed as part of council arboricultural works, consider translocation and installation in reserves as standing dead stags or individual hollows installed in existing trees.
- Where absent, add leaf litter, rock cover and woody debris to reserves, particularly around edges of patches, of varying sizes and configurations. Where possible use logs, branches and fine woody debris salvaged from native trees removed as part of council arboricultural works.
- Avoid slashing or mowing of indigenous groundcover within reserves. Where slashing is required establish a fine-scale mosaic of slashed and un-slashed within the interface. See example in Plate 2.
- Undertake fencing, or install other barriers (e.g. large logs or dense woody debris), around native vegetation patches to restrict access and minimise disturbance to ground layers and vegetation Clearly define and limit access to established tracks and trails.
- Manage dogs, cats and pest animals such as Common Myna, as well as weeds, in accordance with previous advice provided in Bayside Fauna Survey (Practical Ecology 2012) and Bayside Native Vegetation Works program (Ecology Australia 2013).

Plate 1. Cross-section of bushland reserve showing a range of structural habitat elements

Plate 2. Example of a 'no-mow' native grassland within a mixed-use, urban bushland reserve

S2: Parklands

Public parks and gardens are multi-use spaces. Parks and gardens also provide important habitat for native wildlife and facilitate dispersal through the landscape (Plate 3).

Habitat improvement objectives

- Expand on areas of existing native vegetation (both patches and individual trees) with dense understorey plantings, or identify locations for additional native plantings, to create structurally diverse 'habitat planting zones'. Where possible ensure gaps between in habitat plantings are no greater than:
    - 20m for unmanaged groundcover vegetation
    - 50m for shrubs and trees
- Where possible create 'core habitat' by establishing structurally diverse, contiguous vegetation at least 0.5 hectares in size.
- Within habitat planting zones, establish structurally complex native vegetation that provides a fine-scale mosaic of:
    - Open to dense tree canopy (5 – 20% cover)
    - Open to dense shrub-layer (5 – 30% cover), with mixture of tall (3-7m) and low (1-3m) strata.
    - Tall, dense ground covers of grasses, sedges, forbs or prostrate/small shrubs (>50% cover, >30cm height) interspersed with small open patches (1-2m^2) of bare ground, rocks, litter or logs.
- Using the planting palette as a guide, ensure plantings include a mixture of species which provide a range of habitat resources (e.g. stringybarks vs. smooth bark, dense vs. open, species with different flowering times etc). Where low-habitat-value introduced species are present, consider introducing additional habitat structures (such as nest boxes or seeding with mistletoe) or replacing with native species.
- Retain and protect all hollow-bearing trees - where absent, create hollows or install artificial nesting structures within trees in habitat planting zones (Plate 4).
- Where absent, add native logs, woody debris, leaf litter/mulch and rocks of varying sizes to planting zones, particularly around edges of patches, in varying configurations. Where possible use timber and woody debris salvaged from native trees removed as part of arboricultural works.
- Identify suitable host trees for establishment of native mistletoes. Trees should be mature and where possible solitary to prevent browsing from possums whilst plants are establishing. Using seed collected from local host-plants (based on existing data collected by Bayside City Council), seed onto host plants of the same species in accordance with practices recommended by Dr David Watson (Charles Sturt University).
- Maintain mixed-aged stands by ensuring adequate recruitment is occurring, and supplement with plantings when necessary.
- Install fencing or other barriers (e.g. large logs or dense woody debris) on the edge of habitat plantings to restrict access and minimise disturbance to ground layers and vegetation (Plate 4).
- Where possible, create 'no mow' areas where mowing is prohibited allowing tall groundcover to develop to >30cm. Ideally establish indigenous species in these areas e.g. tussock grasses.

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These areas can be used along the interface of habitat plantings or can be combined with mown areas to create a mosaic of habitat whilst still providing access/amenity to the public.

- Where possible, restrict access of dogs to offleash areas away from habitat plantings.
- Control pest animals such as Common Myna, as well as weeds, in accordance with previous advice provided in Bayside Fauna Survey (Practical Ecology 2012) and Bayside Native Vegetation Works program (Ecology Australia 2013).

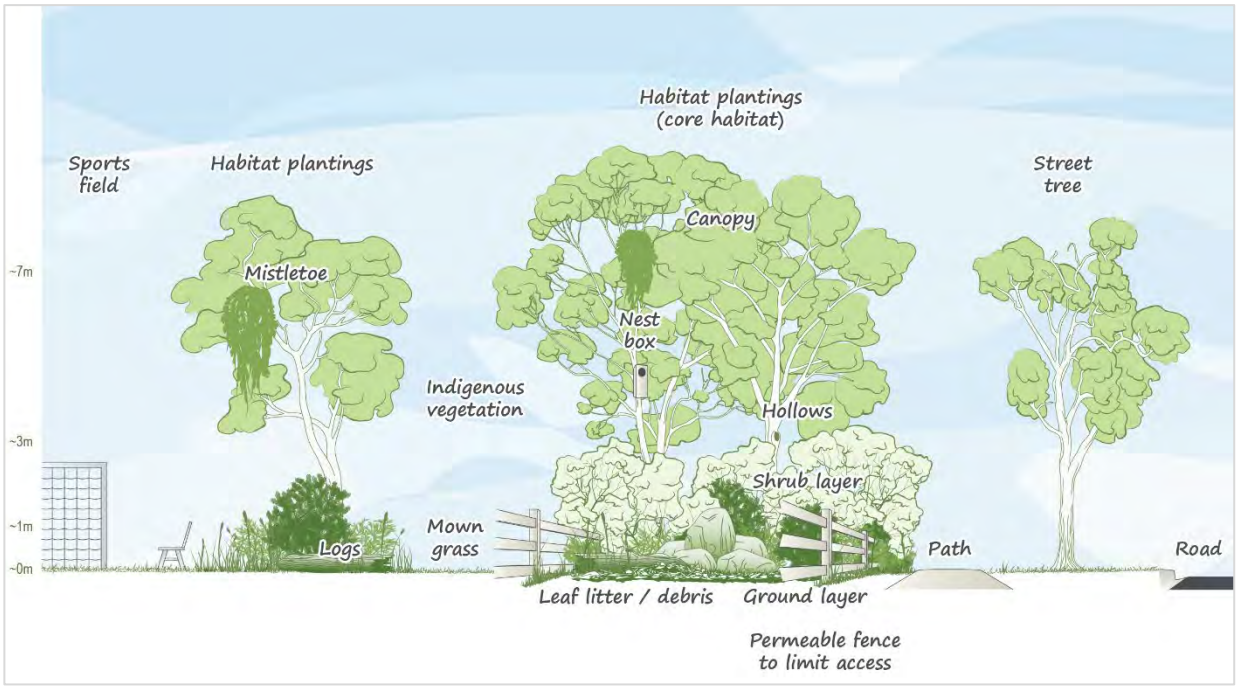

Plate 3. Cross-section of urban parkland showing a range of structural habitat elements

Plate 4. Example of habitat elements (large logs, understorey plantings and nest box) installed in an urban parkland

S3: Streetscapes

Road reserves play an important role in providing connectivity due to the persistence of remnant or recolonising vegetation in otherwise cleared landscapes. Whilst narrow, these corridors often support a diversity of structure and their linear nature are considered valuable for the role they play in providing functional connectivity through a landscape (Plate 5).

However, the presence of habitat can also pose risks to fauna due to injury and mortality associated with transport activities, as well as the changes in foraging, reproduction and social behaviours associated with increased noise, light and movement. The management of roadsides also cater to a wide variety of uses ranging from the need to provide safe vehicle passage, location for utilities, drainage and recreational functions.

Habitat improvement objectives

- Wherever possible, increase the extent of indigenous understorey vegetation in verges, nature strips, roundabouts, traffic islands and edges of carparks or other less frequented or unused areas (Plate 6). Habitat plantings should be:
    - As large as practicable, however small patches (e.g. 10m x 3m) with mown/managed verges between are still valuable.
    - No further than 50 metres apart, however the closer the better.
- Within habitat plantings, establish structurally complex native vegetation that provides:
    - Open to dense tree canopy (5 – 20% cover)
    - Dense shrub-layer (30%+ cover), with mixture of tall (3-7m) and low (1-3m) species.
    - Tall, dense ground covers of grasses, sedges, forbs or prostrate/small shrubs (>50% cover, >30cm height).
- Using the planting palette as a guide, ensure plantings include a mixture of species which provide a range of habitat resources (e.g. stringybarks vs. smooth bark, dense vs. open, species with different flowering times etc). Where low-habitat-value introduced species are present, consider introducing additional habitat structures (such as nest boxes or seeding with mistletoe) or replacing with native species.
- Use locally indigenous tree species in streetscape plantings with high habitat values (e.g. stringybarks, hollow-developing species, nectar/pollen producing species).
- Where possible, identify ‘habitat sides’ to establish continuous vegetation, allowing other side of road to be used for amenity and utility purposes.
- Retain and protect all hollow-bearing trees - where absent, create hollows or install artificial nesting structures within trees in habitat planting zones.
- Where practicable, add native logs, woody debris, leaf litter/mulch and rocks of varying sizes to planting zones, in varying configurations. Where possible use timber and woody debris salvaged from native trees removed as part of arboricultural works.
- Identify suitable host trees for establishment of native mistletoes. Trees should be mature and where possible solitary to prevent browsing from possums whilst plants are establishing. Using seed collected from local host-plants (based on existing data collected by Bayside City Council),

seed onto host plants of the same species in accordance with practices recommended by Dr David Watson (Charles Sturt University).

