

Melbourne Biodiversity Network

Unlocking biodiverse networks for community health and climate resilience

Strategic Plan 2024

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This project was made possible through generous support from the Lord Mayor's Charitable Foundation (LMCF). For over 100 years, LMCF has taken a leading, proactive role in addressing the social and environmental issues of the day.

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Figure 1: Kargaroo Grass along Merril Creek

Acknowledgement of Country

OFFICE and the University of Melbourne acknowledges the Traditional Owners of the unceded land on which we work, learn and live: the Wurundjeri Woi-wurrung and Bunurong peoples.

The project team also acknowledges and is grateful to the Traditional Owners, Elders and Knowledge Holders of all Indigenous nations and clans who have been instrumental in our reconciliation journey.

We recognise the unique place held by Aboriginal and Torres Strait Islander peoples as the original owners and custodians of the lands and waterways across the Australian continent, with histories of continuous connection dating back more than 60,000 years. We also acknowledge their enduring cultural practices of caring for Country.

We pay respect to Elders past, present and future, and acknowledge the importance of Indigenous knowledge in the Academy. As a community of researchers, teachers, professional staff and students we are privileged to work and learn every day with Indigenous colleagues and partners.

Executive Summary - Melbourne Biodiversity Network

Introduction

The Melbourne Biodiversity Network (MBN) project is a proposal and strategy for delivering an interconnected network of public natural spaces that forms over 1600 km of biodiverse ecological corridors across an area of 28,900 hectares.

This project identifies and uncovers existing under-utilised public infrastructure spaces in Melbourne, and maps how these sites could be connected to create biocorridors throughout the city.

The identified corridors reconnect pre-invasion networks and linear connections across the city, to increase ecological resilience and create a biodiverse network. The corridors transform publicly owned sites that are used for single purposes such as powerline easements, road verges and pipe tracks - and provide opportunities for accessible and equitable public green spaces for active travel, recreation and ecological benefits.

Project Vision

The vision for this project is to recreate this city-scale network, suggesting how its threads might be systematically revealed, reconnected, and repaired in order to reproduce biodiverse spaces. The publicly accessible and valuable spaces would be woven into the contemporary city, threaded throughout our existing neighbourhoods, via corridors and islands, as a continuous landscape.

Future Project Stages

The initial stages of the MBN project is now completed, and detailed in this report. The research and mapping activities in this document aim to **REVEAL** and to **RECONNECT** establishing the value and possibility of the project.

Future stages of the project will build upon this research to propose an approach and strategy for the delivery of these corridors to **REPAIR** and **REPRODUCE**, creating an interconnected network of eco-social infrastructure throughout Melbourne.

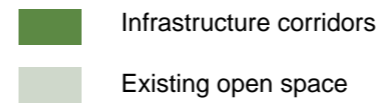
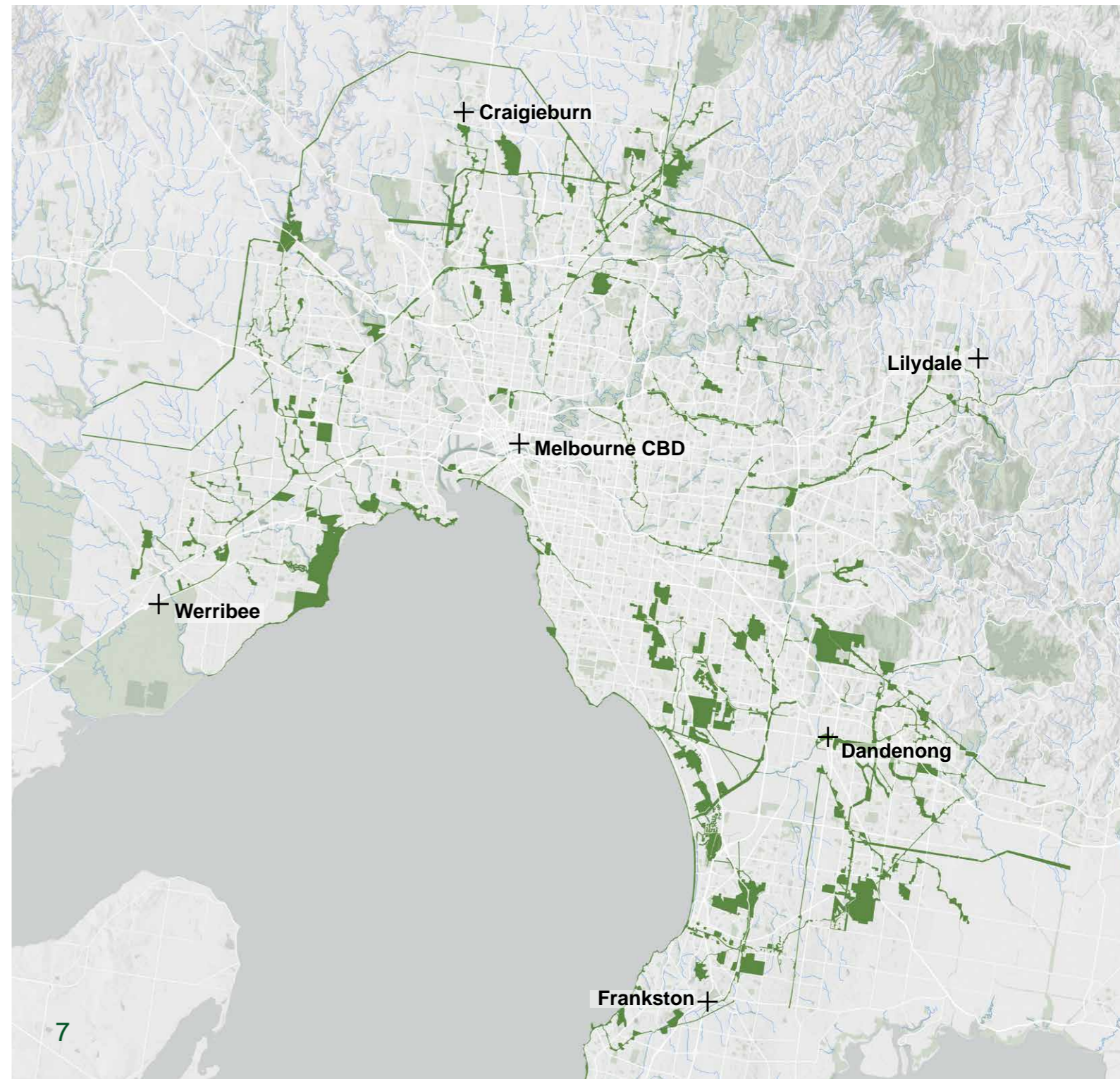
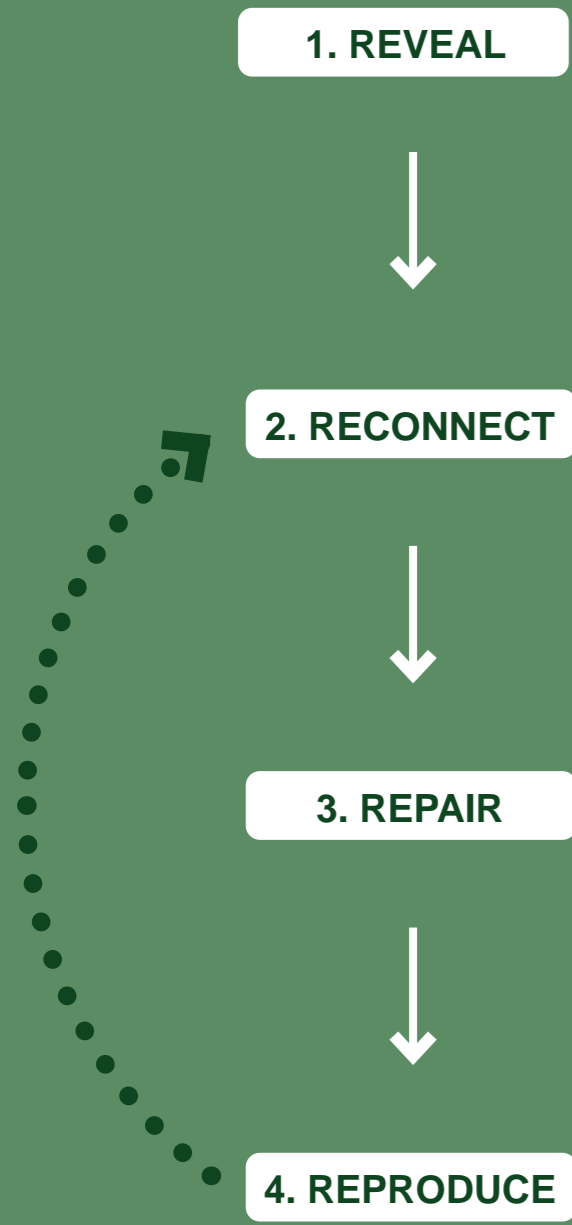


Figure 2: Map of existing infrastructure corridors within Metropolitan Melbourne





1. REVEAL

Mapping existing publicly owned infrastructure spaces to reveal their latent potential.

- 1612 kilometres of potential connected corridors were revealed in Melbourne.
- These corridors constitute a network of 289 square kilometres of public space, making the project one of the largest urban development projects in Australia.
- The under-utilised public infrastructure spaces are primarily located in low-density middle and outer-ring suburbs, which have less access to open green space and are most impacted by heat island effect. This project would help to address issues of equitable access to public open spaces for increasingly developing areas, where biodiversity loss is significant.
- A range of precedent projects have been identified, to provide examples of successful biocorridor projects relevant to MBN, focused on;
 - Community-led regeneration
 - Urban biodiversity projects
 - Corridors in under utilised infrastructure space
 - Local government initiated projects

1. REVEAL



2. RECONNECT



3. REPAIR



4. REPRODUCE

2. RECONNECT

Identifying case study locations for reconnecting these biodiverse networks.

- The research identified eight infrastructure space typologies which are currently used exclusively for service provision, but offer the potential to be transformed into multi-purpose sites.
 - As part of Stage 1, the MBN project undertook four workshops with key stakeholders to identify and understand the enablers and barriers to regenerating these sites, and used these findings to inform the design of Stage 2 of the project.
 - The MBN project objectives align with the key state government policies, and can assist the government and infrastructure agencies to meet their own internal goals.
 - The MBN project can also contribute towards recommendations outlined in the Parliamentary Inquiry into Ecosystem Decline in Victoria, particularly in relation to Traditional Owner leadership, knowledge and expertise; the importance of biolinks and the reintroducing native vegetation to limit/reverse ecosystem decline; and the value of volunteers and community groups.
- A key outcome of initial stages of the MBN project has been the identification of eight case study locations for initial regeneration activity.**
- These sites were selected through GIS mapping, and analysis through a matrix we developed to assess the ecological, social, community and active travel benefits/value of each corridor.

The report then describes the approaches and strategies developed for implementing the research findings in future project stages of the MBN project, through acts of REPAIR and REPRODUCTION.

3. REPAIR

Contributing to repair of Country and employing site specific ecological interventions.

- The project design for the implementation of the MBN is informed by three key design principles: First Nations knowledge, ecological principles and a systems approach. Research and data collection from Stage 1 informed this broader project design, as detailed below.
- First People's knowledge and expertise underpins the MBN strategy, particularly in repairing the biodiversity loss which has occurred since the time of colonial invasion. This will be realised through a project design that is informed by:
 - Understanding the connection between environmental corridors and Songlines, and the role of connectivity
 - Country-wide interdependence
 - Indigenous-led and Indigenous-informed land management and caring for Country strategies.
 - The ecological interventions will be site specific to the particular environmental conditions and possibilities at each location, however interventions will be informed by:
 - Restoration that balances planting endemic species with changing climates and adapting landscapes for the future
 - A networked patch approach, informed by the SLOSS debate, which acknowledges the value of multiple small and connected patches as having significant biodiversity values, as well as enabling community involvement and stewardship.¹
 - Urban agriculture strategies of balancing urban greening with education, culture and community benefits and opportunities.

4. REPRODUCE

A systemic approach to the project informs both the physical interventions and the models of governance and delivery.

- The systemic approach will enable replicability and adaptation at different sites across the city, at different scales, and delivered by different stakeholders. This strategy will include:
- Prototyping of both the site interventions and the organisational structures and delivery (e.g. collective insurance opportunities for community land care groups).
 - Adaptive and modular elements, which provide a set of options for local stakeholders to apply the relevant elements to their specific site.
 - A contemporary 'system-based' governance model would work across nested layers of responsibility, activity and care, enabling highly participative governance at the scale of communities and neighbourhoods.
 - Here communities look after, and effectively 'own' (in a shared, stewardship, non-property-based sense) the corridors they live around—with more representative forms at the scale of the watershed (typically coordinated by environmental protection agencies, water authorities, planning authorities, land care groups, and so on). A 'gradient' of relationships can sit in-between those two poles.

Key project outcomes of Stage 1

Through Stage 1 of the MBN project we have developed a suite of tools and new knowledge:

- GIS mapping of publicly-owned infrastructure space throughout metropolitan Melbourne
- A matrix to determine the most strategic case study sites of intervention for initial regeneration activity, based on ecological, social, community and active travel benefits/value
- Analysis of relevant local and international case studies
- Identifying infrastructure land typologies and developing design strategies relevant to each typology
- Key findings relating to the barriers/enablers across key stakeholder and land management groups, based on four stakeholder workshops
- A policy alignment analysis between the MBN project and relevant government policies and strategies (Appendix 1)
- Ongoing relationships and project buy-in with key stakeholders

Next Steps

To move to the vital second stage of the project to **REPAIR** and **REPRODUCE** the network there are a number of key next steps

- Designing a project plan and strategies to respond to the specific environmental, social and wellbeing context, as well as logistical requirements (land ownership, technical considerations etc) of the eight identified case study sites
- Developing a project plan for the case study sites
- Attracting collaborators to form a network for change, and cultivate buy-in and engagement from local communities and land managers
- Enacting case study projects at priority locations
- Monitoring and evaluation of the success of the case study sites, and identify key learnings to inform adjustments to project design
- Seeking funding, resources, and strategic focus for broad project expansion across key corridors, enabling the project to spread and diversify its intervention points, and ultimately reconnect to form systems of biocorridors.

01

Project Rationale And Scope

A vision for a city-scale biodiversity network

Melbourne Biodiversity Network is an interconnected network of public spaces that forms a richly biodiverse, city-scale web of ecological corridors.

There are many kilometres of existing, under-utilised public infrastructure spaces throughout Melbourne. These spaces are public land hiding in plain sight—fenced-off, disconnected, ‘around the back’—yet often located in areas without good quality public space and around people, and other forms of nature, who need access to such spaces the most.

The sites are currently exclusively used for infrastructure, including powerline easements, road verges, train line easements, pipe tracks, retarding basins, waterways and flood-ways. These are mundane, everyday infrastructures that support the requirements of contemporary Melbourne and are managed accordingly, as narrowly-defined single-purpose utilities. The Melbourne Biodiversity Network project identifies the capacity of this fragmented network of spaces which are overlaid onto remnant channels, as sites for environmental and social benefits. These natural arteries once supported connected and thriving ecosystems, woven across Naarm and surrounds, generating multiple and diverse forms of value.

The vision for this project is to recreate this city-scale network, suggesting how its threads might be systematically Revealed, Reconnected, and Repaired in order to Reproduce biodiverse spaces. The publicly accessible and valuable spaces would be woven into the contemporary city, threaded throughout our existing neighbourhoods, via corridors and islands, as a continuous landscape.

Melbourne Biodiversity Network sees these infrastructure spaces as playing a positive role in three of the largest shared systemic challenges we face, both locally and globally: the interdependent crises of climate and biodiversity, public health, and social justice.

These spaces will support increased biodiversity and cultural diversity, and provide networks of active transport links, shared gardens, and other public open space throughout Melbourne. Community-led restoration and repair will be positioned as the engine for the transformation, yet working with new forms of supportive ‘networked and nested’ governance. A Country-centred design ensures that knowledge systems and cultures of First Peoples will be to the fore, whilst working with a ‘more-than-human’ perspective will help regenerate ecosystems, creeks and waterways. This network will not only connect ecological corridors but also existing bike paths, walking trails, and community infrastructure, supporting more active, healthy and livable communities alongside other forms of biodiversity.