- Where practicable, install fencing or other barriers (e.g. large logs or dense woody debris) on the edge of habitat plantings to restrict access and minimise disturbance to ground layers and vegetation.
- Where practicable, create 'no mow' areas where mowing is prohibited allowing tall groundcover to develop to >30cm. Ideally establish indigenous species in these areas e.g. tussock grasses. These areas can be used along the interface of habitat plantings or can be combined with mown areas to create a mosaic of habitat whilst still providing access/amenity to the public.
- Encourage residential properties to plant indigenous groundcover, shrubs and trees in front gardens to increase the extent and width of habitat along streets.
- Where possible, maintain open swales and drains in roadsides, or install 'roadside rain gardens' to capture, filter and retain stormwater runoff, and provide ephemeral wet habitats. Plant areas with indigenous sedges and rushes tolerant of dry conditions.
- Control pest animals such as Common Myna, as well as weeds, in accordance with previous advice provided in Bayside Fauna Survey (Practical Ecology 2012) and Bayside Native Vegetation Works program (Ecology Australia 2013).

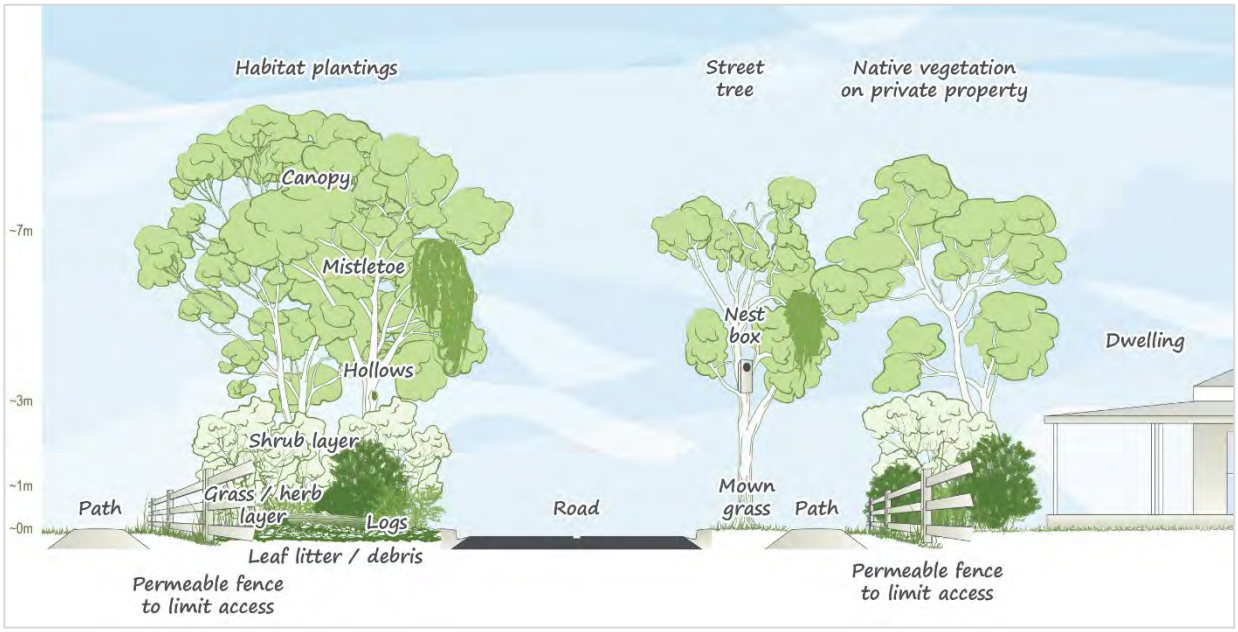

Plate 5. Cross-section of urban streetscape showing a range of structural habitat elements

Plate 6. Example of habitat plantings within an urban street

S4: Wetlands, waterbodies and creek corridors

Wetlands represent important biological 'hot spots' in urban areas, as they encompass a wide range of aquatic and terrestrial habitats and may support diverse flora and fauna communities (Plate 7). They also help maintain the health of waterways by regulating flows, capturing sediment and reducing pollutant loads.

Natural waterways and the adjoining terrestrial habitats provide important connectivity for fauna within urban landscapes due to a lack of barriers associated with roads, housing, infrastructure and other intensive land uses. A key focus for conservation efforts should be maintaining and restoring riparian vegetation along these corridors to improve connectivity. Daylighting piped or channelised sections of major waterways should be a priority to restore diverse aquatic and riparian habitats within Bayside.

Habitat improvement objectives

- Consider options for installation of constructed wetlands within public land with aim to create network of wetlands less than 1000m apart. Focus on existing reserves and parklands and along creek corridors. Wetlands should create structurally diverse habitats (Plate 8), using EVC benchmarks, Melbourne Water guidelines and planting palette as a guide to lifeform cover and species composition, incorporating:
    - Open water with submergent and floating species

  - Shallow and deep marshes with emergent species
  - Fringing vegetation
  - Fringing and submerged rocks and logs
- Manage hydrology of wetlands, lakes and waterways to prevent complete drying out of permanent deep pools and maintain refuges for aquatic species.
- Care needs to be taken to not create nesting sites of colonial bird species as these can have detrimental effect on wetland health and amenity. Design therefore needs to minimise fringing woody vegetation overhanging wetland.
- Consider options for creating 'micro-habitats' to provide stepping-stones within private and public land. This may include 'frog bogs', rain-water gardens, swales and ephemeral 'wet depressions' in low lying areas. Manage to ensure maintenance of tall, indigenous ground cover (e.g. Juncus sp.) in these areas.
- Encourage use of Water Sensitive Urban Design that incorporates habitat elements in new developments.
- Daylight and naturalise creek corridors wherever possible, creating diversity of aquatic habitats including deep pools of standing or slow-moving water, shallow riffles of fast-flowing water and ephemeral or seasonal wetlands and floodplains.
- Ensure contiguous habitat within corridors is at least:
  - 20-50m in width from either bank for minor waterways
  - 50-100m in width from either bank for major waterways.
- Ensure that monitoring for Red-eared Slider Turtles (and any other aquatic pest plants/animals) is undertaken regularly throughout Bayside's wetlands, and if there are observations, that measures for eradication are initiated immediately.

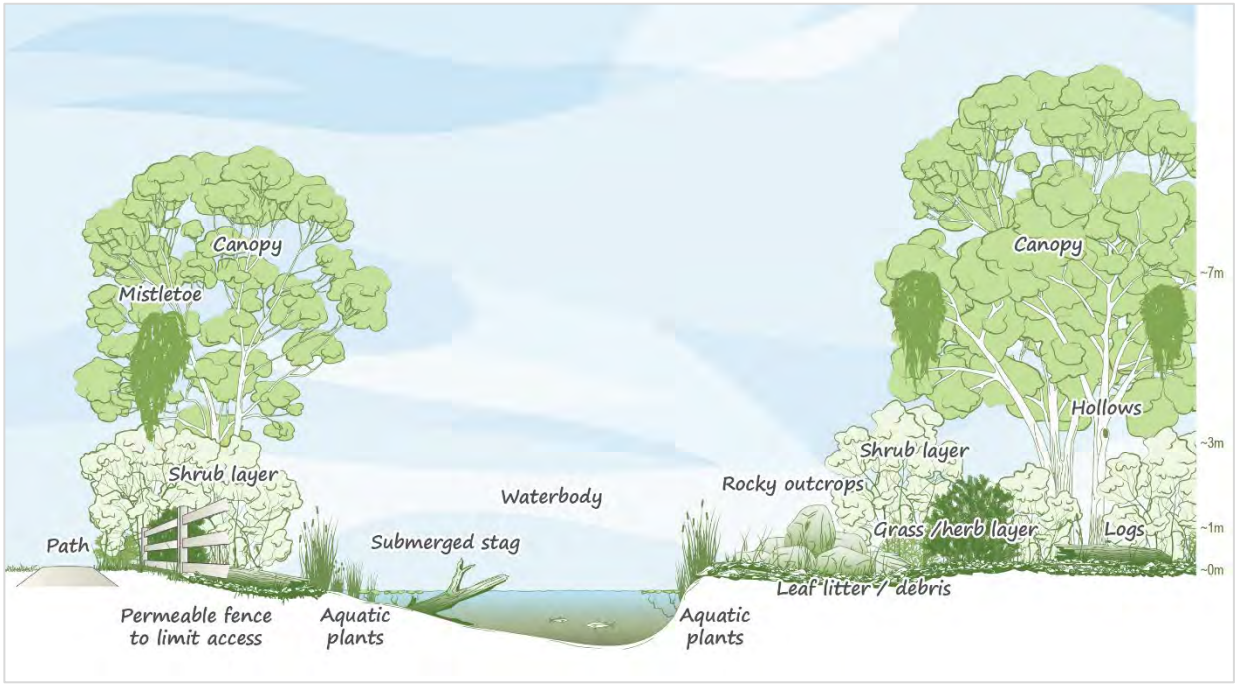

Plate 7. Cross-section of urban waterbody showing a range of structural habitat elements

Plate 8. Example of urban waterbody showing range of habitat elements (fringing vegetation, rocks and submerged logs)

3.4. Planting palette

A planting palette for Bayside has been developed to compliment the planting specifications. The aim is to provide proscriptive mixes of species which fulfill different requirements, allowing application to a broad range of applications. A summary version of the palette is presented in Table 7 with an extensive dataset provided as a spreadsheet with species categorised by:

- Form and height class
- Management specification (i.e. land use contexts presented in Section 3.3)
- Fauna habitat resource
- Ecological vegetation class

Table 7. Species planting selection categorised by planting specifications.

Scientific name	Common name	Form	Height class (m)	S1: Reserves (inland)	S1 : Reserves (coastal)	S2 : Parklands	S3 : Streetscapes	S4 : Waterbodies
Acacia brownii	Heath Wattle	Shrub	1-3	✓				
Acacia dealbata	Silver Wattle	Tree	>7					
Acacia implexa	Lightwood	Shrub	3-7, >7	✓		✓	✓	
Acacia melanoxylon	Blackwood	Tree	3-7, >7	✓		✓	✓	✓
Acacia oxycedrus	Spike Wattle	Shrub	3-7	✓				✓
Acacia stricta	Hop Wattle	Shrub	1-3, 3-7	✓		✓	✓	
Acacia suaveolens	Sweet Wattle	Shrub	3-7	✓				
Acacia ulicifolia	Juniper Wattle	Shrub	1-3	✓				✓
Acacia verticillata	Prickly Moses	Shrub	3-7	✓				
Acaena novae-zelandiae	Bidgee-widgee	Forb	<1		✓			
Acrotriche serrulata	Honey-pots	Heath shrub	<1					
Actites megalocarpus	Dune Thistle	Forb	<1	✓				
Allittia cardiocarpa	Swamp Daisy	Forb	<1	✓				
Allocasuarina paludosa	Scrub Sheoak	Shrub	1-3, 3-7	✓				
Allocasuarina paradoxa	Green She-oak	Tree	1-3	✓				
Alyxia buxifolia	Sea Box	Shrub	1-3		✓			
Amperea xiphoclada var. xiphoclada	Broom Spurge	Shrub	<1	✓				
Aotus ericoides	Common Aotus	Shrub	1-3	✓				✓
Apium annuum	Annual Celery	Forb	<1		✓			
Apium prostratum	Sea Celery	Forb	<1					
Arthropodium strictum	Chocolate Lily	Forb	<1			✓		

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Scientific name	Common name	Form	Height class (m)	S1: Reserves (inland)	S1 : Reserves (coastal)	S2 : Parklands	S3 : Streetscapes	S4 : Waterbodies
Astroloma humifusum	Cranberry Heath	Heath shrub	<1	✓				
Atriplex cinerea	Coast Saltbush	Chenopod	1-3		✓			
Austrostipa flavescens	Coast Spear-grass	Tussock Grass	1-3		✓			
Austrostipa mollis	Soft Spear-grass	Tussock Grass	1-3	✓	✓			
Austrostipa pubinodis	Tall Spear-grass	Tussock Grass	1-3	✓				
Austrostipa semibarbata	Fibrous Spear-grass	Tussock Grass	1-3	✓				
Austrostipa stipoides	Buggar Grass	Tussock Grass	1-3		✓			
Banksia integrifolia	Coastal Banksia	Tree	3-7, >7		✓			
Banksia marginata	Silver Banksia	Shrub	3-7, >7	✓	✓	✓	✓	
Banksia serrata	Saw Banksia	Tree	3-7, >7	✓				
Baumea juncea	Bare Twig-sedge	Sedge	1-3	✓				
Billardiera mutabilis	Common Apple-berry	Vine	<1	✓				
Bolboschoenus caldwellii	Sea Club-rush	Aquatic rush	<1					✓
Bolboschoenus fluviatilis	Tall Club-rush	Aquatic rush	1-3					✓
Bolboschoenus medianus	Marsh Club-rush	Aquatic rush	1-3					✓
Boronia parviflora	Swamp Boronia	Forb	<1	✓				
Bossiaea cinerea	Showy Bossiaea	Shrub	1-3	✓	✓			
Bossiaea prostrata	Creeping Bossiaea	Forb	<1					
Brachyscome parvula	Coast Daisy	Forb	<1					
Bulbine bulbosa	Bulbine Lily	Forb	<1	✓				
Burchardia umbellata	Milkmaids	Forb	<1					
Bursaria spinosa	Sweet Bursaria	Shrub	3-7	✓	✓	✓	✓	

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Scientific name	Common name	Form	Height class (m)	S1: Reserves (inland)	S1 : Reserves (coastal)	S2 : Parklands	S3 : Streetscapes	S4 : Waterbodies
Calandrinia calyptrata	Pink Purslane	Forb	<1		✓			
Carex appressa		Sedge	1-3					
Carex breviculmis	Common Grass-sedge	Sedge	<1	✓				
Carex pumila	Strand Sedge	Sedge	<1		✓			
Carpobrotus rossii	Pig face	Forb	<1	✓	✓	✓		
Cassinia arcuata	Drooping Cassinia	Shrub	1-3	✓		✓	✓	
Centella cordifolia	Centella	Forb	<1	✓				
Centrolepis fascicularis	Tufted Centrolepis	Rush	<1	✓				
Chamaescilla corymbosa	Blue Stars	Forb	<1	✓				
Chrysocephalum apiculatum	Common Everlasting	Forb	<1	✓		✓		
Cladium procerum	Leafy Twig-rush	Aquatic rush	1-3					✓
Clematis microphylla	Small-leaved Clematis	Vine	1-3, 3-7	✓	✓	✓	✓	
Comesperma calymega	Blue-spike Milkwort	Shrub	1-3	✓				
Comesperma ericinum	Heath Milkwort	Shrub	1-3	✓				
Comesperma volubile	Love Creeper	Vine	1-3	✓				
Coronidium scorpioides	Button Everlasting	Forb	<1					
Correa alba	White Correa	Shrub	1-3		✓	✓	✓	
Correa reflexa	Common Correa	Shrub	1-3	✓		✓	✓	
Crassula helmsii	Swamp Crassula	Forb	<1	✓				✓
Crassula sieberiana	Sieber Crassula	Forb	<1		✓			
Cycnogeton procerum	Water Ribbons	Aquatic forb	1-3					✓
Deyeuxia quadriseta	Reed Bent-grass	Tussock Grass	1-3	✓				

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Scientific name	Common name	Form	Height class (m)	S1: Reserves (inland)	S1 : Reserves (coastal)	S2 : Parklands	S3 : Streetscapes	S4 : Waterbodies
Dianella admixta	Spreading Flax-lily	Forb	<1	✓	✓	✓		
Dianella longifolia (syn. Dianella laevis)	Blueberry Lily	Forb	<1	✓				
Dianella revoluta	Black-anther Flax-lily	Forb	<1	✓		✓		
Dianella sp. aff. revoluta	Coastal Flax-lily	Forb	<1		✓			
Dichelachne crinita	Long-hair Plume-grass	Tussock Grass	1-3	✓	✓			
Dichondra repens	Creeping dichondra	Forb	<1	✓	✓			
Dillwynia cinerascens	Grey Parrot-pea	Shrub	1-3	✓		✓	✓	
Dillwynia glaberrima	Smooth Parrot-pea	Shrub	1-3	✓	✓			
Dillwynia sericea	Showy Parrot-pea	Shrub	<1	✓				
Disphyma crassifolium	Rounded Noon-flower	Forb	<1		✓			
Distichlis distichophylla	Australian Salt-grass	Other Grass	<1		✓			
Drosera peltata ssp. auriculata	Tall Sundew	Forb	<1	✓	✓			
Einadia nutans	Climbing Saltbush	Forb	<1	✓		✓		
Eleocharis acuta	Common Spike- rush	Aquatic rush	<1					✓
Eleocharis sphacelata	Tall Spike Rush	Aquatic rush	1-3					✓
Epacris impressa	Common Heath	Heath shrub	1-3	✓	✓			
Epacris obtusifolia	Blunt-leaf Heath	Heath shrub	<1	✓				
Epilobium billardierianum ssp. cinereum	Grey Willow-herb	Forb	<1		✓			
Eragrostis brownii	Common Love-grass	Tussock Grass	<1	✓				
Eryngium vesiculosum	Prickfoot	Forb	<1	✓				

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Scientific name	Common name	Form	Height class (m)	S1: Reserves (inland)	S1 : Reserves (coastal)	S2 : Parklands	S3 : Streetscapes	S4 : Waterbodies
Eucalyptus camaldulensis	River Red Gum	Tree	>7	✓		✓	✓	
Eucalyptus cephalocarpa	Mealy Stringybark, Silver Stringybark	Tree	>7					
Eucalyptus leucoxylon spp. connata	Melbourne Yellow Gum	Tree	>7					
Eucalyptus melliodora	Yellow Box	Tree	>7	✓		✓	✓	
Eucalyptus obliqua	Messmate Stringybark	Tree	>7	✓		✓	✓	
Eucalyptus ovata	Swamp Gum	Tree	>7	✓		✓	✓	✓
Eucalyptus pauciflora	Snow Gum	Tree	3-7, >7	✓		✓	✓	
Eucalyptus spp.	Gum trees	Tree	>7	✓				
Eucalyptus viminalis ssp. pryoriana	Coast Manna Gum	Tree	>7	✓	✓			
Eucalyptus willisii	Jimmy's Shining Peppermint	Tree	>7	✓				
Euchiton collinus	Creeping Cudweed	Forb	<1	✓				
Euchiton sphaericus	Annual Cudweed	Forb	<1	✓				
Euphrasia collina	Purple Eyebright	Forb	<1	✓				
Ficinia nodosa	Knotted Club-rush	Sedge	<1		✓	✓		
Frankenia pauciflora	Southern Sea-heath	Shrub	<1					
Gahnia radula	Thatch Saw-sedge	Sedge	1-3		✓			
Gahnia sieberiana	Red-fruit Saw-sedge	Sedge	1-3	✓		✓		
Galium australe	Tangled Bedstraw	Forb	<1		✓			
Geranium potentilloides var. potentilloides	Soft Crane's-bill	Forb	<1		✓			
Geranium solanderi	Austral Crane's-bill	Forb	<1	✓				