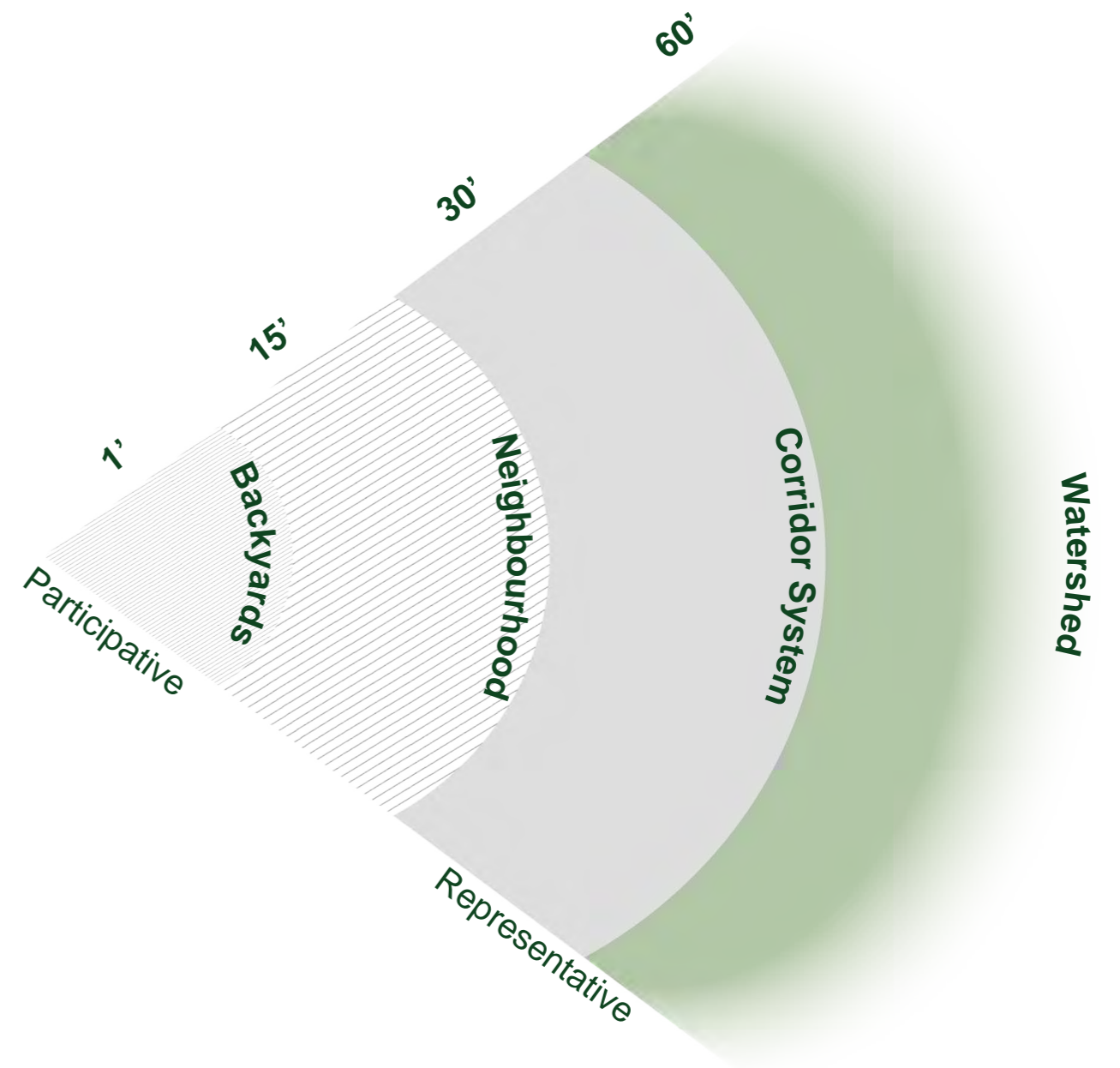


Figure 4: Diagram of nested governance across the corridor system allowing the approach to be reproduced at the scale of the city, from the one minute neighborhood, to 60 minute neighborhood

Melbourne's hidden networks

Melbourne is oriented around Port Phillip Bay, transected by a series of waterways. As the waterways radiate out from the bay, they create ecological biocorridors that often connect remnant vegetation at the fringes of the city.

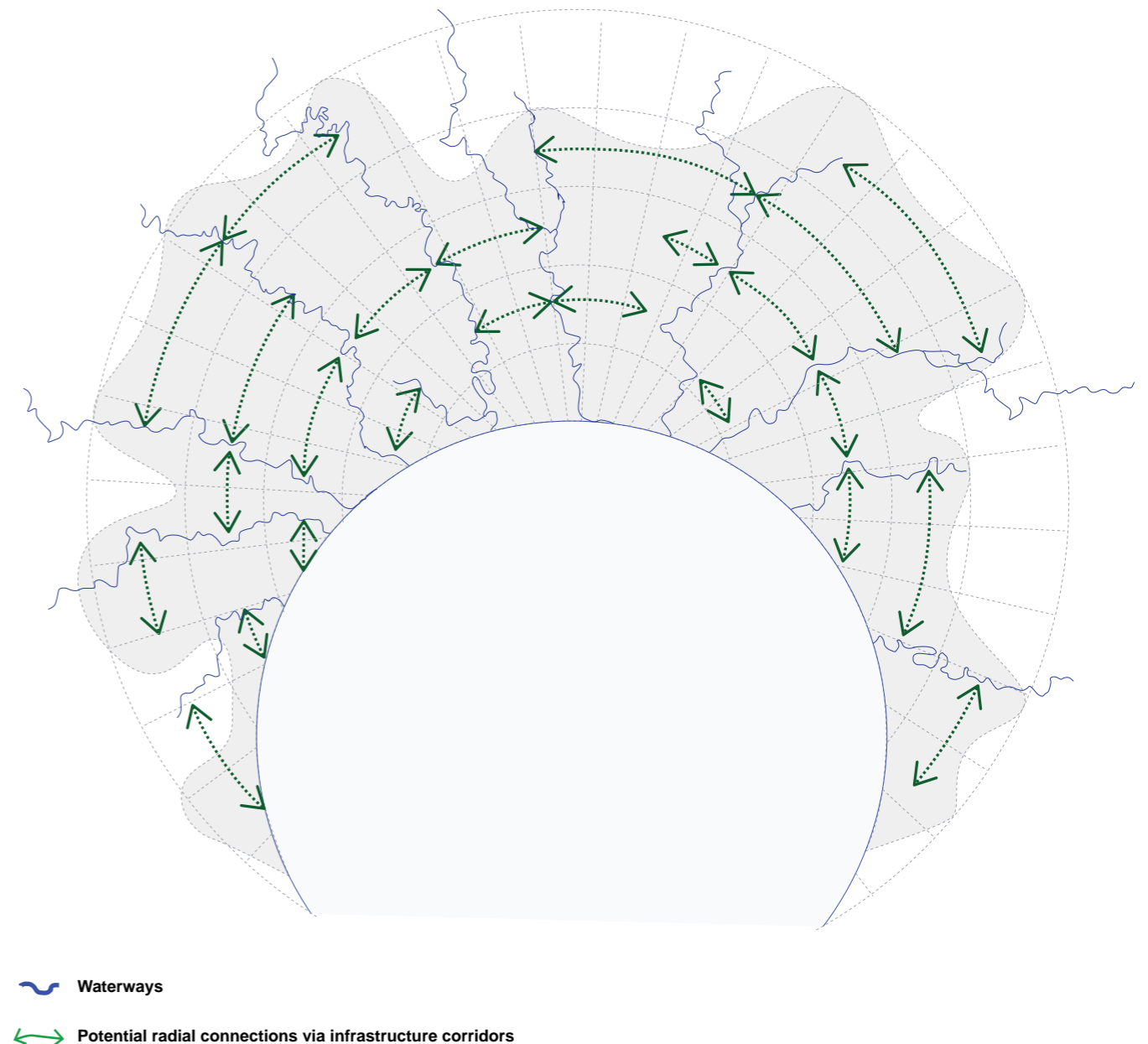
While the introduction of large scale agriculture and the growing urban fabric of the city have disrupted the pre-contact ecologies, these radial waterways remain. This project aims to identify and reinstate the linear connections across the city, linking these waterways to increase ecological resilience and create a rich bio-diverse network that spreads throughout Melbourne.

Many of these potential biodiversity corridors exist within **the middle and outer ring suburbs which often lack quality public and biodiverse open spaces and have fewer active transport links**. As Melbourne's population grows towards a projected nine million residents by 2050, the need for quality green and biodiverse open space will only become more prevalent. Much of this growth is occurring in Melbourne's middle and outer suburbs which are already underserved with accessible and biodiverse public space - and are more likely to be susceptible to the urban heat island effect, biodiversity loss and unhealthy car dependency.² The inequitable planning of green infrastructure is already evident in the existing Melbourne biocorridors which have been regenerated, located in wealthier, well-connected inner-ring suburbs.³ This lack of equity will only be exacerbated as the climate crisis unfolds.

In addition to creating a resilient biodiverse network, a project to unlock this infrastructure for common good would help create healthy, livable, and resilient communities, and provide a more equitable distribution of quality open space throughout Melbourne.

The Melbourne Biodiversity Network comprises 1,612 kilometres of possible biocorridors. Placed end-on-end, it would reach from Melbourne to Sydney and halfway back again. The network of public space in 28,900ha, which is eight times larger than the City of Melbourne. This makes it one of the largest urban development projects in Australia. By way of comparison Melbourne Metro Rail Tunnel is around 9km long and Western Sydney Airport Project is around 1700 hectares, yet both are essentially uninhabitable. Fishermans Bend, currently thought of as 'Australia's largest urban renewal project' is around 480 hectares.

Figure 5: Diagram showing waterways flowing into Port Phillip Bay, and potential connections across the urban fabric.



02

Project Outline

The project is divided into four overarching strategies. The findings are detailed in this report of the work undertaken so far, of **revealing** and **reconnecting** the network, the barriers and enablers that have limited activity of the sites thus far, and identifying eight key case study locations for initial regeneration interventions.

Repair and reconnect strategies presents approaches for targeting resources, attention, and activity to key corridors and connections could set up a coordinated city-wide approach for the **repair** and **reproduction** of these infrastructure spaces.

Reveal and Reconnect

Key activities undertaken during Reveal and Reconnect of the MBN project included:

- An initial context review, to establish appropriate methods and strategies; as well as preliminary mapping of the locations and typologies of public open spaces in Melbourne.
- A series of four collaborative workshops and discussions with key stakeholder groups (practitioners, LGAs, state government agencies, community groups) to identify current activities, and understand barriers and opportunities for biocorridors.
- Interviews with four First Nations experts.
- A dedicated workshop with Arup.
- Detailed mapping of existing public open space to identify linear linkages and potential sites for networked corridors.
- Developing maps that identify community networks and other social and cultural infrastructure to assist in determining appropriate sites for test projects.
- Establishing corridor selection criteria, based on mapping and stakeholder feedback.
- Employing the selection criteria to identify priority case study sites for the second phase of the MBN project.

Repair and Reproduce

This report describes the approaches that have been developed for implementing the research findings, through the overarching strategies of **repair** and **reproduction**. The repair and reproduce section of the report details the three key MBN design principles of

- First People's knowledge and expertise
- Ecological principles
 - Adaptive landscapes.
 - The value of small networked patches.
 - Aligning ecological outcomes with education and community opportunities.
- A systemic approach to both the physical interventions and models of governance and delivery, including:
 - Prototyping and adaptive/modular elements
 - Nested governance and systems-financing.

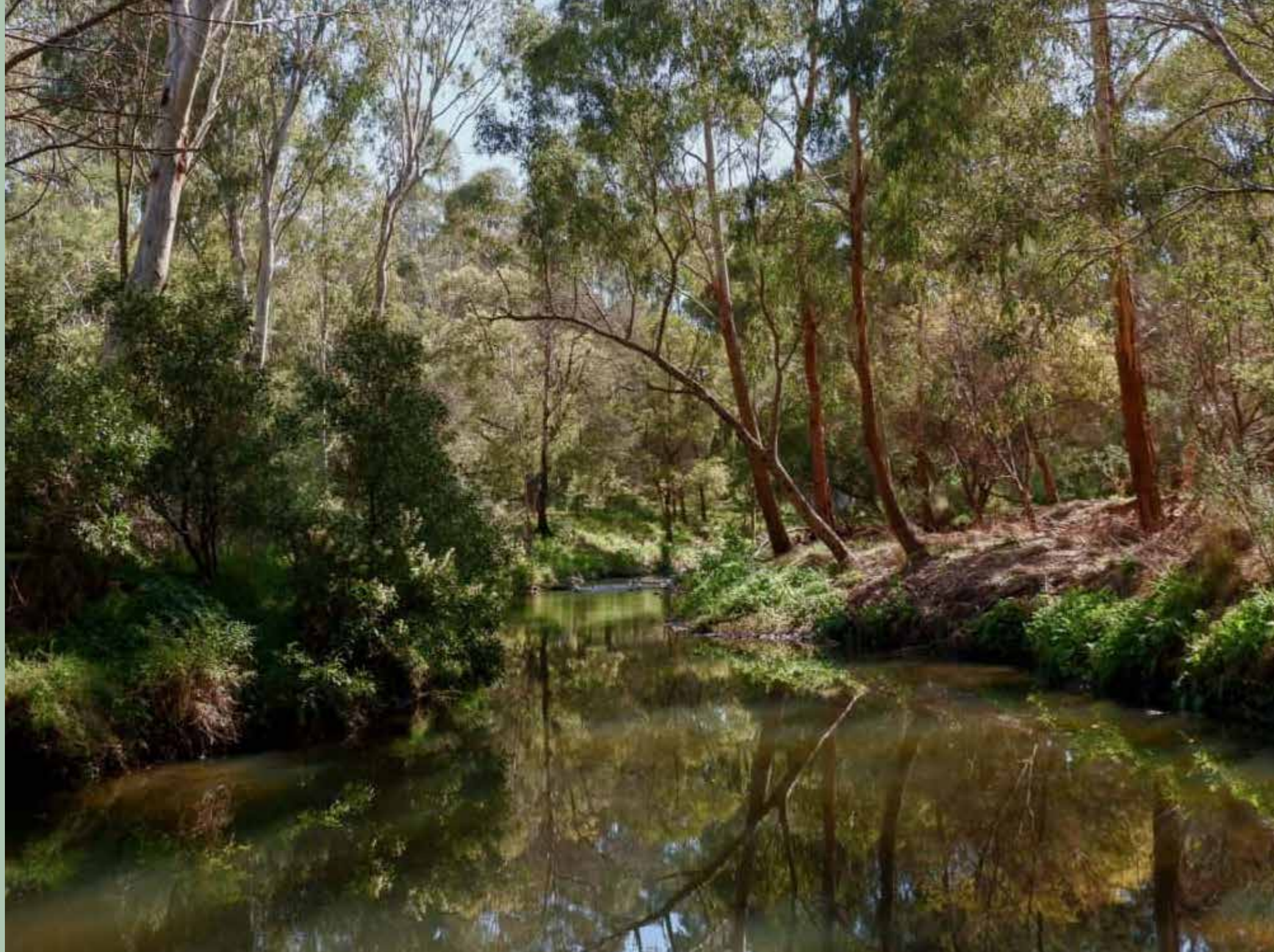
Future Delivery

- Designing a project plan and strategies to respond to the specific environmental, social and wellbeing context of the eight identified case study sites.
- Attracting collaborators and cultivate buy-in and engagement from local communities and land managers
- Enacting case study projects at priority locations.
- Monitoring and evaluation of the success of the case study sites, and identify key learnings to inform adjustments to project design.
- Seeking funding, resources, and strategic focus for broad project expansion across key corridors, and ultimately reconnect to form systems of biocorridors.

Figure 6: View looking north-east towards Plenty Gorge along the Maroondah Aqueduct



Figure 7: Darebin Creek in Melbourne Northern suburbs



Reveal

The contemporary Melbourne landscape is usually defined in a physical sense. The complex cultural landscape, however incorporates not only the physical, but also what's beneath, on and above the surface, including the sky and the cosmos. ... Country embodies these connections associating with what's under the ground, on, above, into the sky, and finally into the cosmos.⁴

Mandy Nicholson, David Jones

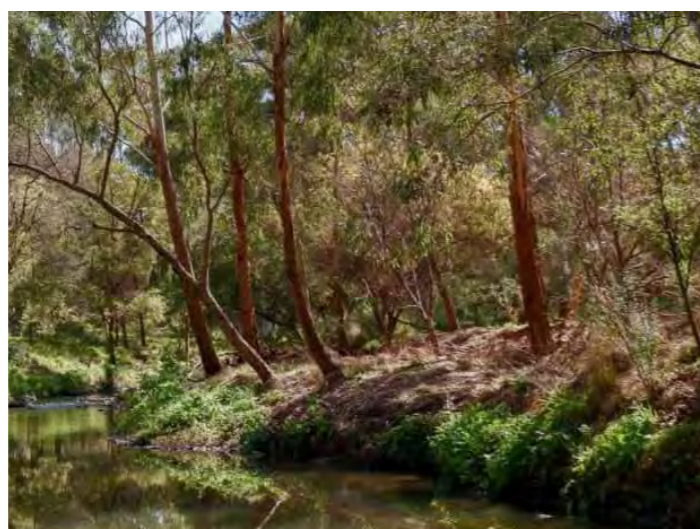
03

Cultural Heritage and Custodianship

From 1788 to the present day, the European invasion of Australia has been defined by extractive exploitation of the land, through widespread land clearing for agriculture and property development, the introduction of destructive mining and forestry, and unprecedented levels of biodiversity degradation. This environmental impact has only been mirrored in the “colonial genocidal actions” against Australia’s Traditional Owners, its First Peoples.⁵ The ecosystems that Traditional Owners have been custodians and stewards of for over 60,000 years were also impacted by the introduction of non-native species (e.g. flora, as well as fauna like rabbits, foxes, and cats) and the interruption of Indigenous fire management practices through forcing Traditional Owners from their lands. This Victorian story sits within the wider Australian context, which has “the highest mammal extinction rate in the world” amongst much other biodiversity loss.⁶ The Parliamentary Inquiry into Ecosystem Decline in Victoria details the impact of colonisation on ecosystem decline, as well as providing evidence of Traditional Owner management of Country through significant events and changes to landscape prior to European invasion.

The report also acknowledges that biodiversity decline has a significant impact for First Nations groups.⁷

First Nations knowledge and expertise underpins the design and future delivery of the MBN project, as detailed in Section 13 of this report.