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Scientific name	Common name	Form	Height class (m)	S1: Reserves (inland)	S1 : Reserves (coastal)	S2 : Parklands	S3 : Streetscapes	S4 : Waterbodies
Gleichenia microphylla	Scrambling Coral-fern	Fern and fern allies	<1	✓				
Gonocarpus humilis	Shade Raspwort	Forb	<1		✓			
Gonocarpus tetragynus	Common Raspwort	Forb	<1	✓				
Goodenia elongata	Lanky Goodenia	Forb	<1	✓				
Goodenia geniculata	Bent Goodenia	Forb	<1					
Goodenia humilis	Swamp Goodenia	Forb	<1	✓				
Goodenia ovata	Hop Goodenia	Shrub	1-3	✓	✓	✓	✓	
Hakea ulicina	Furze Hakea	Shrub	3-7					
Haloragis brownii	Swamp Raspwort	Forb	<1		✓			
Hibbertia acicularis	Prickly Guinea-flower	Shrub	<1	✓				
Hibbertia fasciculata var. prostrata	Bundled Guinea-flower	Shrub	<1	✓	✓			
Hibbertia riparia	Erect Guinea-flower	Shrub	1-3	✓				
Hibbertia sericea	Silky Guinea-Flower	Shrub	<1	✓				
Hovea heterophylla	Common Hovea	Forb	<1	✓				
Hydrocotyle hirta	Hairy Pennywort	Forb	<1	✓				
Hydrocotyle laxiflora	Stinking Pennywort	Forb	<1	✓				
Hydrocotyle sibthorpioides	Shining Pennywort	Forb	<1		✓			
Hypericum gramineum	Small St John's Wort	Forb	<1	✓				
Hypolaena fastigiata	Tassel Rope-rush	Rush	<1	✓	✓			
Imperata cylindrica	Blady Grass	Tussock Grass	<1		✓			
Isolepis inundata	Swamp Club-sedge	Sedge	<1	✓				

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Scientific name	Common name	Form	Height class (m)	S1: Reserves (inland)	S1 : Reserves (coastal)	S2 : Parklands	S3 : Streetscapes	S4 : Waterbodies
Isopogon ceratophyllus	Horny Cone-bush	Shrub	<1	✓				
Isotoma fluviatilis ssp. australis	Swamp Isotome	Forb	<1					✓
Juncus kraussii ssp. australiensis	Sea Rush	Rush	1-3		✓			
Juncus pallidus	Pale Rush	Rush	1-3			✓		
Juncus planifolius	Broad-leaf Rush	Rush	1-3	✓				
Juncus spp.	Rush	Rush	<1	✓	✓			
Juncus subsecundus	Finger Rush	Rush	1-3	✓				
Kennedia prostrata	Running Postman	Vine	1-3	✓	✓	✓	✓	
Lachnagrostis billardierei	Coast Blown-grass	Tussock Grass	<1		✓			
Lachnagrostis filiformis	Common Blown-grass	Tussock Grass	<1		✓			
Lagenifera stipitata	Blue Bottle-daisy	Forb	<1	✓				
Lasiopetalum baueri	Slender Velvet Bush	Shrub	1-3		✓			
Laxmannia orientalis	Dwarf Wire Lily	Forb	<1					
Lepidosperma concavum	Sandhill Sword-sedge	Sedge	<1	✓	✓			
Lepidosperma gladiatum	Coast Sword-sedge	Sedge	<1		✓			
Lepidosperma gunnii	Slender Sword-sedge	Sedge	<1	✓				
Lepidosperma longitudinale	Pithy Sword-sedge	Sedge	<1	✓				
Lepidosperma semiteres	Wire Rapier-sedge	Sedge	<1	✓				
Leptorhynchos tenuifolius	Wiry Buttons	Forb	<1	✓				
Leptospermum continentale	Prickly Tea-tree	Shrub	1-3	✓	✓	✓	✓	✓
Leptospermum myrsinoides	Heath Tea-tree	Shrub	1-3	✓	✓			
Leucophyta brownii	Cushion Bush	Shrub	<1		✓	✓	✓	

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Scientific name	Common name	Form	Height class (m)	S1: Reserves (inland)	S1 : Reserves (coastal)	S2 : Parklands	S3 : Streetscapes	S4 : Waterbodies
Leucopogon ericoides	Pink Beard-heath	Heath shrub	<1	✓				
Leucopogon parviflorus	Coast Beard-heath	Heath shrub	3-7		✓	✓	✓	
Leucopogon virgatus	Common Beard-heath	Heath shrub	<1	✓	✓			
Lindsaea linearis	Screw Fern	Fern and fern allies	<1	✓				
Lobelia anceps	Angled Lobelia	Forb	<1		✓			
Lomandra filiformis	Wattle-headed Mat-rush	Rush	<1	✓				
Lomandra longifolia	Spiny-headed Mat-rush	Rush	<1	✓		✓		✓
Lomandra multiflora	Many-flowered Mat-rush	Rush	<1	✓				
Lomandra nano	Dwarf Mat-rush	Sedge	<1	✓				
Machaerina articulata (syn. Baumea articulata)	Jointed Club-rush	Aquatic rush	1-3					✓
Melaleuca ericifolia	Swamp Paperbark	Shrub	3-7	✓		✓	✓	✓
Melaleuca lanceolata	Moonah	Shrub	3-7, >7		✓			
Melaleuca squarrosa	Bottle-brush Tea-tree	Shrub	1-3, 3-7	✓		✓	✓	✓
Microlaena stipoides var. stipoides	Weeping Grass	Tussock Grass	<1	✓		✓	✓	
Monotoca scoparia	Prickly Broom-heath	Heath shrub	<1, 1-3	✓				
Muellerina eucalyptoides	Creeping Mistletoe	Epiphyte	NA	✓				
Myoporum insulare	Common Boobialla	Shrub	1-3, 3-7	✓	✓	✓	✓	
Myoporum petiolatum	Sticky Boobialla	Shrub	1-3	✓	✓			
Myriophyllum crispatum	Upright Water-milfoil	Aquatic forb	<1					✓
Myriophyllum simulans	Amphibious Water-milfoil	Forb	<1	✓				

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Scientific name	Common name	Form	Height class (m)	S1: Reserves (inland)	S1 : Reserves (coastal)	S2 : Parklands	S3 : Streetscapes	S4 : Waterbodies
Olearia axillaris	Coast Daisy-bush	Shrub	1-3	✓	✓			
Olearia glandulosa	Swamp Daisy-bush	Shrub	1-3	✓				
Opercularia ovata	Broad-leaf Stinkweed	Forb	<1					
Opercularia varia	Variable Stinkweed	Forb	<1	✓				
Ornduffia reniformis (syn. Villarsia reniformis)	Running Marsh-	Forb	1-3	✓				
Oxalis exilis	Shady Wood-sorrel	Forb	<1	✓				
Oxalis perennans	Grassland Wood-sorrel	Forb	<1		✓			
Ozothamnus ferrugineus	Tree Everlasting	Shrub	3-7	✓		✓	✓	✓
Patersonia fragilis	Short Purple-flag	Forb	<1	✓				✓
Patersonia occidentalis	Long Purple-flag	Forb	<1	✓				
Pelargonium australe	Austral Stork's-bill	Forb	<1		✓	✓		
Pelargonium inodorum	Kopata	Forb	<1					
Persicaria decipiens	Slender Knotweed	Forb	<1	✓				
Persoonia juniperina	Prickly Geebung	Shrub	1-3	✓				
Philydrum lanuginosum	Woolly Waterlily	Forb	<1	✓				
Pimelea humilis	Common Rice-flower	Shrub	<1	✓	✓	✓	✓	
Pimelea octophylla	Woolly Rice-flower	Shrub	<1	✓				
Pimelea phylicoides	Heath Rice-flower	Shrub	<1	✓				
Platylobium obtusangulum	Common Flat-pea	Shrub	<1		✓			
Platysace heterophylla	Slender Platysace	Forb	<1					
Poa clelandii	Noah's Ark	Grass	<1	✓				

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Scientific name	Common name	Form	Height class (m)	S1: Reserves (inland)	S1 : Reserves (coastal)	S2 : Parklands	S3 : Streetscapes	S4 : Waterbodies
Poa labillardierei	Common Tussock Grass	Tussock Grass	1-3	✓	✓	✓	✓	
Poa poiformis	Coast Tussock-grass	Tussock Grass	<1		✓			
Pomaderris paniculosa	Shining Coast Pomaderris	Shrub	1-3		✓			
Pomaderris paniculosa subsp. paralia	Coast Pomaderris	Shrub	1-3		✓			
Poranthera microphylla	Small Poranthera	Forb	<1	✓				
Potamogeton ochreatus	Blunt Pondweed	Aquatic forb	<1					✓
Pultenaea dentata	Clustered Bush-pea	Shrub	<1	✓				
Ricinocarpos pinifolius	Wedding Bush	Shrub	1-3	✓				✓
Rytidosperma caespitosum	Common Wallaby-grass	Tussock Grass	1-3	✓		✓	✓	
Rytidosperma erianthum	Hill Wallaby-grass	Tussock Grass	<1		✓			
Rytidosperma geniculatum	Kneed Wallaby-grass	Tussock Grass	<1	✓	✓			
Rytidosperma laeve	Smooth Wallaby-grass	Tussock Grass	<1	✓				
Rytidosperma pilosum	Velvet Wallaby-grass	Tussock Grass	<1	✓				
Rytidosperma racemosum	Clustered Wallaby-grass	Tussock Grass	<1	✓	✓			✓
Rytidosperma semiannulare	Wetland Wallaby-grass	Tussock Grass	<1	✓				
Rytidosperma setaceum	Bristly Wallaby-grass	Tussock Grass	<1	✓				
Sambucus gaudichaudiana	White Elderberry	Shrub	1-3		✓			
Samolus repens	Creeping Brookweed	Forb	<1		✓			
Sarcocornia blackiana	Thick-head	Forb	<1		✓			
Sarcocornia quinqueflora	Beaded Glasswort	Shrub	<1		✓			
Schoenoplectus tabernaemontani	River Club-rush	Aquatic rush	1-3					✓
Schoenus apogon	Common Bog-sedge	Sedge	<1	✓				