04

Ecological Context And Rationale

It is now globally recognised that the ‘biodiversity is declining faster than at any time in history.’ At a national level, Australia is a signatory to the United Nations Decade of Ecosystems Restoration, which is committed to working to ‘prevent, halt and reverse the degradation of ecosystems on every continent and in every ocean.’⁸

The *Parliamentary Inquiry into Ecosystem Decline in Victoria* found that the state’s ecosystems face serious decline, and that this has significant implications for the health, prosperity, and ultimately survival of both Victorians and Victorian flora and fauna. Since colonisation; Victoria’s population growth, industrialisation and land management has placed the environment under increasing pressure and resulted in the loss and degradation of numerous species and habitats. As outlined in the government’s Biodiversity 2037 document,

Victoria is the most intensively settled and cleared state in Australia, with over 50 per cent of the state’s native vegetation cleared since European settlement. More recently, climate change has brought new and challenging threats to biodiversity.⁹

All of these interventions have contributed to widespread biodiversity loss, a decline in soil health, and ongoing contributions to the drivers of the climate crisis; as well as its effects, like urban heat island, riverine flooding, coastal sea level rises, and bushfires. In turn, this makes Victoria less resilient to extreme weather events, which will increase as the climate crisis unfolds.

The Inquiry also specifically highlights the role of biolinks in assisting to address biodiversity loss, and the loss of vegetation that has occurred through diminished connectivity of ecosystems:

In Victoria, much of the connectivity between ecosystems has been lost through land clearing and changed land uses. Around 80% of all native vegetation has been cleared. Most remaining examples of native forests,

woodlands and grasslands occur in parks and reserves, or privately-owned farmland and urban environments, not under management of the Victorian Government.¹⁰

The Inquiry in Ecosystems Decline also found that biolinks both promote and protect biodiversity, as well as provide climate change mitigation opportunities. Revegetated biolinks are acknowledged for increasing the resilience of Victorian ecosystems to climate change, providing suitable habitats for native species, increasing genetic diversity in populations, and potentially increasing carbon sequestration.

Several key findings and recommendations from the inquiry directly relate to the research, design and future delivery of this project:

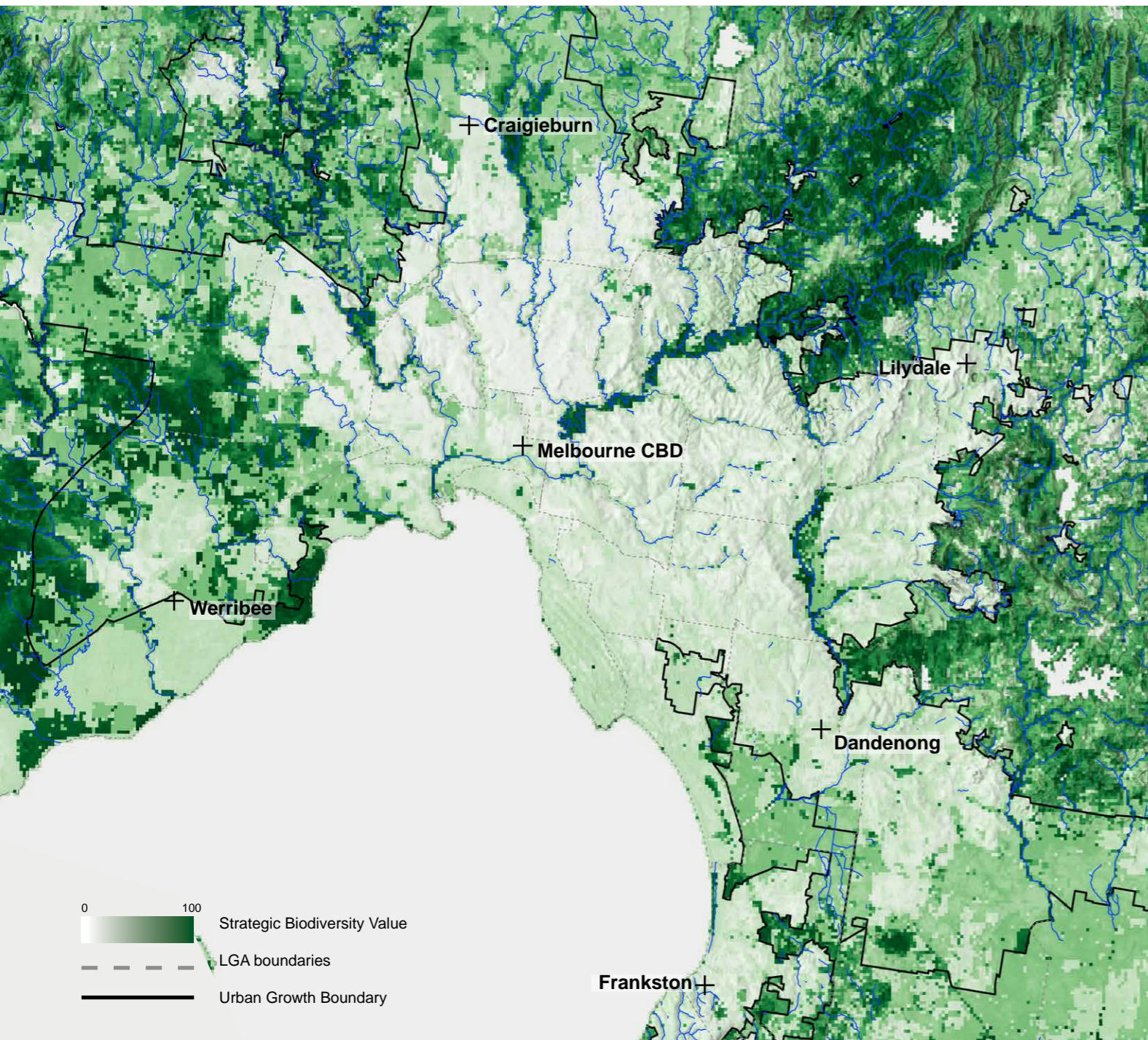
- The need for Traditional Owner leadership and expertise in working with rather than against biodiversity.
- The importance of creating biolinks in suturing together corridors.
- That the removal and degradation of native vegetation is a key driver of ecosystem decline.
- The value of landcare groups and local government in critical biodiversity protection, conservation and restoration.
- The need for greater support for councils to undertake localised biodiversity initiatives.
- The significant role of volunteers in protecting, conserving and restoring Victoria’s ecosystems.

This MBN project presents a direct and applied opportunity for the Victorian state government to redress some of the 80% native vegetation loss, through enabling a large-scale bio-corridor intervention on publicly owned land.

05

Urban context

Figure 8: Map showing that Melbourne has been largely cleared of biodiversity.



As outlined in Section 4, the landscape of Melbourne has borne a series of fundamental ruptures post-colonisation. These are consistent with global shifts towards urbanisation, with cities moving both upwards and outwards. The particular patterns of population growth, and associated approaches to infrastructure projects, have in many cases impinged upon existing open spaces. This process transforms previously biodiverse and regenerative adaptive landscapes into monofunctional hardscape infrastructure spaces. Australian cities prioritise car-dependent suburban development, with Sydney and Melbourne being home to some of the largest new houses¹¹ on the least densely settled land in the world, promoting heavy car reliance.¹²

As outlined in Section 9 there are many precedents of cities developing linear open public spaces that capitalise on vacant urban land, as well as providing pedestrian links to transport and biodiversity opportunities.

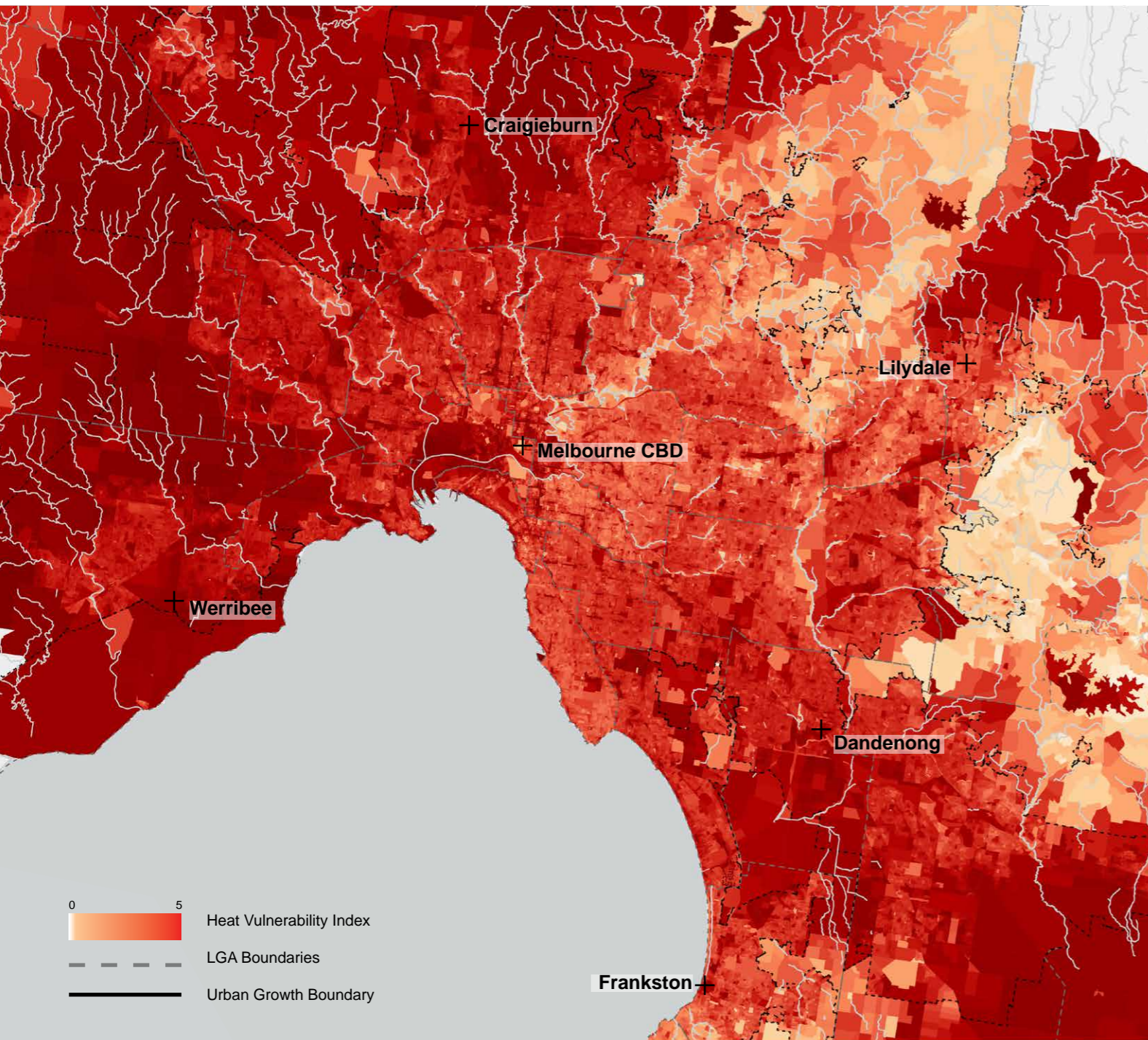
In a Victorian context, Melbourne's urban planning moves radially out from its relatively high-density CBD through extremely low-density middle- and outer-ring suburbs. The largely opportunistic nature of urban development in Melbourne means that these suburban environments often feature underutilised and unmaintained pockets and patches of land, peppered throughout the areas most impacted by urban heat island effect—and particularly in the historically industrial areas in the west of the city.

This project focuses on these suburban environments. These sites are undergoing significant transformations through new housing developments, transport and infrastructure corridors in order to support and drive ongoing population growth. This pattern provides shared challenges in ensuring that there is ample open green space for both the livability, health, vitality and resilience of these areas for residents, as well as for ecological protection and benefits. The corollary of these challenges is that the same environments provide great opportunities to embed ecological corridors alongside and within these new urban developments. This can repair and reconnect previously underused existing open spaces and patches of existing biodiverse habitat and indigenous species.¹³

06

Health and Community Benefits

Figure 9: Map showing the high heat vulnerability throughout Melbourne, particularly in the west and south east.



It is well documented that public open space provides health and wellbeing benefits, in addition to significantly contributing to biodiversity, city cooling and climate resilience values.¹⁴ *Melbourne's Open Space for Everyone* strategy identifies the need for increased access to open spaces, as a means to improve wellbeing and community health.¹⁵ Similarly, Parks Victoria's *Healthy Parks Healthy People* document details evidence from city planners, medical professionals and psychologists about the importance of public open space for the mental and physical health of residents.¹⁶

The MBN project is also designed to help facilitate active transport and active living. This aligns with the *Victorian Public Health And Wellbeing Plan 2019-2023's* recognition that public open space helps to promote mental and physical health and wellbeing; and vision to create public open spaces that increase participation in sport and active recreational activities.¹⁷

Evidence also shows that access to public open space improves mental health, particularly when it is well-designed, accessible, and safe for all members of the community to interact and build relationships.¹⁸ Similarly, active living can improve the quality of life for residents, as well as reduce the risk of serious and chronic health issues. The ability to grow healthy food locally through urban agriculture has not only direct health benefits but also co-benefits such as food security and mental health benefits. The significance of access to open public spaces for both community and individual wellbeing was particularly highlighted during the lockdowns of COVID-19.

Figure 10: Merri Creek corridor in the 1970's prior to revegetation works



Reconnect

Aboriginal knowledge is ecological; it's about relationships, responses to relationships, and respect for the land.

Bruce Pascoe, *Dark Emu*



Powerline Easement



Powerline Easement Intersecting Waterway



Victrack Easement



Pipetrack



Former Waterway



Municipal Infrastructure



Road Easement



Floodway and Retarding Basin



Retarding Basin

07

Existing spatial typologies

Our initial city scale mapping revealed that there are currently over 1600 km of publicly owned linear corridors that are underutilised and under-valued.

These sites have the potential to operate as meaningful social and ecological corridors, and collectively would be one of the largest urban development 'sites' in Australia. The scale of this underutilised space is largely invisible as it is distributed throughout the existing city. Though not all corridors are necessarily appropriate for a diverse range of uses, the latent potential of this land can barely be understated.

Throughout Melbourne there are a range of infrastructure space typologies that can be converted into biodiversity corridors. These include:

- former waterways
- pipe tracks
- power-line easements
- retarding basins
- floodways
- road easements
- rail corridors
- gas easements

The opportunities for restoring these infrastructure spaces are partly determined by the management and governance of the sites. Ownership and access has historically been a key barrier to their restoration or opportunities for alternative use. The following sections detail the current governance and ownership models, before detailing how current restrictions could be addressed/or removed.

- Minimal restrictions
- Moderate restrictions
- Highly restrictive

Existing Spatial Typologies

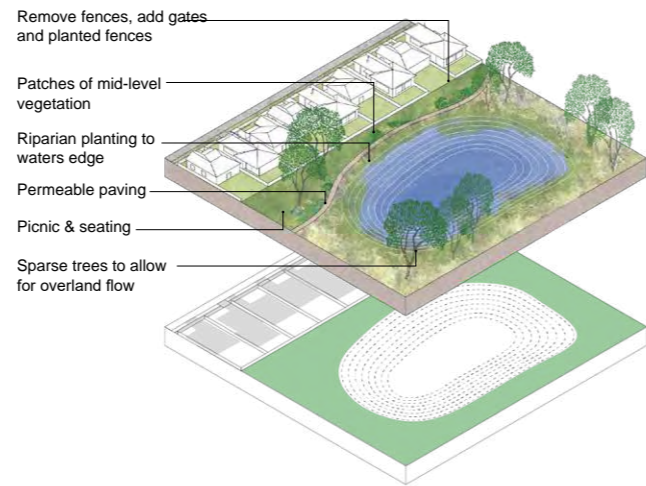
Residential Typologies

Retarding Basin

Current condition



Proposed condition

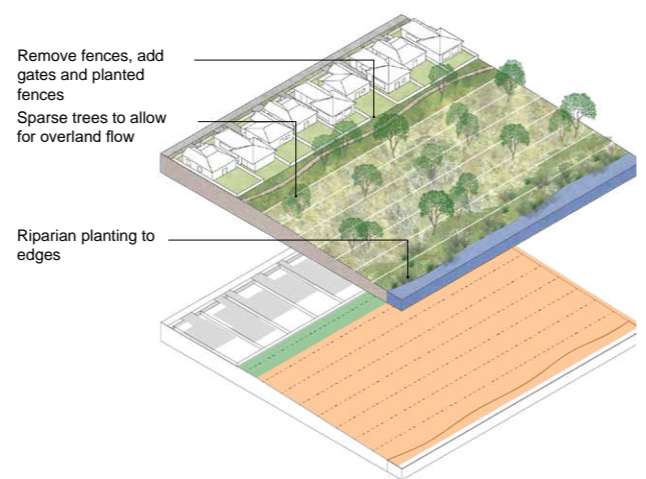


Floodway

Current condition



Proposed condition



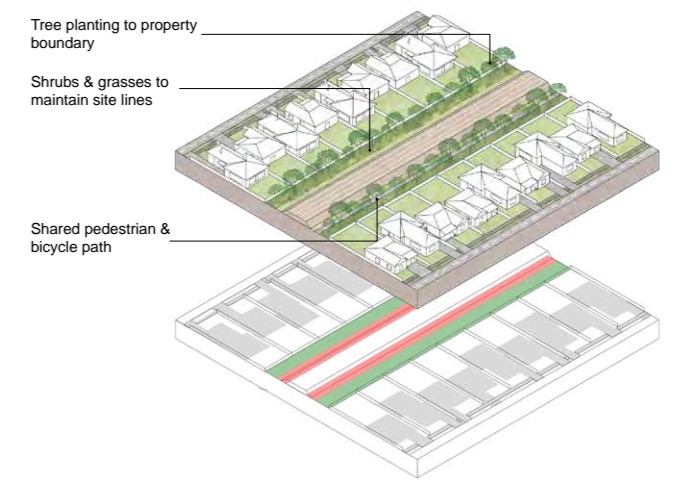
Residential Typologies

Rail Corridor

Current condition



Proposed condition



Pipe Track in Road Way

Current condition



Proposed condition

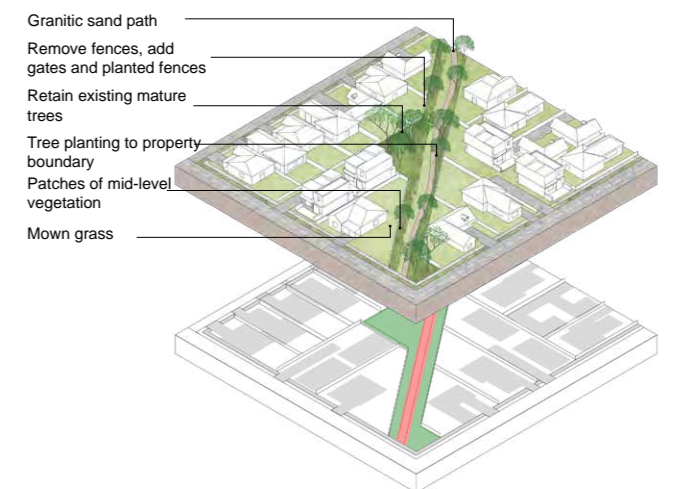


Figure 11: Design approaches for infrastructure spaces in residential areas

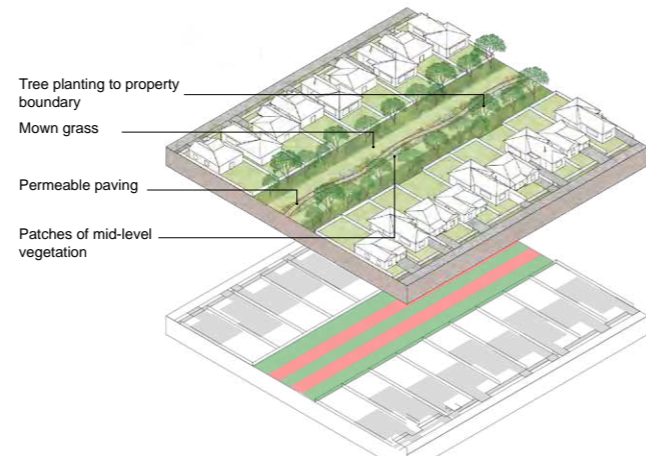
- Minimal restrictions
- Moderate restrictions
- Highly restrictive

Residential Typologies

Gas Easement Current condition



Proposed condition



Residential Typologies

Former Waterway Current condition



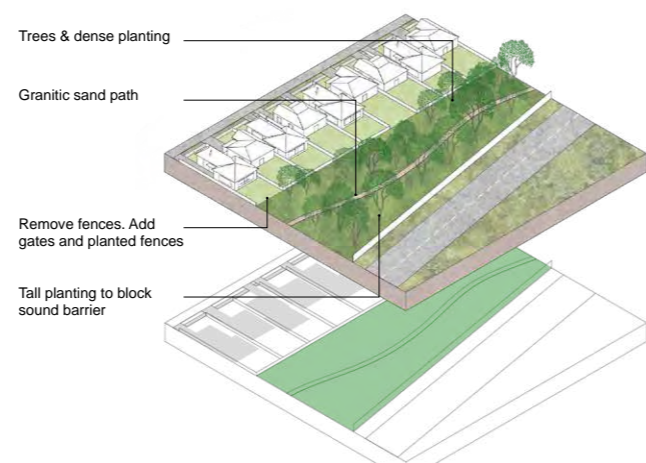
Proposed condition



Road Easement Current condition



Proposed condition



Poweline Easement Current condition



Proposed condition



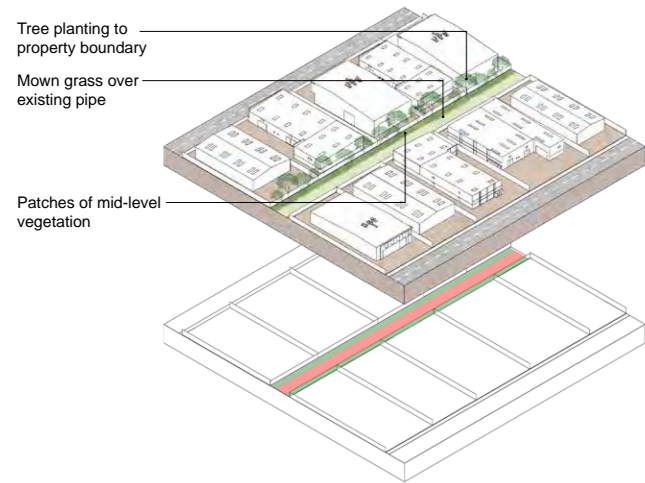
Figure 12: Design approaches for infrastructure spaces in residential areas

- Minimal restrictions
- Moderate restrictions
- Highly restrictive

Industrial Typologies

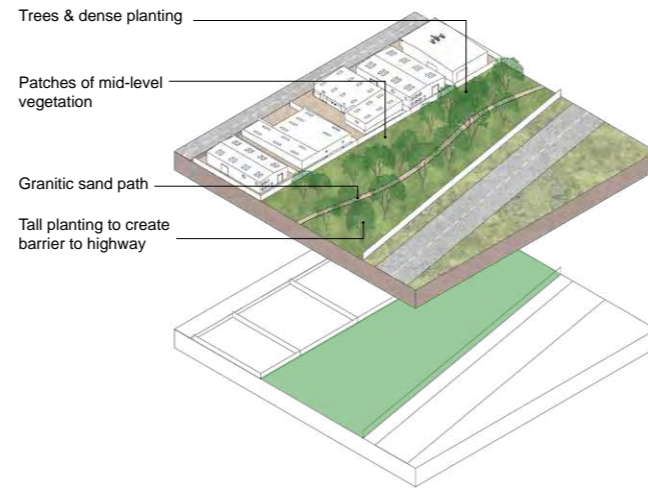
Pipe Track

Proposed condition



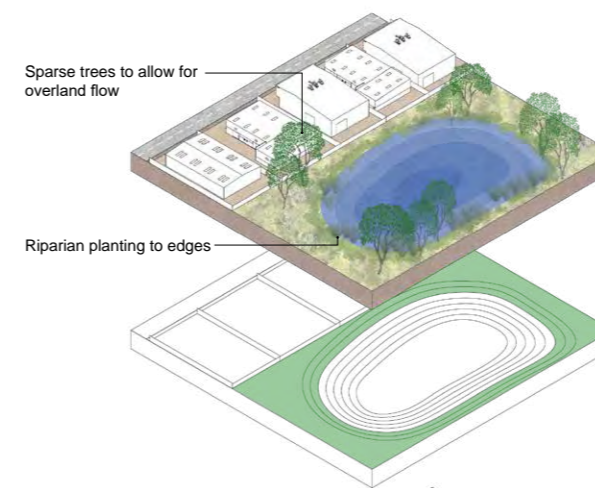
Road Easement

Proposed condition



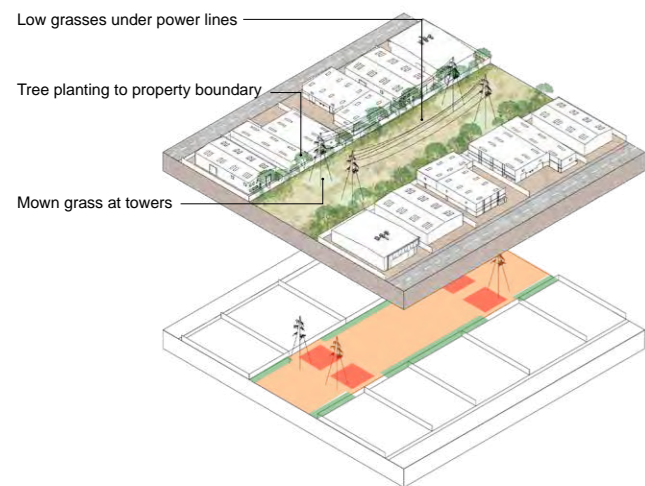
Retarding Basin

Proposed condition



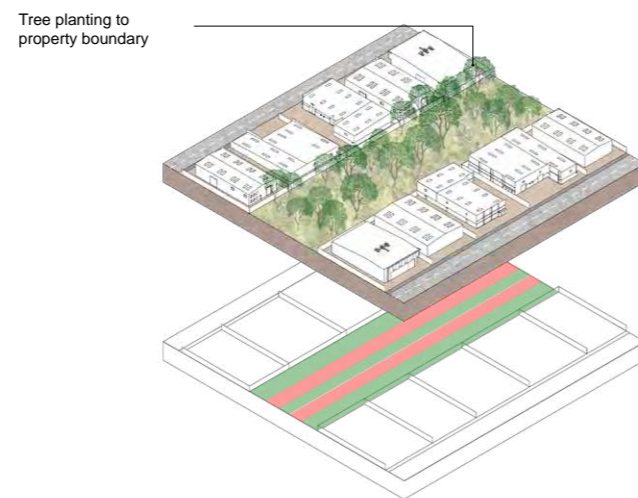
Powerline Easement

Proposed condition



Gas Easement

Proposed condition



Floodway

Proposed condition

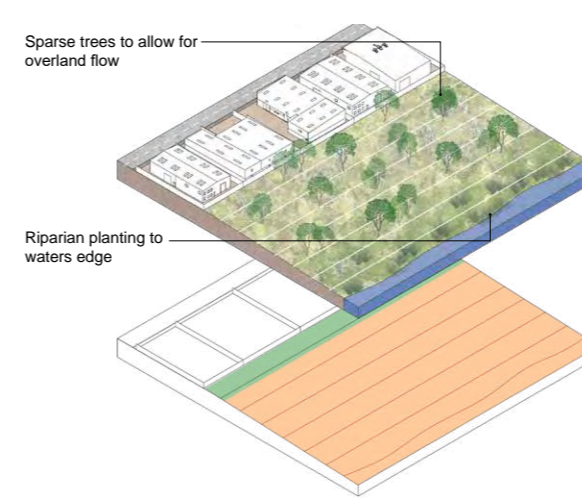


Figure 13: Design approaches for infrastructure spaces in industrial areas

- Infrastructure corridors
- Existing open space

Typologies Creating a Network

Each corridor is made up of multiple infrastructure typologies, a range of design strategies need to be deployed in order to deal with the specific restrictions and opportunities of each corridor. In future stages of the MBN project designs will be developed for specific case study corridors, using the design strategies for typologies as a starting point.

Figure 14: Map of multiple design approaches on a sections of a case study corridor



08

Land management and policy context

Land Management

Infrastructure spaces throughout Melbourne are predominantly embedded in public land and managed by a range of government and non-governmental organisations. These organisations range from Victorian Government's Department of Energy, Environment, and Climate Action (DEECA), Victorian Government's Department of Transport and Planning (DTP), Melbourne Water, VicRoads, power and gas companies, VicTrack, and local councils. Often infrastructure spaces sit within combinations of complicated governance arrangements, and are nested within multiple jurisdictions, responsibilities and interests.

The opportunities and restrictions for public open spaces are partly dependent upon the land owners and managers, as well as specific requirements depending on the primary use of the area (e.g., planting height restrictions under transmission lines, issues with roots and underground pipes, and vehicle access).

Using open sourced data and GIS modelling, we have mapped both the ownership of public open space, as well as covenants and restrictions that will inform planting strategies. Ultimately, careful plant selection, co-design and governance cultures, and maintenance and care activities will be key to ensure the delivery of quality ecological outcomes while allowing access and providing a safe environment for all.

Policy Context

There are a wide range of policies and plans that both directly and indirectly align with the objectives of the Melbourne Biodiversity Network project, including *Plan Melbourne*, *Protecting Victoria's Environment - Biodiversity 2037*, and *Open Space for Metropolitan Melbourne*. **There is clear evidence of how the Melbourne Biodiversity Network project can contribute to a range of established outcomes and objectives and assist in achieving state-level priorities** (See Appendix 1).

These policies have resulted in a range of government-led programs and activities, however, despite the development of these broad aims and targeted interventions, overall there has been limited evidence of these policies and plans meaningfully producing outcomes that help Victoria to move towards its biodiversity goals. The MBN project provides an opportunity for the internal objectives of government agencies to be met —while also expanding upon and facilitating access to land, community groups and other living systems — in order to deliver diverse environmental, social and cultural outcomes.

Limited monitoring and evaluation to assess the effectiveness existing activities can be partly attributed to the relatively recent introduction of some of the biodiversity strategies and policies, and the need to allow time for interventions to develop and be appropriately monitored and evaluated. However, as outlined in the *State of the Environment Biodiversity* report, there is an urgent need to ensure that policy objectives are met through strategic and well-resourced projects with clear and measurable outcomes.¹⁹

The MBN project offers direct and impactful ways to produce these shared system-scale outcomes, such as regenerative biodiversity, improved public health and social justice, resilient climate adaptation and mitigation measures. It indicates how revealing, repairing and redistributing biodiverse open and shared space is key to achieving these outcomes. Through the stakeholder workshops and expert interviews (See Section 10), the project has helped to identify existing barriers that have limited other programs to significantly contribute to biodiversity outcomes and policy objectives.

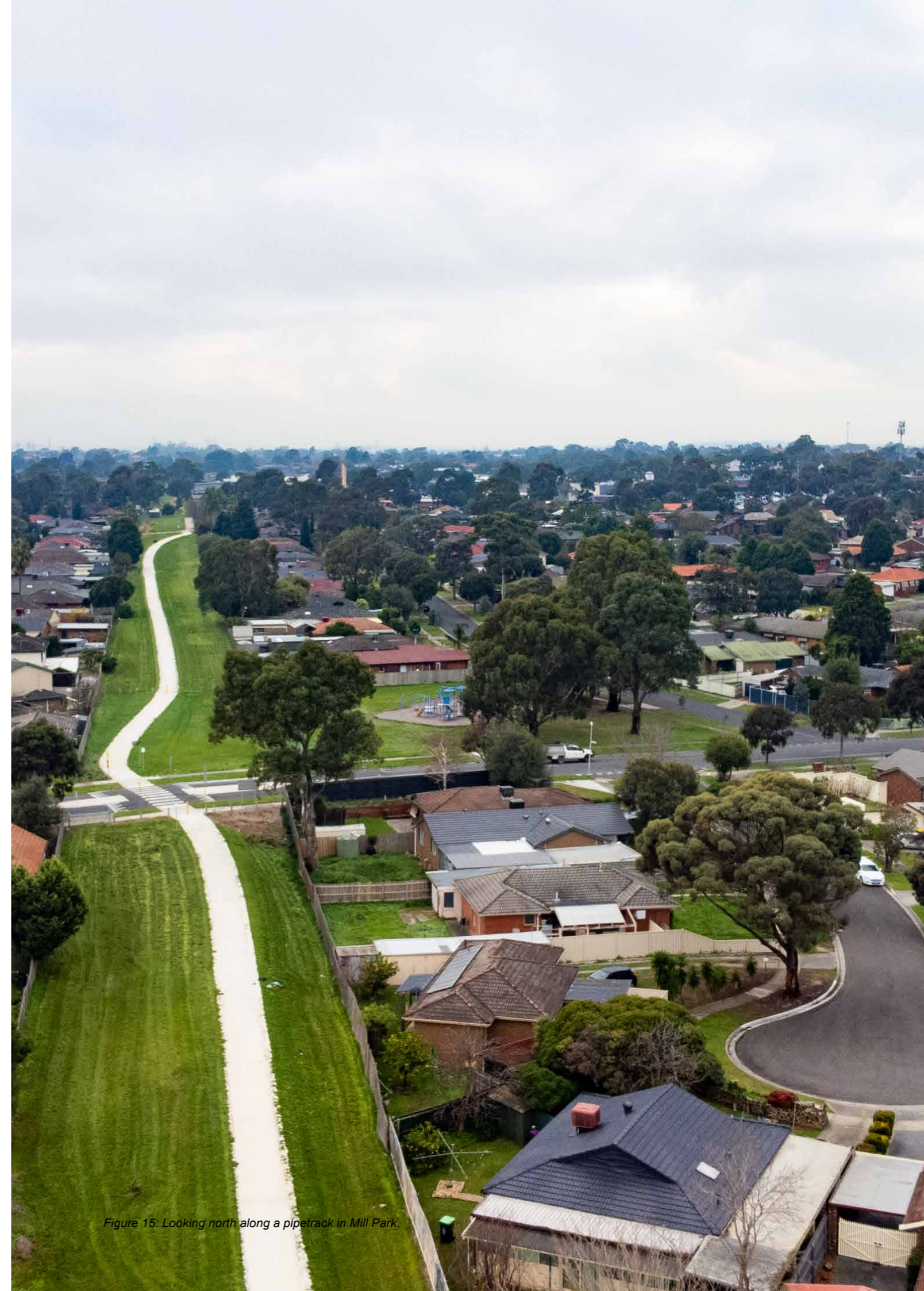


Figure 15: Looking north along a pipetrack in Mill Park.

09

Precedents

There are a range of relevant local and international projects that offer precedent case studies for shaping the content, approach, objectives, and governance structures for MBN.

Key precedent projects are described below under four themes that are central to the development of the MBN approach:

- Community-led regeneration
- Urban biodiversity
- Infrastructure space
- Local government

A high level table of additional precedents and their key relevant themes is provided in Appendix 2.

Community-led regeneration

The three projects detailed on this page are self-initiated 'bottom up' projects that have grown in scope and scale over time. While MBN is being developed by OFFICE in partnership with the University of Melbourne and intends to partner with a range of state and local government bodies - the precedent studies offer frameworks for working with communities, as well as models for monitoring and evaluation.