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Scientific name	Common name	Form	Height class (m)	S1: Reserves (inland)	S1 : Reserves (coastal)	S2 : Parklands	S3 : Streetscapes	S4 : Waterbodies
Schoenus brevifolius	Zig-zag Bog-sedge	Sedge	<1		✓			
Schoenus maschalinus	Leafy Bog-sedge	Sedge	<1	✓				
Scutellaria humilis	Dwarf Skullcap	Forb	<1		✓			
Selaginella uliginosa	Swamp Selaginella	Fern and fern allies	<1	✓				
Selliera radicans	Shiny Swamp-mat	Forb	<1					✓
Senecio biserratus	Jagged Fireweed	Forb	<1	✓				
Senecio glomeratus	Annual Fireweed	Forb	<1		✓			
Senecio hispidulus	Rough Fireweed	Forb	<1	✓				
Senecio minimus	Shrubby Fireweed	Forb	<1		✓			
Senecio pinnatifolius	Variable Groundsel	Forb	<1		✓			
Senecio quadridentatus	Cotton Fireweed	Forb	<1	✓				
Senecio squarrosus	Leafy Fireweed	Forb	<1	✓				
Spinifex sericeus	Hairy Spinifex	Other Grass	<1		✓			
Sporobolus virginicus	Salt or Sand Couch	Other Grass	<1		✓			
Sprengelia incarnata	Pink Swamp-heath	Heath shrub	1-3	✓				
Stackhousia monogyna	Creamy Stackhousia	Forb	<1	✓				
Stackhousia spathulata	Coast Stackhousia	Forb	<1		✓			
Stylidium graminifolium	Grass Trigger-plant	Forb	<1			✓		
Suaeda australis	Austral Seablite	Chenopod	<1		✓			✓
Tetragonia implexicoma	Bower Spinach	Forb	<1		✓	✓		✓
Tetrarrhena juncea	Forest Wire-grass	Tussock Grass	<1	✓				

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Scientific name	Common name	Form	Height class (m)	S1: Reserves (inland)	S1 : Reserves (coastal)	S2 : Parklands	S3 : Streetscapes	S4 : Waterbodies
Thelionema caespitosum	Tufted Lily	Forb	<1	✓				
Themeda triandra	Kangaroo grass	Tussock Grass	<1	✓		✓	✓	
Threlkeldia diffusa	Coast Bonefruit	Forb	<1		✓			
Thysanotus patersonii	Twining Fringe-lily	Vine	<1	✓				
Thysanotus tuberosus	Common Fringe-lily	Forb	<1	✓				
Trachymene composita	Parsnip Trachymene	Forb	<1	✓				
Tricoryne elatior	Yellow Rush-lily	Forb	<1	✓				
Tricostularia pauciflora	Needle Bog-sedge	Sedge	<1	✓				
Triglochin striatum	Streaked Arrowgrass	Forb	<1		✓			✓
Utricularia dichotoma	Fairies' Aprons	Forb	<1	✓				
Vallisneria australis	Eel-grass	Aquatic forb	<1					✓
Veronica gracilis	Slender Speedwell	Forb	<1	✓				
Veronica plebeia	Trailing Speedwell	Forb	<1		✓			
Viminaria juncea	Golden Spray	Shrub	1-3, 3-7	✓		✓	✓	✓
Viola cleistogamoides	Hidden Violet	Forb	<1	✓				
Viola hederacea	Ivy-leaved Violet	Forb	<1	✓	✓			
Wahlenbergia stricta	Tall Bluebell	Forb	<1	✓				
Wurmbea dioica	Common Early	Forb	<1	✓				
Xanthorrhoea minor	Small Grass-tree	Xanthorrhoea	<1, 1-3	✓	✓	✓	✓	
Xanthosia huegelii	Heath Xanthosia	Forb	<1	✓				

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Figure 3: Bayside connectivity modelling and improvement locations [Map Series Index]

Bayside LGA boundary
Map Series Extent

0 0.5 1 2
Kilometres

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Figure 3: Bayside connectivity modelling and improvement locations [Map 1]

- Bayside LGA boundary
- Core habitat patches
- Least cost paths (≤1000 m)
- Least cost paths (>1000 m)
- Habitat Improvement Areas
- Linkage Improvement Areas
- Habitat-bearing Trees

Land Cover

- Building Footprint
- Arterial - Highway
- Arterial - Other
- Non-arterial road
- Rail Corridor
- Tracks/Footpath
- Waterbody/Watercourse
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

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Figure 3: Bayside connectivity modelling and improvement locations [Map 2]

- Bayside LGA boundary
- Least cost paths (>1000 m)
- Habitat-bearing Trees

Land Cover

- Building Footprint
- Arterial - Highway
- Arterial - Other
- Non-arterial road
- Rail Corridor
- Tracks/Footpath
- Waterbody/Watercourse
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

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Figure 3: Bayside connectivity modelling and improvement locations [Map 3]

- Bayside LGA boundary
- Core habitat patches
- Least cost paths (≤1000 m)
- Least cost paths (>1000 m)
- Habitat Improvement Areas
- Linkage Improvement Areas
- Habitat-bearing Trees

Land Cover

- Building Footprint
- Arterial - Other
- Non-arterial road
- Rail Corridor
- Tracks/Footpath
- Waterbody/Watercourse
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

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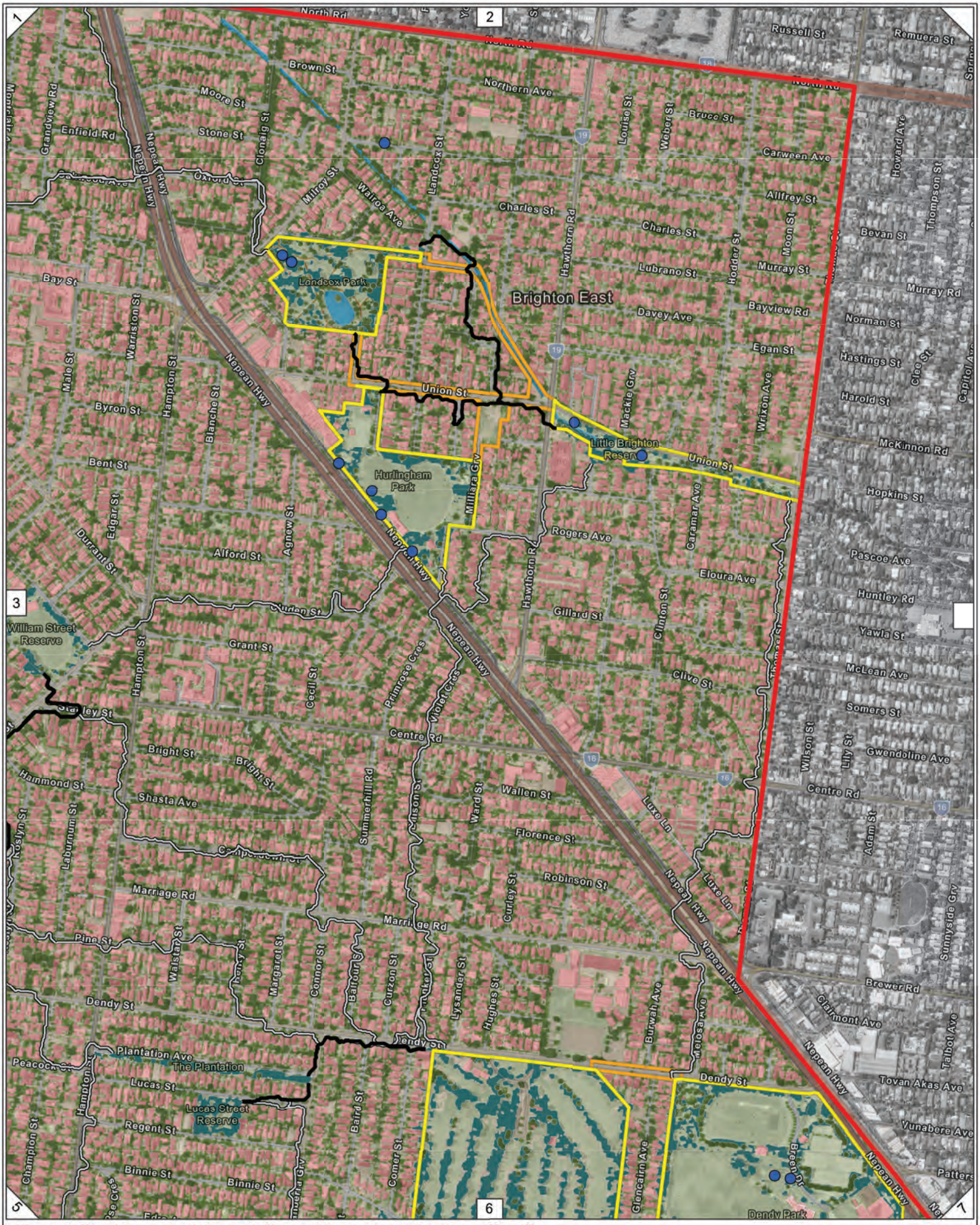

Figure 3: Bayside connectivity modelling and improvement locations [Map 4]

- Bayside LGA boundary
- Core habitat patches
- Least cost paths (≤1000 m)
- Least cost paths (>1000 m)
- Habitat Improvement Areas
- Linkage Improvement Areas
- Habitat-bearing Trees

Land Cover

- Building Footprint
- Arterial - Highway
- Arterial - Other
- Non-arterial road
- Tracks/Footpath
- Waterbody/Watercourse
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

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Figure 3: Bayside connectivity modelling and improvement locations [Map 5]

- Bayside LGA boundary
- Core habitat patches
- Least cost paths (≤1000 m)
- Least cost paths (>1000 m)
- Habitat Improvement Areas
- Linkage Improvement Areas

Land Cover

- Building Footprint
- Arterial - Other
- Non-arterial road
- Rail Corridor
- Tracks/Footpath
- Waterbody/Watercourse
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

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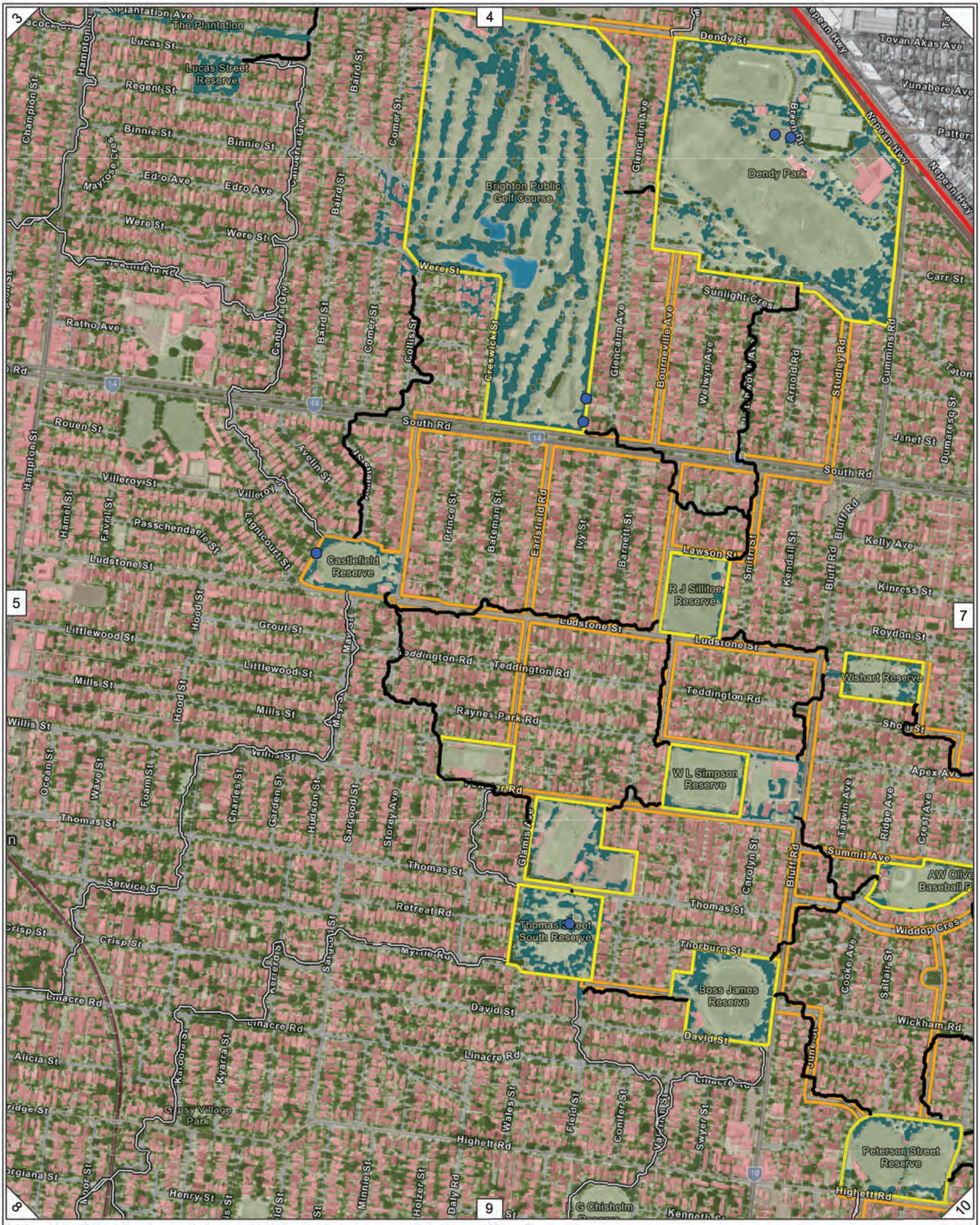

Figure 3: Bayside connectivity modelling and improvement locations [Map 6]

- Bayside LGA boundary
- Core habitat patches
- Least cost paths (≤1000 m)
- Least cost paths (>1000 m)
- Habitat Improvement Areas
- Linkage Improvement Areas
- Habitat-bearing Trees

Land Cover

- Building Footprint
- Arterial - Highway
- Arterial - Other
- Non-arterial road
- Rail Corridor
- Tracks/Footpath
- Waterbody/Watercourse
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

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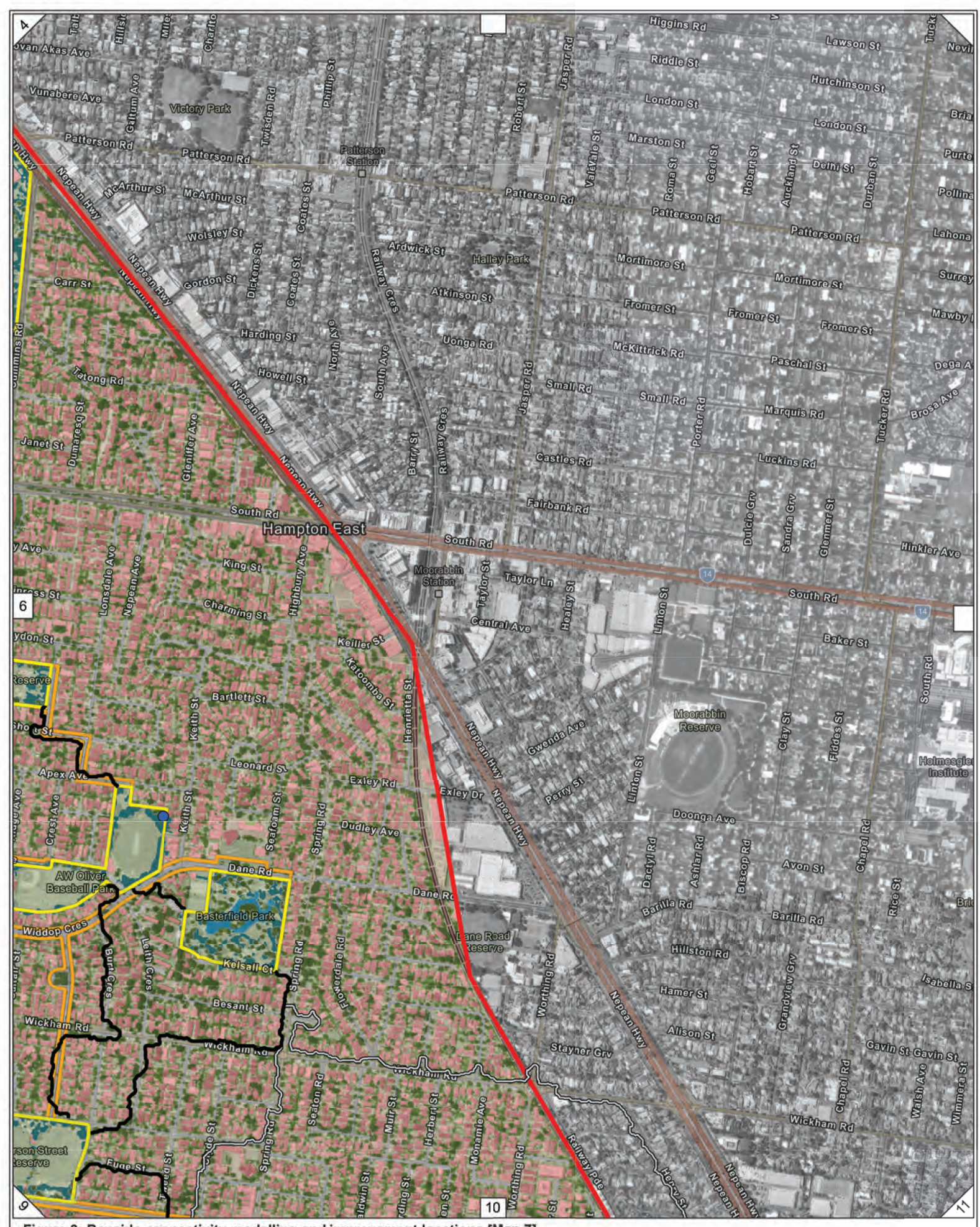

Figure 3: Bayside connectivity modelling and improvement locations [Map 7]

- Bayside LGA boundary
- Core habitat patches
- Least cost paths (≤1000 m)
- Least cost paths (>1000 m)
- Habitat Improvement Areas
- Linkage Improvement Areas
- Habitat-bearing Trees

Land Cover

- Building Footprint
- Arterial - Highway
- Arterial - Other
- Non-arterial road
- Rail Corridor
- Tracks/Footpath
- Waterbody/Watercourse
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