Girona Shores, Marti Franch

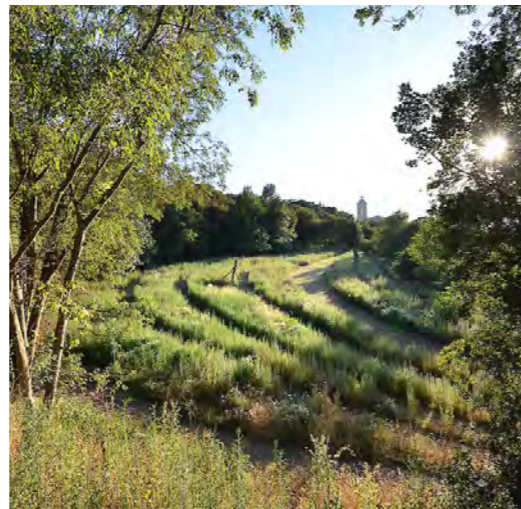


Figure 16: Girona Shores, Spain, Marti Franch

The Girona Shores project is a self-initiated project by landscape architect Marti Franch. The initiative began with unofficial vegetation management at the fringes of a town, before evolving into a low-cost approach to the development and maintenance of green public multi-use spaces across the town. As the project developed, municipality maintenance staff became involved, and the Multifunctional Green Infrastructure of Girona plan was developed.

The project commenced with small interventions, which once proved, were scaled up to a town-wide strategy. Through removing and adjusting vegetation, and strategically considering habitat types (high meadow, low meadow, unmanaged forest), small interventions have promoted significant positive biodiversity options, and opportunities for cultural programming of the spaces. In addition to the development of the green infrastructure plan, the project has resulted in 13 new loop paths, and 30 naturban parks.

Merri Creek



Figure 17: Friends of Merri Creek, Melbourne

Friends of Merri Creek evolved from a small collective of friends groups in the 1970s to the formation of Friends of Merri Creek with the Merri Creek Management Committee in 1989. The group is driven by community activism works to restore and protect Merri Creek and the parklands that surround the waterway. Through weeding, earthworks, restoration and monitoring of wetlands, and submissions to planning and decision-making processes; the group aims to preserve and enhance Merri Creek. Members of the committee are six local governments in the catchment area, Friends of Merri Creek and the Wallan Environment Group. The Committee and Friends of Group have strong links with the Wurunddjeri's Narrap natural resources team, and are committed to build a sense of stewardship for local communities through community organising and collective action. Arguably, the success of Merri Creek's restoration is the collective action of both MCMC and the Friends, that also brought together Local and State governments' active involvement, funding and input.²⁰

Test Plot - Terremoto



Figure 18: Test Plot, Los Angeles, Terremoto

The Test Plot project began during lockdown in LA, where local landscape architecture firm Terremoto saw an opportunity to rehabilitate a local parkland plot. The Test Plot was initially seen as a pilot to test a community-focused restoration project that required limited interventions and time/resources from the community participants. The project has dual aims of ecological restoration and community connections.

The primary mechanisms for ecological change include initial site weeding, planting of native species, and ongoing mulching, watering and maintenance. The outcomes of the project are being monitored by students at the University of Southern California, who have developed a three-pronged approach to evaluating the success of the sites.

1. Tracking larger ecological processes (drone and ground photos against base data of the sites)
2. Land practices (seasonal updates on 'tests' at each location, e.g., different watering regimes, maintenance tasks and habitat types)
3. Stewardship and building community capacity (qualitative interviews with participants, volunteer hours).

Precedents

Urban Biodiversity

The urban biodiversity precedents highlight the possibilities of working across different scales to produce ecological and community benefits. Living Links shows the benefit of cross department collaboration at a catchment scale, while the Woody Meadow and Linking the Mornington Peninsular Landscape initiatives demonstrate the value of low-cost community interventions with significant ecological outcomes.

Living Links



Figure 19: Mapping the Gap, Melbourne

The Living Links project directly informs the design of MBN, as OFFICE helped to deliver their previous Living Links: Mapping The Gaps project and have utilised that knowledge in developing MBN. Living links was led by Port Phillip and Westernport CMA and aimed to create a biocorridor for native plants and animals to flourish, as well as enhanced green space for the community. Living Links: Mapping The Gaps project supported this broader aim through GIS mapping, redefining the corridor system, identifying gaps in the network, and discussions with key stakeholders. This project did not develop to a delivery stage, but identified key areas of targeted activity that could be enacted in order to achieve the project aims.

Woody Meadows Project



Figure 21: Woody Meadows Project, Dandenong

In 2015, the Woody Meadow Project established a low-cost and low-maintenance approach to urban greening. The project introduced woody meadows (multi-layered shrub planting of diverse Australian native species) to underutilised open green spaces including roadsides, roundabouts and railway corridors. This University of Melbourne project is led out of its Burnley urban horticulture campus and capabilities, who would be ideal partners for Stage 2.

From initial trials, the two research plots identified a design strategy (3 shrub layers), a maintenance approach (coppicing every 1-3 years to promote flowering and dense canopies to exclude weeds)

Linking the Mornington Peninsula Landscape



Figure 20: Linking the Mornington Peninsula, Melbourne

The Linking the Mornington Peninsula Landscape approach also offers a comparable model in the ecological approach of creating wildlife corridors through reconnecting fragmented areas and revegetating them with Indigenous plant species. However this project is being delivered in a different environmental context to the proposed MBN, and predominantly works with local landowners, supported by landcare groups, to create a network of revegetated land through public and private plots. The project has so far received funding for works to 69 properties across 13 regions.

Precedents

Infrastructure spaces

Life Elia

Life Elia seeks to revegetate land that has been cleared of trees under high voltage electricity lines in Europe. The primary motivations for the project are public relations and cost benefits, as well as strengthening the biodiversity network. The project has been trialled in Wallonia and Flanders, with significant scope to extend the project over time. The rationale for Life Elia is informed by an understanding of the value of ecological corridors and broader European environmental policy and strategies for biodiversity.

Greening The Pipeline, Melbourne Water and Greening the West

Greening the West has been supporting local environmental, climate resilience and public space projects in the west of Melbourne since 2011. As part of their broad suite of projects that aim to 'enable sustainable, liveable, healthy communities through urban greening', the Greening the Pipeline initiative (co-delivered with Melbourne Water) offers a relevant infrastructure-focused precedent. The project aims to transform the heritage-listed main outfall sewer reserve and Federation Trail bike path. The project is transforming the pipeline reserved into a linear parkland, with the objectives of connecting communities, creating vibrant open space, improving health and wellbeing, enhancing active transport and greenlinks, managing water through Integrated Water Management, and celebrating heritage.

State and local government

Reimagining Your Creek Program - Melbourne Water

This program assists community groups, councils and other partners to reimagine their creeks across Melbourne to create quality open spaces for public use, as well as creating cooler healthier environments. The community-engaged approach intends to deliver outcomes that reflect community needs, values and knowledge.

20-Minute Neighbourhood Pilot Program - Plan Melbourne

This initiative aims to deliver 20 minute neighbourhoods that address six key 'hallmarks.' Hallmark 2 is 'high-quality public realm and open spaces' with a focus on walkability, urban greening, and climate resilience.

North Metro Trails Program - DEECA/ Environment Victoria

The delivery of new walking and cycling trails in Melbourne's North. This program is recreation-led, but also encourages community engagement with Melbourne's waterways.

Chain of Ponds Collaboration

Integrating City of Moonee Valley, Moreland Council, City of Melbourne, Hume Council, Parks Victoria, Yarra Valley Water, Western Water, Melbourne Water, this collaborative project works across LGAs and government agencies to transform Moonee Ponds Creek into an iconic waterway, and provide social and environmental benefits to the community.



Figure 22: Re-vegetation along the Merri Creek

10

Stakeholder workshops

Introduction & Project Background

OFFICE and the University of Melbourne held four workshops with key stakeholders from the following groups:

- Practitioners/researchers working in biodiversity and planning contexts. Participants included; Alex Breedon, Judy Bush, Katherine Horsfall, Michael Lopes Vieira, Marilu Melo, Hugh Stanford, Alex Felson.
- State Government agencies. Participants included representatives from; DEECA, DTF, Melbourne Water, Infrastructure Victoria, Yarra Valley Water.
- Local councils. Participants included representatives from; Wyndham, Merri Bek, Casey, Frankston, Brimbank, Banyule, Dandenong.
- Volunteer groups. Participants included representatives from; Landcare, KooyongKoot Alliance.

OFFICE and UoM also held a focused workshop with Arup, and conducted individual interviews with four First Nation's experts in ecology and restoration. We spoke with **Maddison Miller** (researcher, Lecturer in Ecology Knowledges at University of Melbourne, and Darug woman), **Uncle Andrew Gardiner** (representing Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation on the First Peoples Assembly and Wurundjeri Woi-wurrung Elder), and **Uncle Dave Wandin** (Wurundjeri Woi-wurrung Elder and Cultural Practices Manager [Fire and Water] at the Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation and chairperson of the Wandoon Estate Aboriginal Corporation), all of whom shared valuable insights on the MBN possibility from the perspective of Country.

Siqing Chen from UoM led a masters of landscape architecture studio using the project as a starting point, allowing students to engage with a real work project and look at ways infrastructure spaces could support greater biodiversity throughout the city

Across the workshops and conversations, a range of themes were identified in relation to the design, governance, delivery, outcomes and scope of the proposed MBN project. These key themes have helped inform the development of Design Principles for Stage 2 of the MBN project. (See Appendix 3 for a high-level overview of these themes).



Figure 23: Workshop with key stakeholders

Stakeholder key themes

1. Nested systems of delivery

The project will require balancing a broad strategy with a localised delivery. The overall structure of the project will also need to take into consideration:

- Balancing super-local diversity within a broader sense of consistency, commonality and equity at scale
- The challenge of working within project-based funding cycles through potentially ensuring that grants are staged to encourage ongoing work that also builds capacity and allows for maintenance of the sites
- Ensuring that small scale interventions are aligned with broader goals (rather than semi-privatising sites for exclusive groups)
- Consider how program design can remove barriers to on-ground delivery
- Allowing practicalities and limitations to help inform the adaptability of the delivery, while maintaining the overall clarity of the broader structure
- An approach based on principles, rather than rigid guidelines that can accommodate varying environmental, public space and capacity needs.

2. Identifying and communicating value

The success of the project will be enhanced by having a clear set of aims and objectives that can be clearly communicated to government and land owners, and advocated for by project champions. This will likely include

- Robust mapping that identifies potential corridors to link up remnant vegetation
- Articulating the value of small patches
- Developing metrics and language to communicate the value of biodiversity/open space outside of a financial figure
- Having a clear rationale for choices of site/type of intervention
- Consider how the government need for job-creation can be reflected in the value of the project
- Having a clear overall vision that can be used to: help people feel part of the project, enable government/leadership champions of the project, and get buy-in from key stakeholders.

3. Systems Approach

The project will need to consider the connected nature of the river systems, as well as moving beyond human-centred responses. This will likely look like:

- Moving beyond immediate care of creek area to entire river system
- Where possible working collaboratively across LGA borders
- Balancing human and biodiversity outcomes, and acknowledging that some sites may not prioritise/limit public access
- Balancing endemic plants with new species (reflecting changing climates/climate futures)

4. Community Engagement

There is a robust opportunity community involvement in these projects. The program can draw on and expand:

- The existing value of people connecting with their local areas
- A sense of stewardship and agency for community
- Recognition of local expertise
- Value of small patches contributing to larger project
- An approach/hope that through volunteers being empowered with small-scale successes, they will feel more empowered to commit to ongoing work and help to address volunteer fatigue

5. Land Management and Ownership

Gaining access for interventions, maintenance and public engagement on the sites will require identifying and developing relationships with land-owners and managers.²¹ Approaches to negotiating land management and ownership may include:

- Promoting a sense of public good/public benefit for publicly owned spaces, and responsibility of agencies to assist in enabling this outcome
- Having a clear approach to safety and risk management (see below)
- Identifying opportunities for privately-owned spaces and assisting others to help deliver this (outside of MBN scope)
- Articulating the value of the project to land managers (e.g., potential reduction in mowing costs), while avoiding an offset model.

6. Collaboration

A successful project will require collaboration, or at least alignment, beyond and between traditional departments, LGA's and organisational structures. Ways to help achieve this include:

- Drawing on successful case studies (e.g. Merri Creek) as successful examples
- Modelling collaboration at the delivery end (volunteer sites) to help inform the broader program
- Ensuring the program design helps to build capacity for collaboration at all levels of governance and delivery
- Helping to build relationships between organisations and repairing a sense of mutual distrust between different levels of governance

Stakeholder key themes

7. Maintenance and Care

In addition to the spatial interventions on identified sites, the locations will require ongoing maintenance and care of Country. Identified ways to ensure this is delivered include:

- Embedding maintenance in the program design can also help to manage/challenge the cyclical nature of funding, to ensure that the program is designed to support both initial
- site work as well as ongoing maintenance, capacity building, monitoring and evaluation, and knowledge sharing
- Identifying the specific priorities for the site, and ongoing monitoring of changes to demonstrate the success in meeting these priorities

8. Safety and Risk Management

The project will need to acknowledge that different stakeholders are able to take on different levels of risk and responsibility, and the major role that risk and safety will take in shaping physical outcomes and delivery processes. The project will consider:

- Where there is the possibility of changes to guidelines (e.g., Melbourne Water) which allows for specific approvals rather than a uniform ban on activities.
- How risks can be managed and where responsibilities are held (e.g., insurance)
- There is potential to enhance safety through some projects (e.g., passive surveillance and accessible pathways)

Landcare Victoria offer a simple and affordable insurance model for community groups, through joining Landcare Victoria Inc as a Member Group. Member Groups maintain an annual subscription with Landcare Victoria which allows each group to be covered by Landcare's insurance policies. Landcare Victoria has over 600 groups, which allows for small groups to pay a significantly lower insurance as part of a collective (approximately \$290 per group). Landcare Victoria also covers any excess payments in the case of an insurance claim.

The Landcare Victoria Inc. insurance package is available to all members and includes:

Public and Products Liability cover:

Protects organisations if third parties suffer an injury or property damage as a result of your organisation's activities

Voluntary Workers Personal Accident cover: Volunteers of all ages are covered if accidental injury or death occur whilst performing their duties

Association Liability cover: Cover for your organisation's directors, officers and bearers against legal obligation for actions arising from their duties

Landcare Victoria also offer ways for sub-contractors to access a significantly subsidised insurance cover if they have taken a contract with a Member Group.

The success of the distributed model has been recognised by DEECA, who promote the Landcare Victoria approach on their website. Landcare Victoria also have an extensive risk identification and management framework that all volunteers are introduced to, meaning that insurance acts as a legal and financial protection that is seldom required.

11

Corridor Selection Matrix

A selection criteria has been established in order to select priority case study corridors, evaluating the environmental, social and cultural opportunities and value of the corridors. The corridor selection was informed by a range of publicly available data sets.

Ecological

Strategic Biodiversity Value (Environment Victoria):

This data set combines information on areas important for threatened flora and fauna, and vegetation types and conditions to provide a view of relative biodiversity importance of all parts of the Victorian landscape. The total strategic biodiversity value of the corridor is included.

Threatened Flora and Fauna (Department of Energy, Environment and Climate Action):

The number of threatened flora and fauna species within the 400m radius of each corridor was identified. The number of both threatened flora and fauna was used in the corridor selection matrix.

Urban Heat Island Vulnerability (Department of Energy, Environment and Climate Action)

The heat vulnerability index (HVI) layers shows how vulnerable specific areas of metropolitan Melbourne are to extreme heat events. The highest number adjacent to each MBN corridor was used in the corridor selection matrix.

Connection to Existing Waterways (Melbourne Water)

Existing waterways were identified and mapped against the potential MBN network to identify the number of connections each corridor had to existing waterways.

Social

Principle Cycling Network (Department of Transport and Planning)

Department of Transport and Planning's Principle Cycling Network was utilised to map existing active transport links within the study area. The number of connections within a 400m offset of each corridor was included in the selection matrix.

Public Transport Routes (Public Transport Victoria)

Proximity to train, tram and bus networks was mapped and the number of connections with a 400m offset of each corridor was outlined in the selection matrix

Community Groups (ACNC)

Location of community groups across metropolitan Melbourne was mapped based on addresses publicly available on the ACNC website. 1,103 were documented through this method, this number is quite low and in future stages more in depth mapping of community groups would need to be undertaken for case study sites.

Corridor selection matrix

A selection criteria has been established in order to select specific focus corridors, evaluating the environmental and social potential of the corridors as well potential future investment. The total score for each corridor has been calculated by adding all the values from various attributes together and dividing by the length of the corridor.

Figure 24: Corridor selection matrix, top 20 of 131 corridors.