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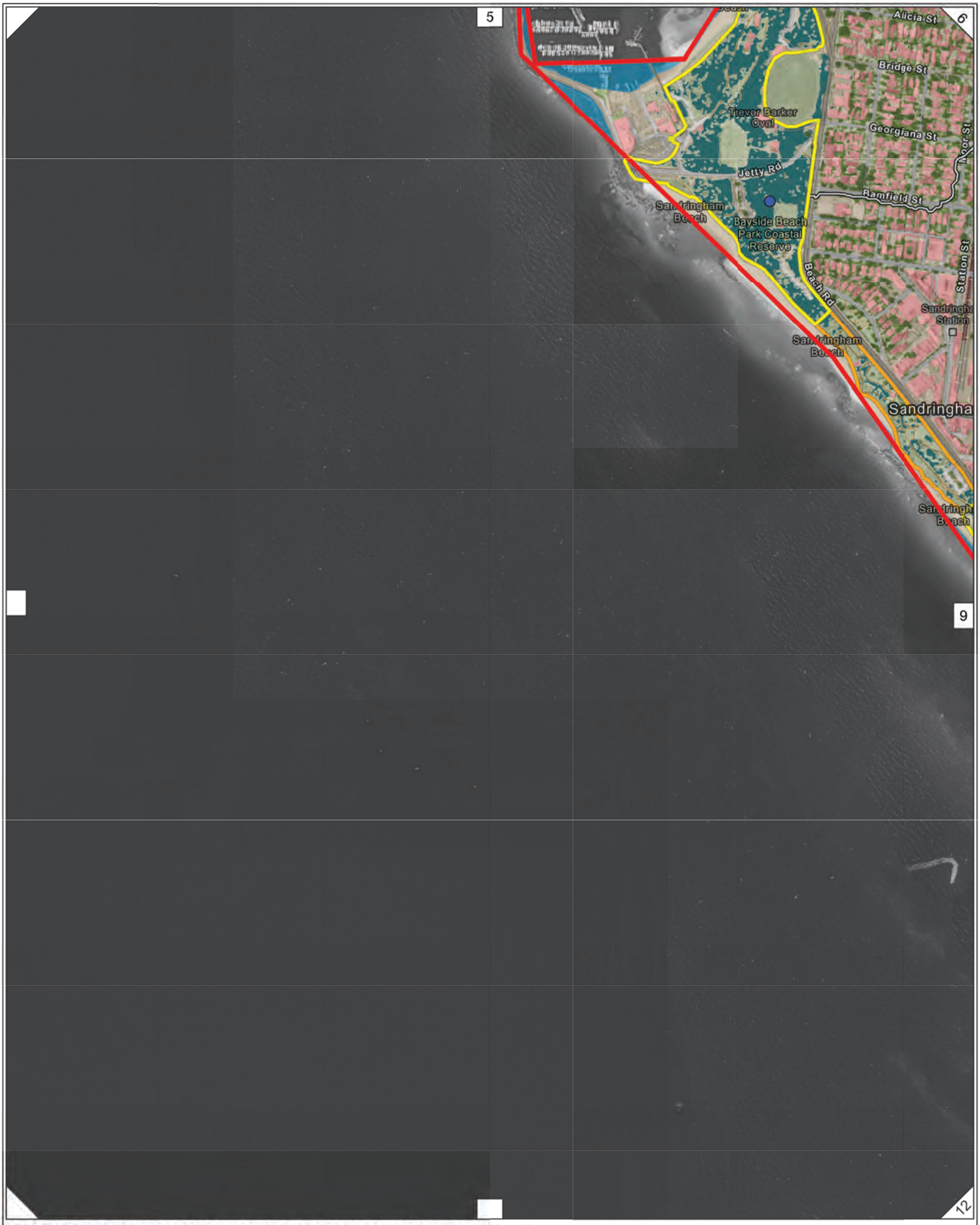

Figure 3: Bayside connectivity modelling and improvement locations [Map 8]

- Bayside LGA boundary
- Core habitat patches
- Least cost paths (>1000 m)
- Habitat Improvement Areas
- Linkage Improvement Areas
- Habitat-bearing Trees

Land Cover

- Building Footprint
- Arterial - Other
- Non-arterial road
- Rail Corridor
- Tracks/Footpath
- Waterbody/Watercourse
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

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Figure 3: Bayside connectivity modelling and improvement locations [Map 9]

- Bayside LGA boundary
- Core habitat patches
- Least cost paths (≤1000 m)
- Least cost paths (>1000 m)
- Habitat Improvement Areas
- Linkage Improvement Areas
- Habitat-bearing Trees

Land Cover

- Building Footprint
- Arterial - Other
- Non-arterial road
- Rail Corridor
- Tracks/Footpath
- Waterbody/Watercourse
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

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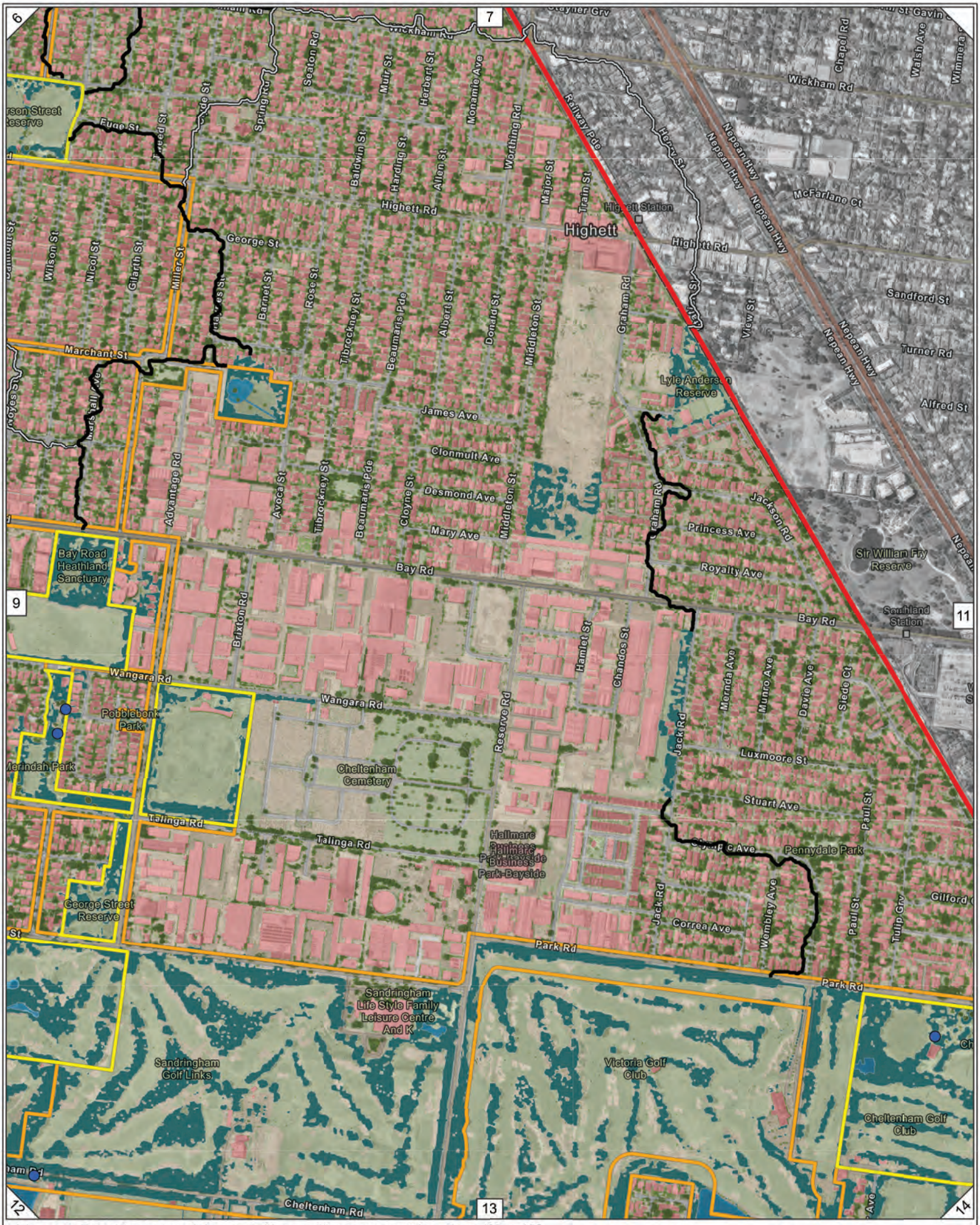

Figure 3: Bayside connectivity modelling and improvement locations [Map 10]

- Bayside LGA boundary
- Core habitat patches
- Least cost paths (≤1000 m)
- Least cost paths (>1000 m)
- Habitat Improvement Areas
- Linkage Improvement Areas
- Habitat-bearing Trees

Land Cover

- Building Footprint
- Arterial - Other
- Non-arterial road
- Rail Corridor
- Waterbody/Watercourse
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

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Figure 3: Bayside connectivity modelling and improvement locations [Map 11]

- Bayside LGA boundary
- Core habitat patches
- Habitat Improvement Areas
- Linkage Improvement Areas
- Habitat-bearing Trees

Land Cover

- Building Footprint
- Non-arterial road
- Rail Corridor
- Tracks/Footpath
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

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Figure 3: Bayside connectivity modelling and improvement locations [Map 12]

- Bayside LGA boundary
- Core habitat patches
- Least cost paths (≤1000 m)
- Least cost paths (>1000 m)
- Habitat Improvement Areas
- Linkage Improvement Areas
- Habitat-bearing Trees

Land Cover

- Building Footprint
- Arterial - Other
- Non-arterial road
- Tracks/Footpath
- Waterbody/Watercourse
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

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Figure 3: Bayside connectivity modelling and improvement locations [Map 13]

- Bayside LGA boundary
- Core habitat patches
- Least cost paths (≤1000 m)
- Least cost paths (>1000 m)
- Habitat Improvement Areas
- Linkage Improvement Areas
- Habitat-bearing Trees

Land Cover

- Building Footprint
- Arterial - Other
- Non-arterial road
- Tracks/Footpath
- Waterbody/Watercourse
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

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Figure 3: Bayside connectivity modelling and improvement locations [Map 14]

- Bayside LGA boundary
- Core habitat patches
- Least cost paths (≤1000 m)
- Least cost paths (>1000 m)
- Habitat Improvement Areas
- Linkage Improvement Areas
- Habitat-bearing Trees

Land Cover

- Building Footprint
- Arterial - Other
- Non-arterial road
- Rail Corridor
- Tracks/Footpath
- Waterbody/Watercourse
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