Name	Area m2	Length KM	Biodiversity Value Sum	Waterways NO.	UVI (0-5)	Threatened Species		Active Transport NO.	Public Transport NO.	Community Groups NO.	Score
						Flora	Fauna				
Dingley Bypass South	3,567,154	22.04	9,105	8	5	8	2277	18	80	6	47
Royal Botanic Gardens	2,687,902	27.26	11,650	5	5	8	2174	19	63	3	46
Mordialloc to Kananook	2,687,902	15.81	5,835	2	5	6	978	21	54	3	41
West Coast	18,838,940	33.51	12,247	5	4	9	1964	21	18	2	38
East Coast	3,567,154	130.14	45308	9	5	213	821	61	203	21	37
Cherry Creek	7,305,376	19.86	6,920	9	5	91	305	16	23	0	36
Jells	113,167	8.63	2,629	9	4	4	559	13	22	2	36
Dandenong Police Paddocks	9,471,439	25.64	8,162	8	4	2	270	9	25	3	34
Dingley Bypass North	3,567,154	18.55	5,367	1	5	1	426	13	64	5	33
Chandler to Churchill	6,405,120	29.5	8,330	13	5	7	387	12	35	4	31
Craigieburn	9,471,439	30.27	8,198	11	5	71	3819	20	79	0	30
Laverton	7,008,924	21.49	5,621	9	5	118	279	27	41	4	29
The Pines Flora & Fauna Reserve	5,646,198	16.94	4,460	2	5	9	188	12	12	3	29
Hallam	3,583,869	18.87	3,728	62	5	5	131	21	74	4	27
Frankston Resevior	2,612,414	7.34	1,580	6	4	1	26	6	10	2	26
Balcombe	2,687,902	16.68	4,014	17	5	4	69	13	38	0	26
Presidents Park	2,680,071	8.27	1,562	6	5	4	2	13	31	2	24
Plenty Gorge	8,444,448	26	5,466	17	5	50	329	15	82	1	23
Delacombe	1,346,922	16	3,203	21	5	37	170	12	22	1	23
Ruffey	1,740,588	5.3	753	4	4	3	37	8	63	2	22
Mordialloc	2,687,902	14.31	2,509	27	4	13	363	10	42	2	22

12

Case Study Corridors

Based on policy research, GIS mapping of infrastructure spaces, workshop feedback and precedent studies, using the corridor selection matrix we have identified eight case study sites for priority restoration. In selecting case study sites we have identified those site that rank in the top 20 of the selection criteria matrix, but also provide a range of conditions.

Case Study Corridors are:

- Craieburn
- Dandenong Police Paddocks
- Dingley Bypass North
- Jells
- Laverton
- Plenty Gorge
- Royal Botanic Gardens
- West Coast

KEY

- 1-10 Ranked corridors
- 11-20 Ranked corridors

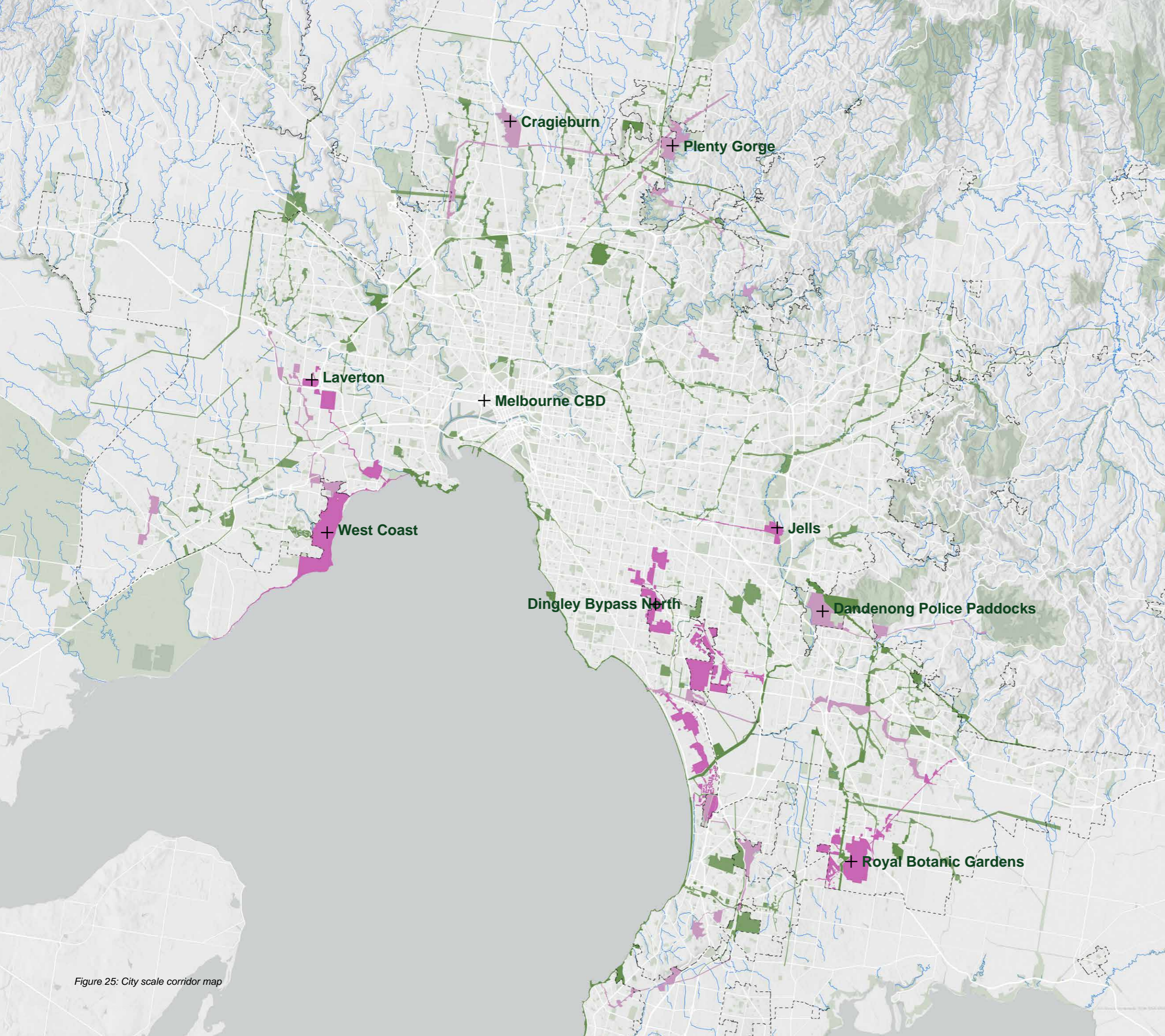
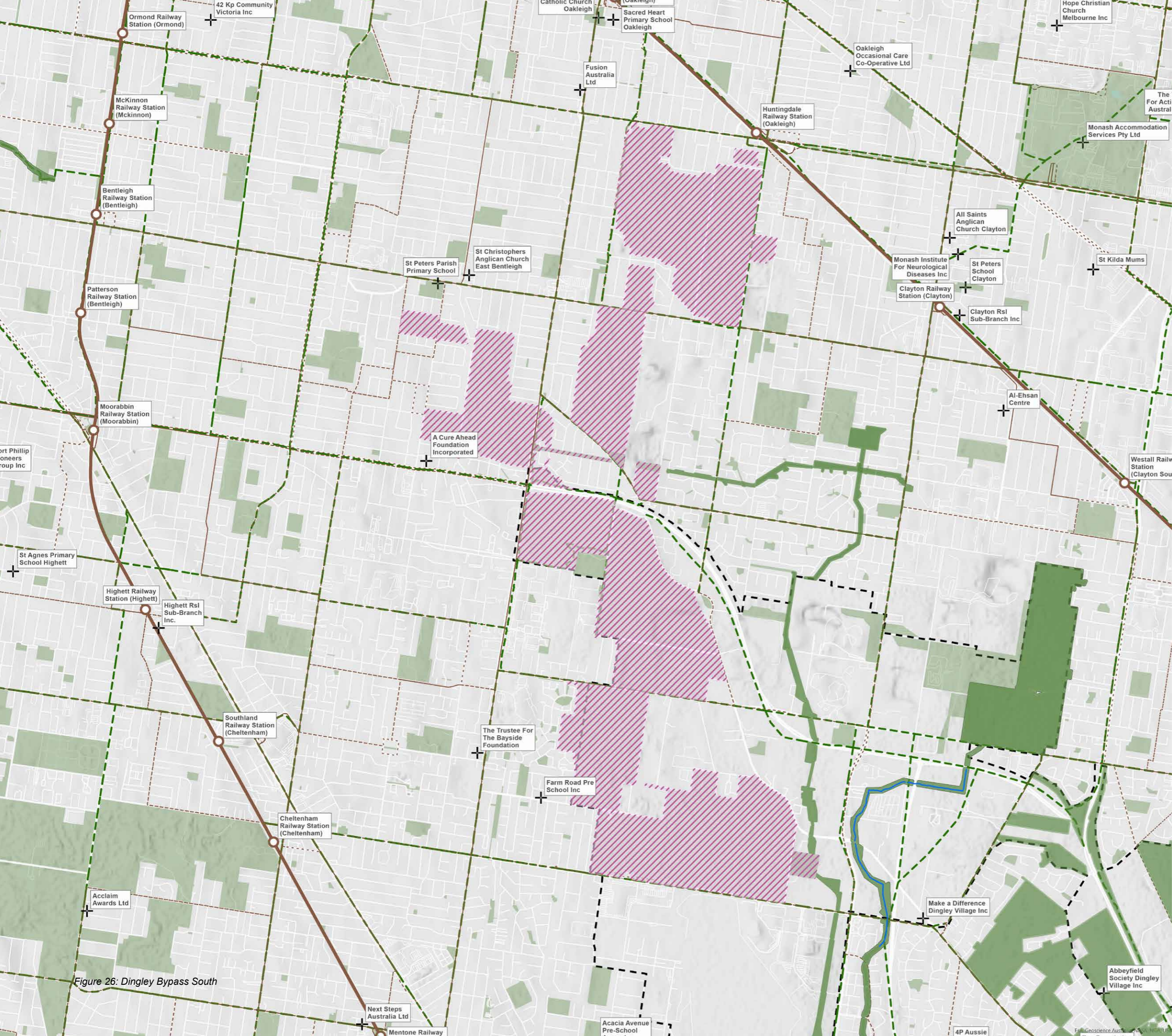


Figure 25: City scale corridor map



Dingley Bypass North

This corridor follows the northern section of Dingley Bypass and continues along Westhall road. The corridor is made up of a range of land uses, including road verges, sportfields, a large former landfill site, and former quarry sites, whilst having areas of high ecological value such as Braeside Park. As the site sits within one of Melbourne Green Wedge zones there are restrictions on development in the area allowing for greater ecological outcomes. The corridor links Mordialloc creek and in turn Port Phillip bay further into suburban Melbourne.

Length: 22.04km

Area: 357ha

Typology: Road Easement, Sports Fields, Public Park

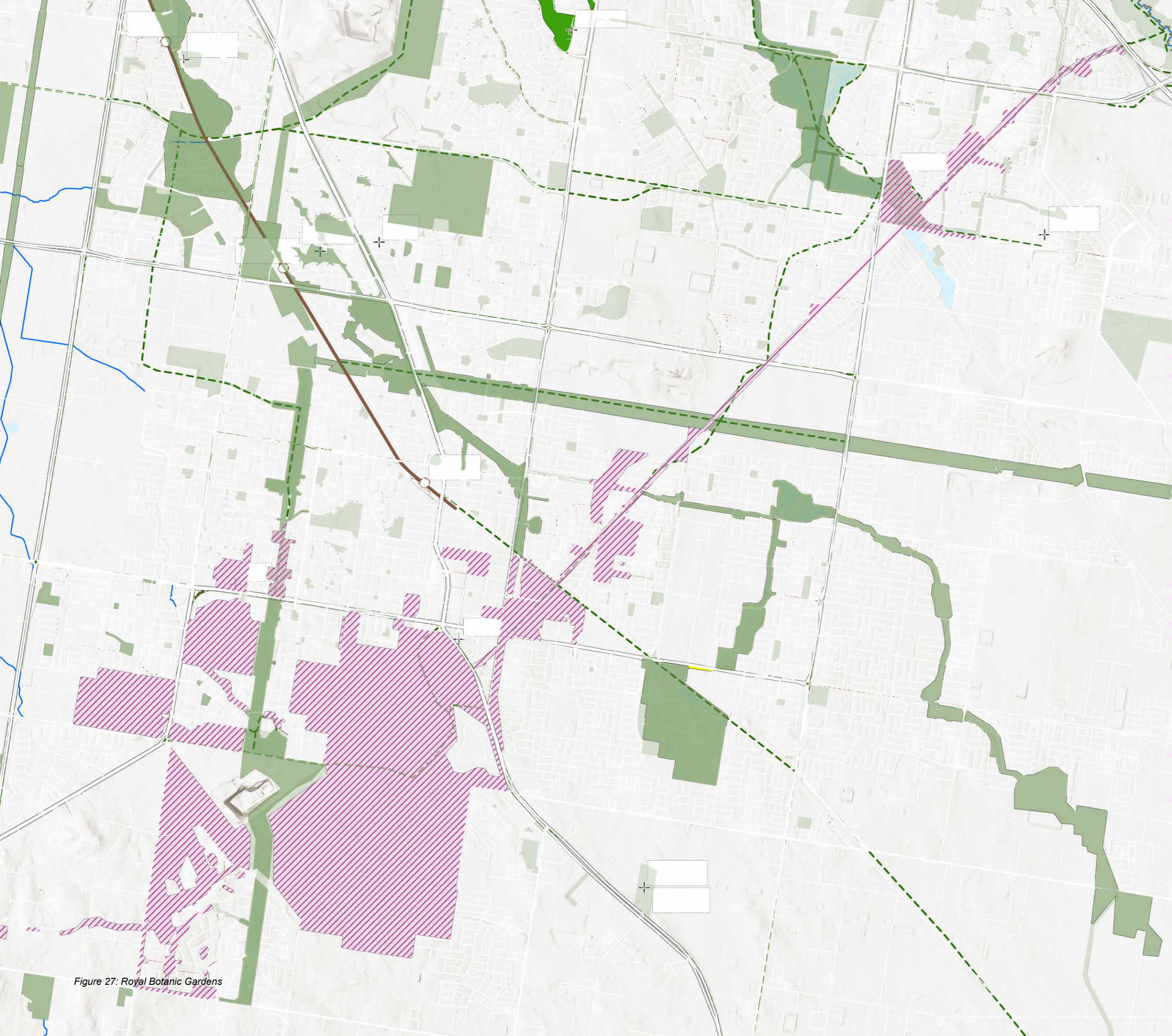
LGA: City of Kingston, City of Greater Dandenong

Land Manager: Vic Roads, Parks Victoria, Local Council, Sporting Clubs

KEY

- Case Study Corridor
- Other Corridors
- VPA Open Space
- Train Line
- Tram Line
- - - Bus Route
- - - Principle Bicycle Network
- Waterway
- Body of water
- + Community group

Figure 26: Dingley Bypass South



Royal Botanic Gardens

A long corridor defined by a pipe track that intersects the Royal Botanic Gardens Cranbourne. The surrounding suburbs are some of the fastest growing in Melbourne, with little provision of public open space, and active transport. Due to the type of development in the area this area will be greatly affected by the increasing heat within the city. The corridor also acts as an armature for horse racing tracks, golf courses, and community sports fields.

Length: 27.26km

Area: 269ha

Typology: Pipe Track, Public Park, Sportsfiels

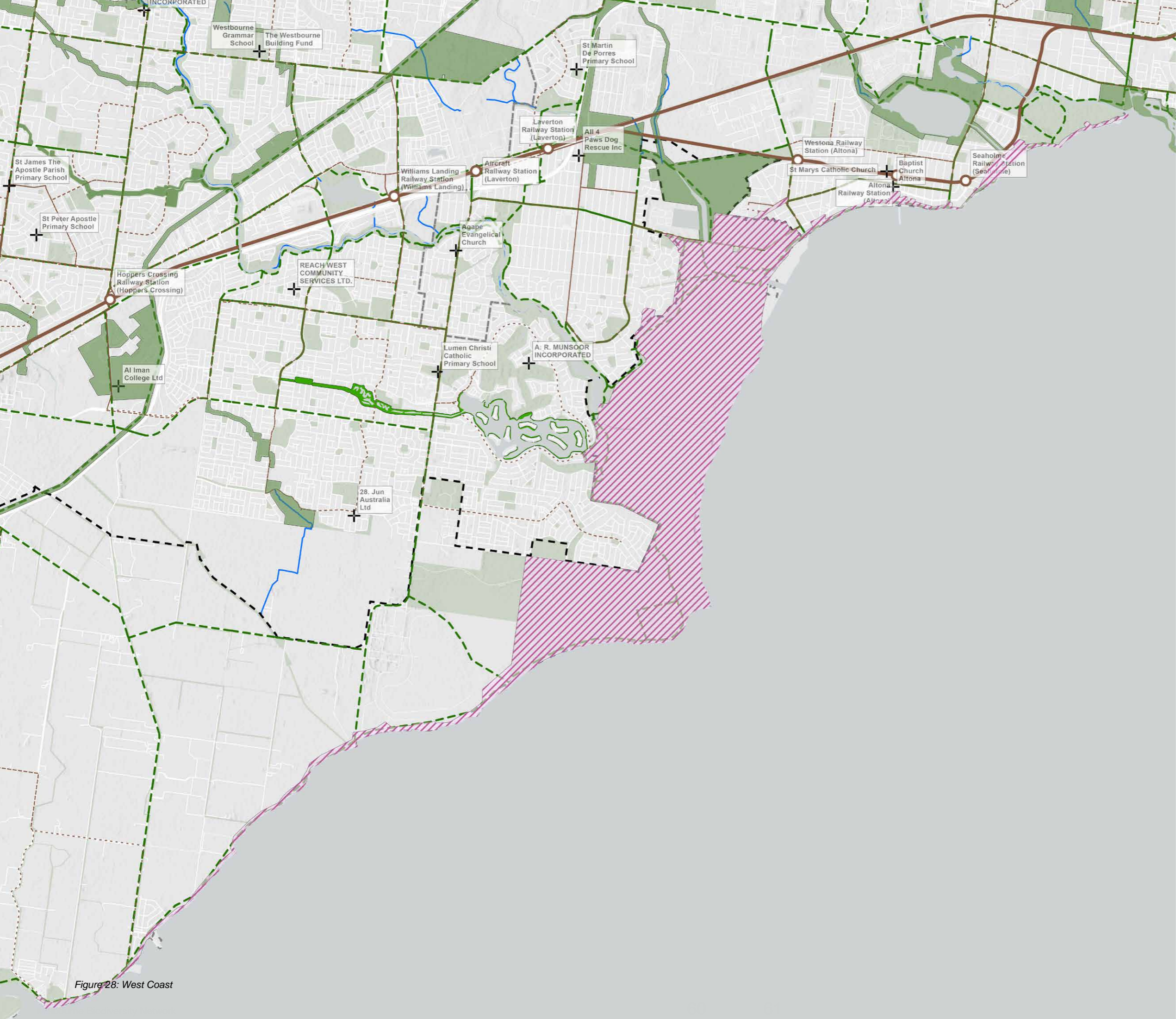
LGA: City of Casey

Land Manager: Melbourne Water, Local Council, Parks Victoria, Sporting Clubs

KEY

- Case Study Corridor
- Other Corridors
- VPA Open Space
- Train Line
- Tram Line
- - - Bus Route
- - - Principle Bicycle Network
- Waterway
- Body of water
- + Community group