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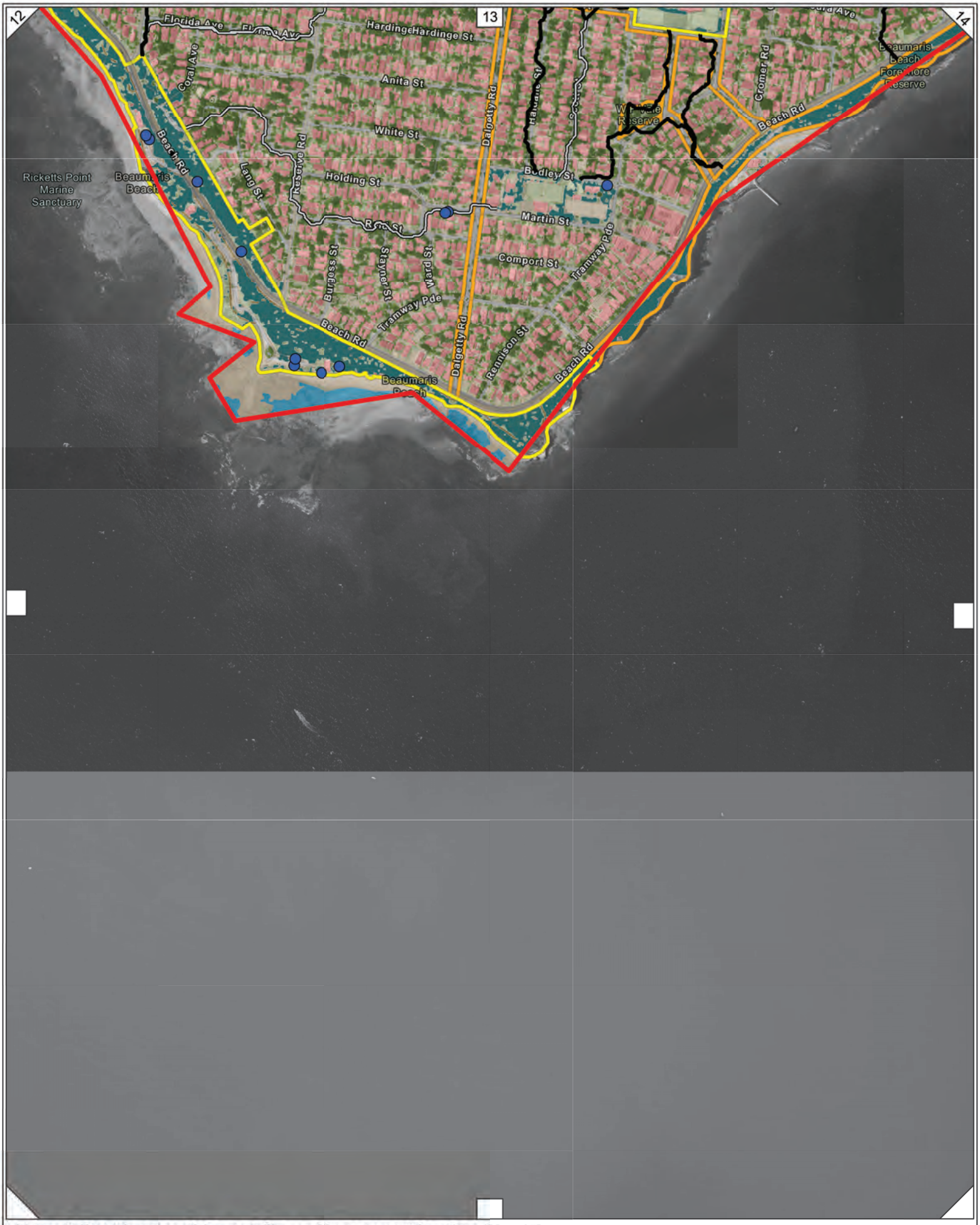

Figure 3: Bayside connectivity modelling and improvement locations [Map 15]

- Bayside LGA boundary
- Core habitat patches
- Least cost paths (≤1000 m)
- Least cost paths (>1000 m)
- Habitat Improvement Areas
- Linkage Improvement Areas
- Habitat-bearing Trees

Land Cover

- Building Footprint
- Arterial - Other
- Non-arterial road
- Tracks/Footpath
- Waterbody/Watercourse
- High vegetation (greater than 7m)
- Medium vegetation (3 to 7m)
- Low vegetation (1 to 3m)
- Ground cover (less than 1m)
- Non-vegetated

0 100 200 400
Metres

Datum/Projection:
GDA2020 MGA Zone 55

21MEL19992-KR Date: 12/05/2022

mapbox

Basemap: © Mapbox © OpenStreetMap, Outline Imagery™
Service Layer Credits: Esri, HERE, Garmin,
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Appendix A Connectivity modelling methods

Vegetation and non-vegetation areas were mapped across the municipality based on 2021 aerial imagery and 2018 LiDAR supplied by Council. A canopy height model (CHM) was created from 2018 LiDAR point clouds.

A detailed land cover classification was developed based on available data (Table 8). The landcover classification map was reviewed manually by Council and adjusted for building footprint and shadows were possible. In areas of overlapping attributes, this was resolved by ranking whereby high and medium vegetation took priority over roads, footpaths, water features, and buildings.

Table 8: Land Use Classification

Category	Land cover class	Raw Data layers	Data Treatment
Infrastructure	Buildings	Building Footprint – 2008 LiDAR (Melbourne Water)	Updated by visual API using latest imagery (10cm April 2021) at 1:2,000 scale.
Transport	Rail	Vicmap – Transport (Tr_rail)	Buffered by 4.7m
	Arterial – Highway	Vicmap – Transport (Tr_road) VicRoads Declared Roads	Width of road determined from class code identified in tr_road: Highway = 9m or 16m, depending on highway or if it was a centreline for one direction or both Major Road = 6m Minor Road = 4m, exclude Proposed Road classes determined from VicRoads Declared Roads dataset (containing Arterial roads, roads not in this dataset were classed as 'non arterial roads'
	Arterial – Other		
	Non-arterial road		
	Tracks and footbridges	Vicmap – Transport (Tr_road)	The Tr_road dataset did not contain all footpaths for the LGA. Paths in parks/reserves, along foreshore were identified, manually updated if were significantly different from the April 2021 imagery provided by Bayside. Missing major tracks in these areas were added manually at a scale of approx. 1:1,250 Average buffer widths for track types shown below: Raised foot bridges = 1m Tracks/paths = 1.5m to 2m (dependent on track width measured on imagery)
Drainage	Watercourse open channel	Natural drain – centreline (Melbourne Water) Vicmap – Hydro (Hy_watercourse)	Additional watercourses from Vicmap were unioned to the natural drainage line layer and all lines were buffered by 2m
	Canal	VMPlan (Plan_Zone) Manual digitising/edits	Used the lot boundary/zone boundary to define the canal with manual editing where required
	Waterbody	Vicmap – Hydro (Hy_water_area_polygon, Hy_water_area_fuzzy)	Waterbodies were captured by visual API using latest imagery (10cm April 2021) at 1:250 scale. Existing features captured within Vicmap

Category	Land cover class	Raw Data layers	Data Treatment
		Bayside CC assets polygons	Hydro were crossed check against the layer to ensure no areas had been excluded. Some small ponds/water features/fountains added from Bayside assets polygons dataset
	Ocean	Vicmap – Hydro (Hy_water_area_polygon, Hy_water_area_fuzzy)	Waterbodies were captured by visual API using latest imagery (10cm April 2021) at 1:250 scale. Existing features captured within Vicmap Hydro were crossed check against the layer to ensure no areas had been excluded.

Core habitat patches were identified and classified. A simplified workflow was applied as follows;

1. Polygons attributed High, Medium, and Low Vegetation were exported to a new layer and dissolved to form solid polygons.
2. Patches of vegetation within 30m were assigned into individual 'patches'
3. Exotic trees were removed by intersecting with the relevant Tree Register points.
4. Vegetation polygons were aggregated and areas that were less than 0.5 ha were removed
5. Manual refinement of patches. Split patches between major roads or other features that may pose a barrier to movement.
6. Attribute patches within Council owned/managed land and other land holders (such as golf courses, schools, parks).
7. Habitat was then classified based on set of criteria to identify 'core habitats' (areas that are large enough to support populations) and 'stepping-stones' (other vegetation that is important for facilitating dispersal within the landscape).

Resistance was applied to all other landcover layers, representing the difficulty species may experience traversing different non-habitat landcover types (e.g. sports field vs. busy road) following rules set in Table 9.

Table 9: Pathway Resistance

Broad Land Cover Category	Land Cover Class	Resistance Raster Value
Infrastructure	Building Footprint	500
Transport (Roads)	Arterial – Highway	400
	Arterial – Other	300
	Non-Arterial Road	200
Transport (Rail)	Rail Corridor	200
Transport (Other)	Tracks/Footpaths	100
Water	Water – Watercourse open channel	100

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Broad Land Cover Category	Land Cover Class	Resistance Raster Value
	Water – Canal	100
	Water – Waterbody	100
	Water – Ocean	100
Vegetation Cover	High Vegetation (greater than 7m)	1
	Medium Vegetation (3 to 7m)	1
	Low vegetation (1 to 3m)	1
	Ground cover (less than 1m)	100
	Non-vegetated	200

Habitat Linkages were mapped using 'Linkage Mapper' version 2.0 toolset for ArcGIS. This identified linkages between areas of core habitat throughout the council area. Pinch-points and barriers to movement between core habitat areas were reviewed with local knowledge.

Linkage Pathways Tool was run twice: Once with the resistance raster masked to road corridors and Bayside Council Assets to identify least cost pathways relying on land owned or managed by Council. Once without any mask to identify least cost pathways based on physical links present at the time of model inputs. The unmasked output included links that were subject to private land management actions. The mask was generated by:

1. Buffering roads by 10m
2. Buffering all Tree Register Points by 15m
3. Buffering all Core Habitat Areas by 5m
4. Including all Bayside asset polygons (not building, sport field assets, etc)
5. Including all Priority Areas (buffered by 5m) identified by Bayside
6. Default settings used for these trials; further refinement may be required.

No distance limit was used to run the tool, the links were manually filtered post output to only show links less than 1km as higher priority. This was factored in to consider ecological redundancy in links as species move through the landscape between patches.

The initial outputs were reviewed to check accuracy of core habitat mapped, feasibility of the modelled pathways between mapped core habitat. Council staff walked a sample of linkages and provided feedback. There was limited data available on the existing character of small linkages outside reserves and further field survey is recommended.

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