Figure 27: Royal Botanic Gardens



West Coast

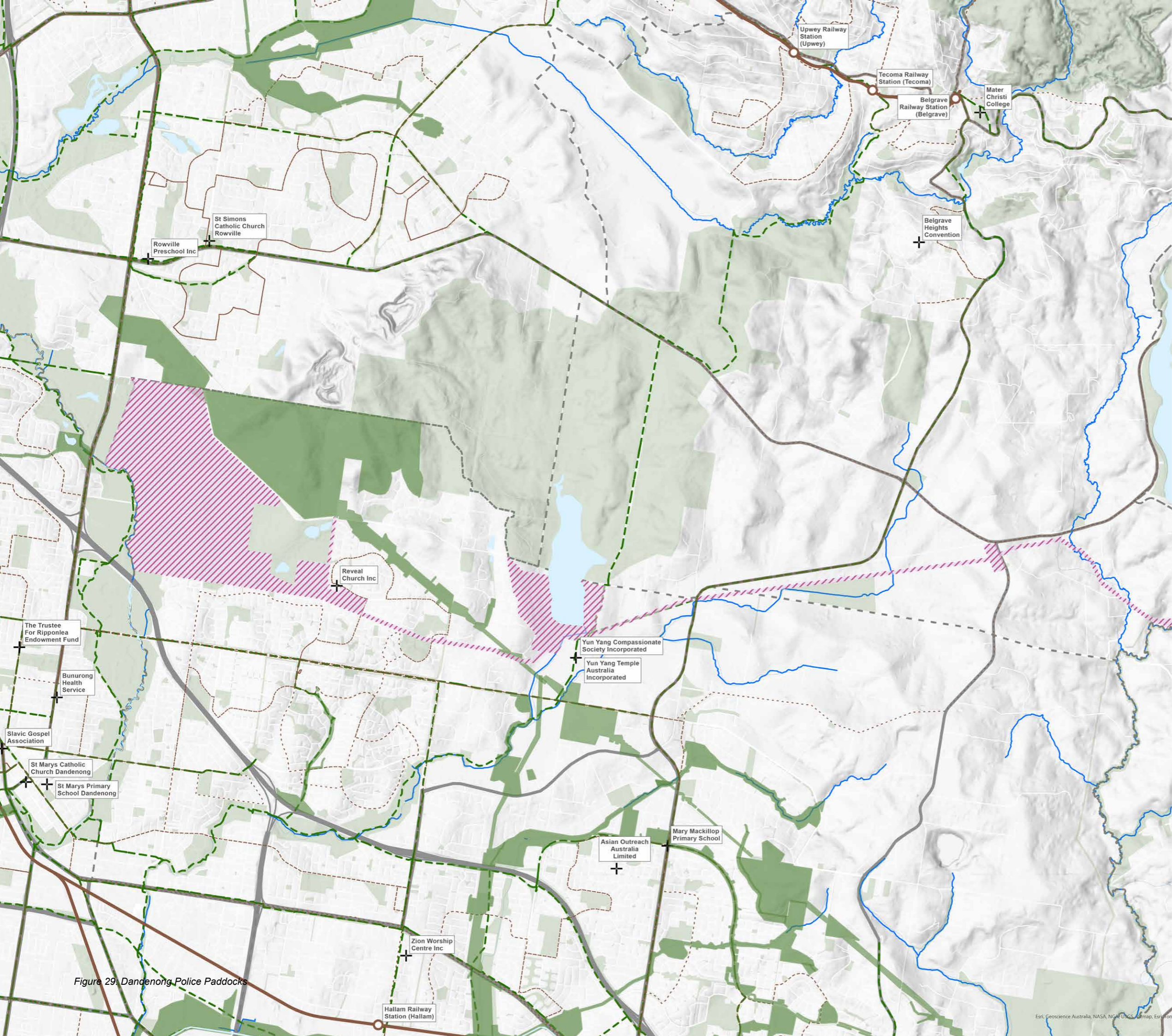
Following Port Phillip Bay from Altona Coastal Park to Werribee South. A number of waterways flow into the bay in this area including Kororoit Creek and the Werribee River. There are a range of interfaces with the bay through this area including places of high ecological value like Cheetham Wetlands and Altona Coastal Park, suburban residential through Altona and Point Cook and farmland in Werribee south. The opportunity in this corridor is the strengthening of coast ecologies in the area and whilst supporting increasing active uses along the bay.

- Length: 33.51km
- Area: 1884ha
- Typology: Coastal
- LGA: Wyndham, Hobsons Bay
- Land Manager: Melbourne Water, Local Council, Parks Victoria, DEECA, Royal Australian Air Force

KEY

- Case Study Corridor
- Other Corridors
- VPA Open Space
- Train Line
- Tram Line
- - - Bus Route
- - - Principle Bicycle Network
- Waterway
- Body of water
- + Community group

Figure 28: West Coast



Dandenong Police Paddocks

A long corridor that links Dandenong Creek with Cardinia Reservoir via a pipe track. The corridor begins at Dandenong Creek at the Dandenong Police Paddocks, travels past Lysterfield lake, and then continues through agricultural land to Cardinia Reservoir. The corridors offers an opportunity to connect key places of recreation and ecology in the area, Dandenong Police Paddocks, Lysterfield Park and Cardinia Reservoir.

Length: 22.64km

Area: 947ha

Typology: Public Park, Pipe Track

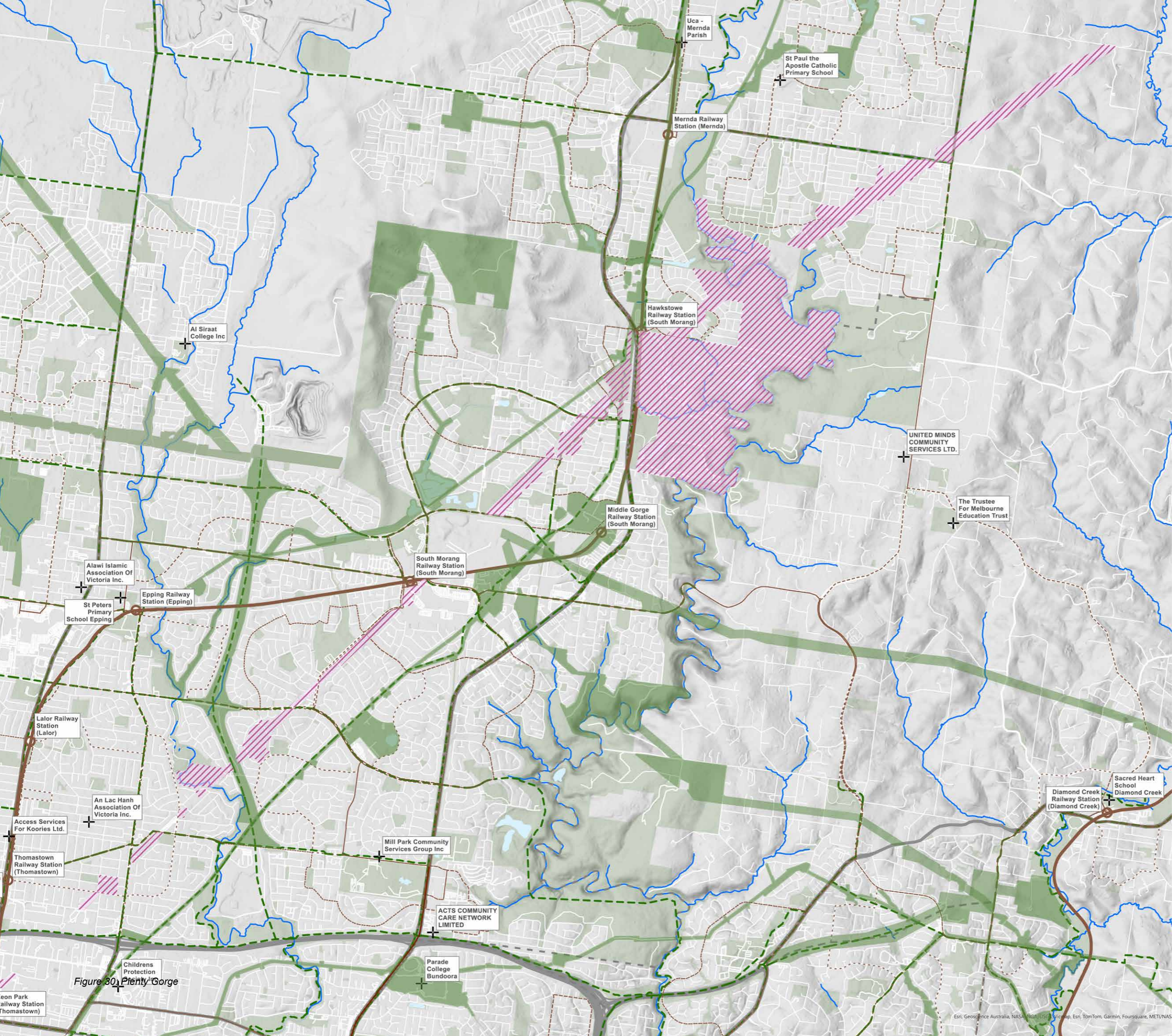
LGA: City of Casey, City of Greater Dandenong, Cardinia, Yarra Ranges Shire, City of Knox

Land Manager: Melbourne Water, Local Council, Parks Victoria, DEECA

KEY

- Case Study Corridor
- Other Corridors
- VPA Open Space
- Train Line
- Tram Line
- - - Bus Route
- - - Principle Bicycle Network
- Waterway
- Body of water
- + Community group

Figure 29. Dandenong Police Paddocks



Plenty Gorge

Large powerline easement that transects Plenty Gorge, and continues well outside of metropolitan Melbourne connecting to Kinglake National Park. Crosses through many fast growing suburbs north of the ring road from Thomastown to Doreen. There is an opportunity to provide these underserved suburbs with increase public amenity whilst supporting ecologies movement from outside of metro Melbourne into the urban fabric.

Length: 26km

Area: 845ha

Typology: Powerline Easement

LGA: Nilimbuk, Whittlesea

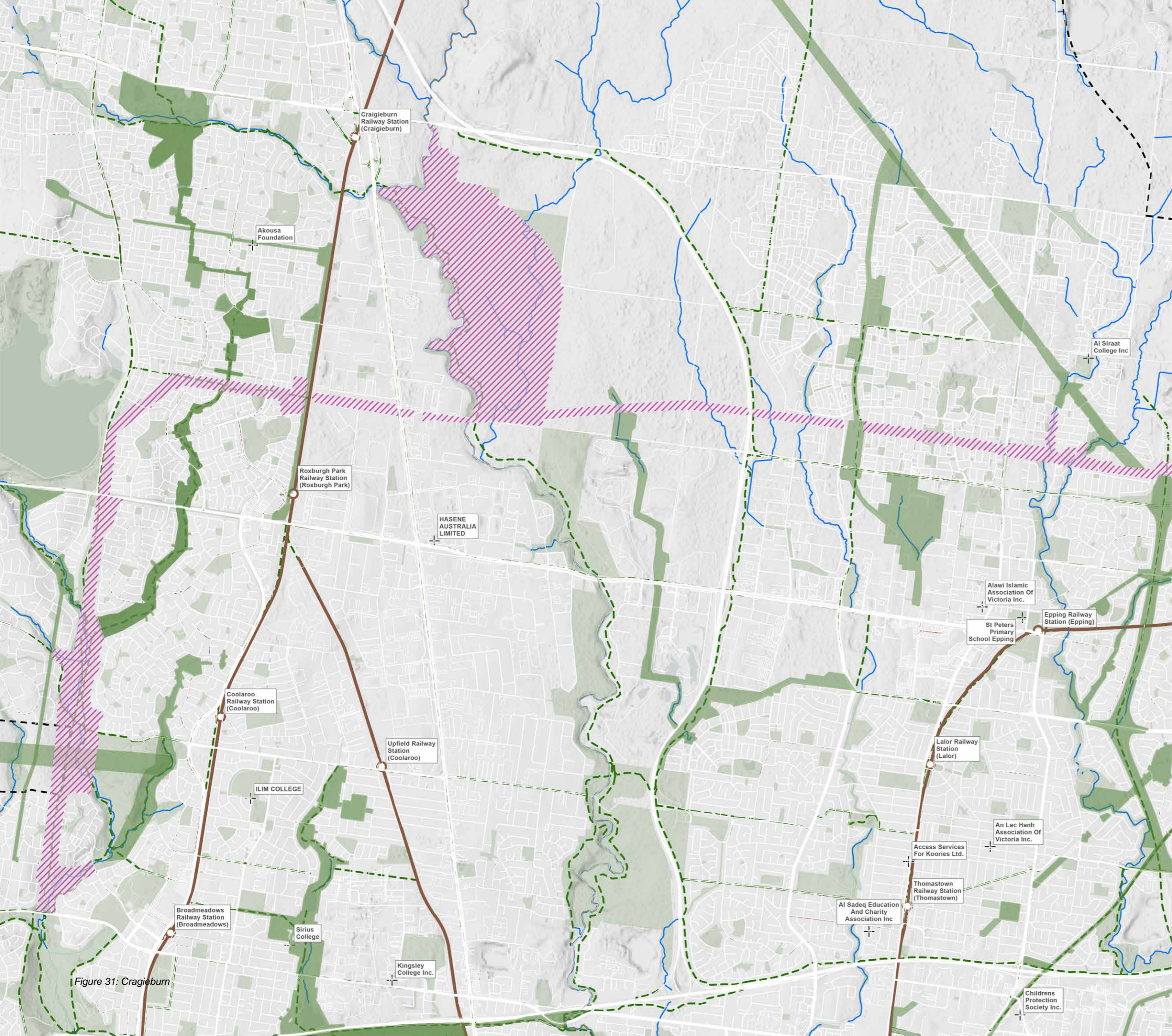
Land Manager:

KEY

- Case Study Corridor
- Other Corridors
- VPA Open Space
- Train Line
- Tram Line
- - - Bus Route
- - - Principle Bicycle Network
- Waterway
- Body of water
- + Community group

Figure 30. Plenty Gorge

Esri, Geoscience Australia, NASA, NGA, USGS, Vicmap, Esri, TomTom, Garmin, Foursquare, METI/NAS



Craigieburn

This powerline easement connects a number of important ecological sites including, Craigieburn Grassland, Greenvale Reservoir, Moonee Ponds Creek, Merri creek, Edgars Creek, Darebin Creek. The corridor has high ecological potential whilst also running from Epping through to Broadmeadows servicing communities that have increasingly poor access to quality public open space and will become more vulnerable to urban heat island effect

Length: 30.27km

Area: 947ha

Typology: Powerline Easement, Public Park, Floodway

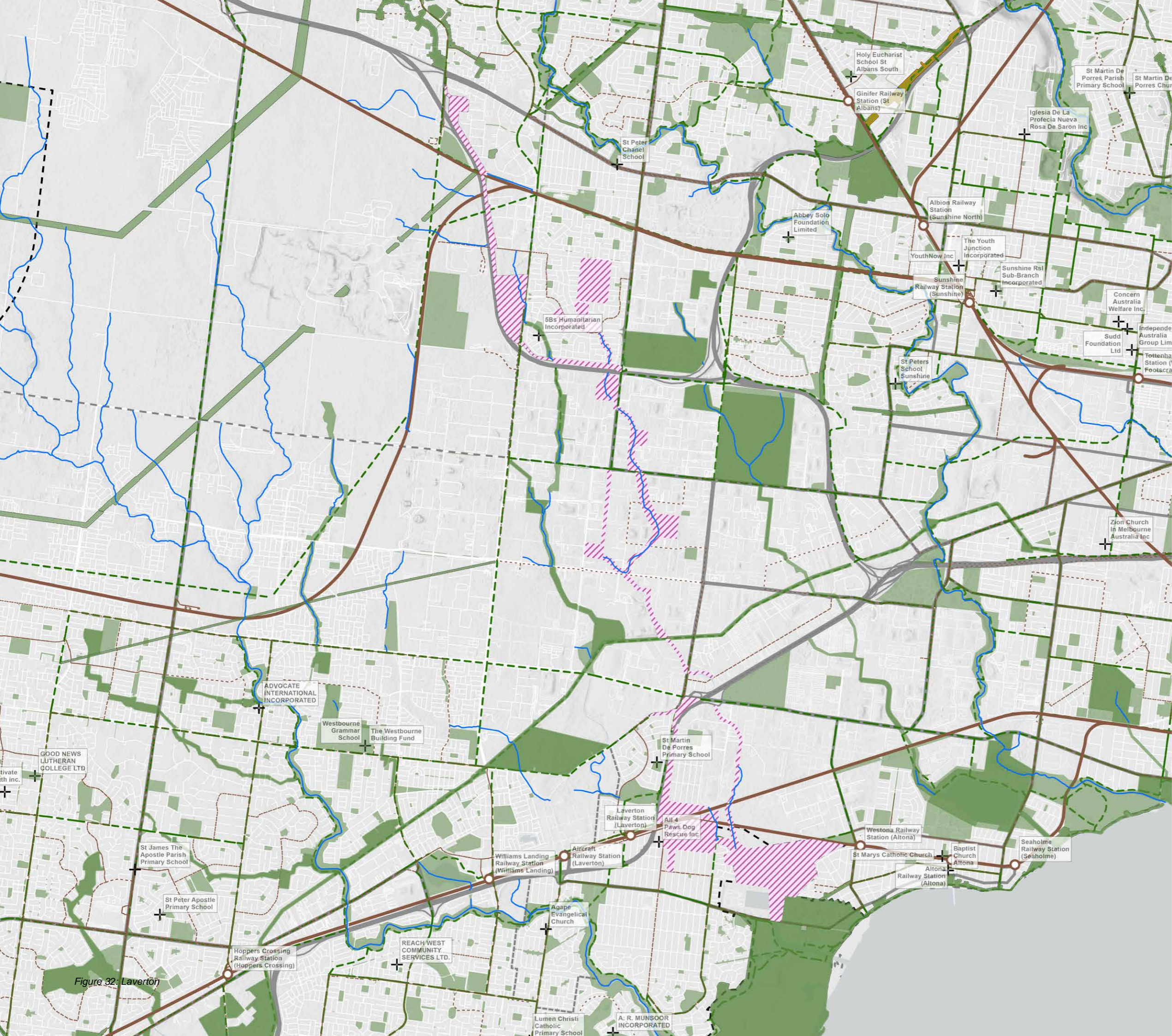
LGA: Whittlesea, Hume

Land Manager: Power Provider, Parks Victoria, Local Council, Melbourne Water

KEY

- Case Study Corridor
- Other Corridors
- VPA Open Space
- Train Line
- Tram Line
- - - Bus Route
- - - Principle Bicycle Network
- Waterway
- Body of water
- + Community group

Figure 31: Cragieburn



Laverton

Predominantly follows a concreted drain on the site of a former waterway, connects to a range of grasslands, including Anglis Grassland Reserve and Mount Derrimut Nature Conservation Reserve. The corridor starts at the bay in Altona, and predominantly industrial estates finishing in Ravenhall connecting a range of remnant Western plains grasslands.

Length: 21.49km

Area: 700ha

Typology: Pipetrack, Retarding Basin, Former Waterway, Road Easement, Public Park, Sports Field

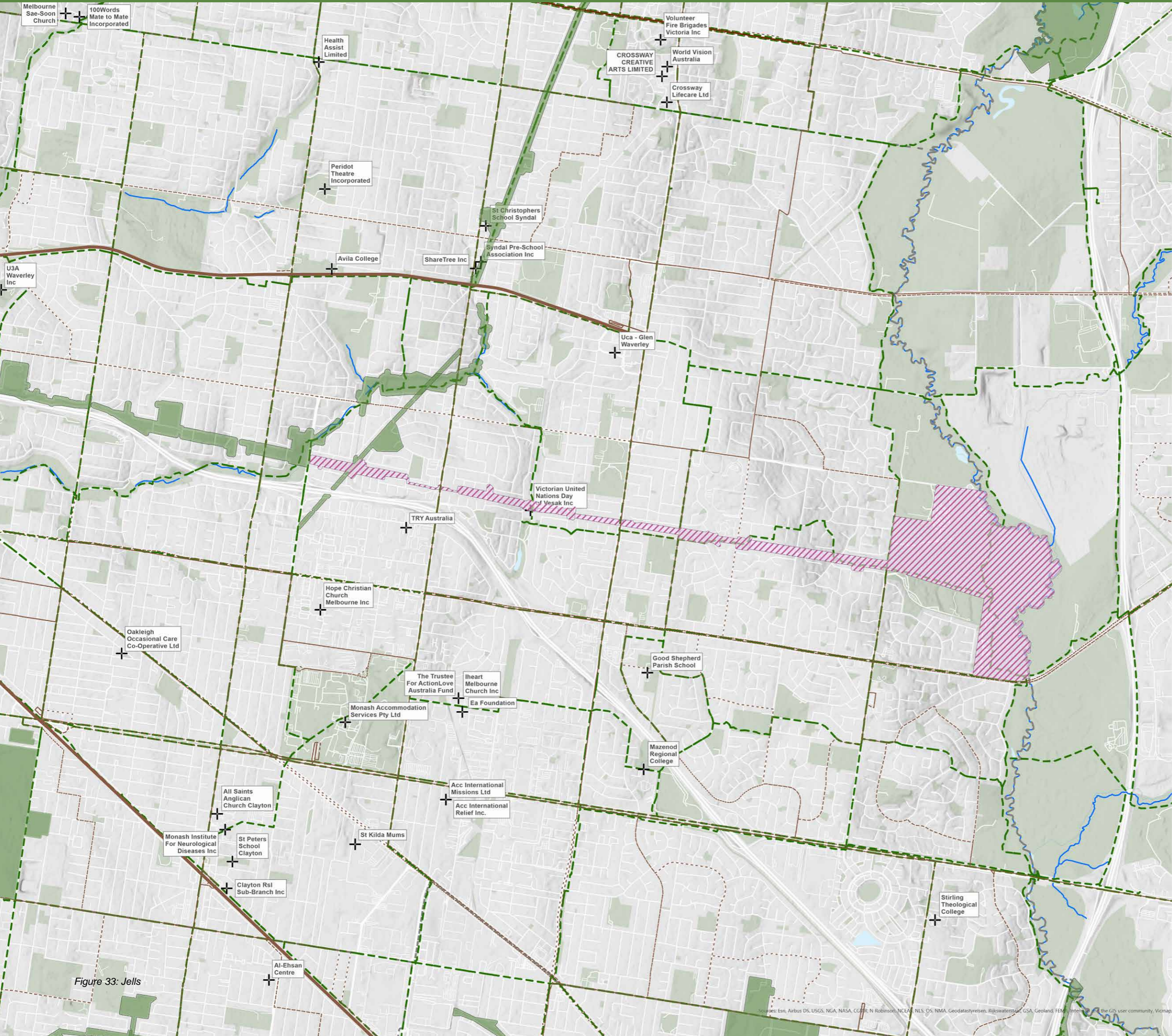
LGA: Brimbank, Wyndham, Melton

Land Manager: Melbourne Water, Local Council

KEY

- Case Study Corridor
- Other Corridors
- VPA Open Space
- Train Line
- Tram Line
- - - Bus Route
- - - Principle Bicycle Network
- Waterway
- Body of water
- + Community group

Figure 32: Laverton



Jells

The corridor provides an opportunity to link Dandenong, Scotchmans and Gardiners creeks. This corridor is defined by a powerline easement, the use underneath varies from public space and sports fields to private residential. Working closely with local residents on strategies to improve biodiversity in private residences would be key to developing this easement into a bio-corridor.

Length: 8.63km

Area: 11ha

Typology: Powerline Easement, Public Park.

LGA: Monash

Land Manager: Local Council, Power Providers, Private residents

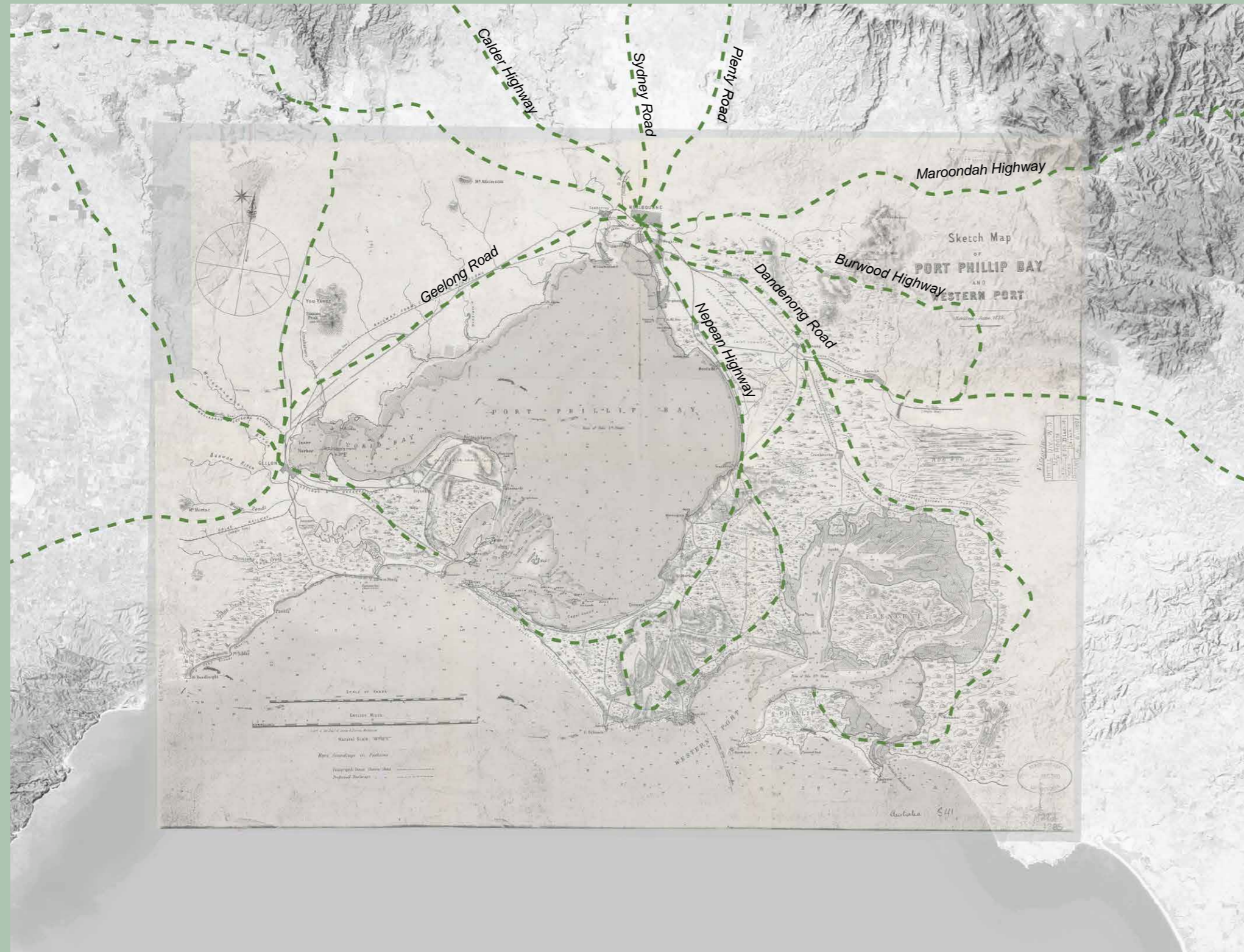
KEY

- Case Study Corridor
- Other Corridors
- VPA Open Space
- Train Line
- Tram Line
- - - Bus Route
- - - Principle Bicycle Network
- Waterway
- Body of water
- + Community group

Figure 33: Jells

Sources: Esri, Airbus DS, USGS, NGA, NASA, COPR, N Robinson, NCEA, NLS, DS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap, Inc. The GIS user community, Vicmap

Figure 34: Mapping songlines across contemporary Melbourne roads



Repair

...when settlers began arriving in Port Phillip at present day Melbourne in mid-1835, they simply got in their carts and on their horses and followed the paths of least resistance. Their routes became established as cart-tracks, then became gravelled, then bitumenised, and ended up as the major roads that now radiate out of Melbourne. All these generally follow along ridge lines, valley lines and easy contours. Think about it from an aerial perspective. Geelong Road, Ballarat Road, Calder Highway, Sydney Road, Plenty Road, Heidelberg Road, Maroondah Highway, Burwood Highway, Dandenong Road and Nepean Highway were all originally Aboriginal Songlines. We drive along such roads every day without the faintest apprehension of their true history.

Uncle Bill Nicholson, *Toward the Municipal Mapping of Traditional Aboriginal Land Use*, with Jim Poulter, 2018

13

First Peoples Approach

The MBN project is informed by First Nations's expertise, knowledge and care of Country. For the future delivery of this project, these principles will be realised through exploring the relationships between biocorridors and Songlines, an understanding of country-wide interdependence, an emergent-systems approach, and program design that prioritises Indigenous-led and informed land management strategies.

Songlines

MBN project will explore the potential alignment of the biodiversity corridors with Songlines through Naarm. There are established relationships between songlines and other major arteries, in the form of roads. Creeks, trails and what became roads clearly all intersect at numerous points, or twist and wind around each other, and so there are highly likely to be further relationships between songlines and aspects of Melbourne Biodiversity Network. Indeed, as the project intends to pursue an interconnected approach to linear infrastructures, connecting grids of streets with networks of creeks, and developing a 'gradient' of increasing biodiversity from street to creek, we believe it is imperative to enable an Indigenous-led research project to research the relationships between songlines and the urban fabric of Naarm at the scale of the Port Phillip Bay watershed.

Country-wide interdependence

The MBN project is underpinned by an understanding of interconnections, where activities and actions 'upstream' have impacts and outcomes 'downstream.' There is a need to care for the health of the overall system, which is evident in the connection to, and care of Country, in the lives of Aboriginal and Torres Strait Islander people. This value of interdependence is central to the MBN project, and logistically evident in the need to collaborate with project stakeholders across

LGA boundaries and bureaucratic hierarchies. The restoration of biocorridors through the city requires understanding of Country as a whole connected system, rather than discreet and separated areas or functions to address in isolation.

Emergent systems

At neighbourhood scale, the overall network of biocorridors manifests itself only as smaller elements, as individual threads woven together by biolinks. Each is a water system in its own right, embodying the pattern of the broader network—but at the scale of the watershed, taken as its whole, the connected biodiversity network system transcends the sum of those individual parts. This means that the overall biodiversity network has emergent properties, producing a richness of ecosystem benefits greater than the sum of its parts. Described in 'western science' as emergence, this is a key concept in many Indigenous knowledge systems, and reinforces the need for multi-scalar, multi-level governance, and more complex and diverse approaches to understanding the value of the biodiversity network, at system scale.

Indigenous-led and Indigenous-informed land management and Caring for Country strategies

As part of the MBN research phase, Uncle Dave Wandin described how 'the system is crumbling and the issue is maintenance.' In not ensuring ongoing care of Country, particularly through mis-management of waterways, these sites have been unable to fulfil key ecological functions. However, both Uncle Dave Wandin and Uncle Andrew Gardiner acknowledge the possibility of change, and cite the restoration of Merri Creek and the Moonee Ponds Creek as successful projects of revegetation, supporting diverse species habitats, healthy waterways and community building. For Uncle Andrew, the MBN project offers an opportunity for First Nation's monitoring, stewardship, custodianship and symbiosis



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Ecological approach

The ecological interventions will be site specific to the particular environmental conditions and possibilities at each location, however will be informed by ecological principles including biodiversity corridors, climate adaptation, networked small patches, and urban agriculture strategies.

Biodiversity corridors

As recognised by DEECA, wildlife and biodiversity corridors support natural processes through providing connections across landscapes and linking up areas of habitat.²² They can assist in retaining, restoring and managing connections and interactions across the landscape, and protect against the isolation of fragmented patches that can make species vulnerable. Bio-corridors are often established as linear tracts of vegetation that connect fragmented patches, enabling movement of flora and fauna to support ecological processes and support ecosystem health.²³

Restoration

This MBN project recognises a need to balance the restoration of endemic species planting along the corridors with the recognition that we are facing altered climate futures. As the landscape of Melbourne has been significantly altered since colonisation, and faces ongoing changes from climate and biodiversity crisis, it is important to not focus on a return to an idealised natural state but to look for new solutions to improve the biodiversity and resilience of our city, whilst creating beautiful, culturally grounded spaces that support the social life of Melbourne. As Prober et. al. have identified, due to future projections for accelerated changes, 'climate-based local adaptations are likely to become decoupled from their locations.'²⁴ The specific planting strategies for priority case study sites will be developed in the next phase of the MBN project.

Networked patches

This project draws on research about the value of several small reserves of land in relation to the conservation and protection of biodiversity. An approach of several small patches allows for the potential of harbouring a significant number of species and supporting landscape scale processes when in a network. These connected small patches are particularly important in human-dominated contexts, where natural habitats have been parcelled into many small linked patches. In addition to the direct ecological benefits, there is social and pragmatic value of conserving small patches, or even 'very small patches' in relation to enabling community engagement and fostering stewardship.²⁷ This is highly relevant for the Melbourne Biodiversity Network project, which acknowledges the essential work of community groups, 'friends of' groups, and individuals in their conservation work, just as it aims to enhance equitable access to green space for communities who need it the most.

Urban agriculture

The project also borrows from scalable urban agriculture strategies, which balance urban greening with education, culture and community engagement. While the projects listed below have a less explicit biodiversity focus, the small scale interventions offer a model for the MBN in demonstrating the value of small interventions, which can be replicated and collectively built upon to achieve broader scale objectives. There are many ways that food might be cultivated in these landscapes, and a subsequent enquiry might explore how to best understand the gradient from the "blurry edges" of urban foraging²⁵ and fallen fruit through to more formalised community gardens. Urban agriculture also offers the opportunity for bioregionalism principles to be embedded in the project, encouraging further citizenship, commitment stewardship and connecting with First Nations cultural land management.²⁶

Figure 35: Biodiversity corridors diagram

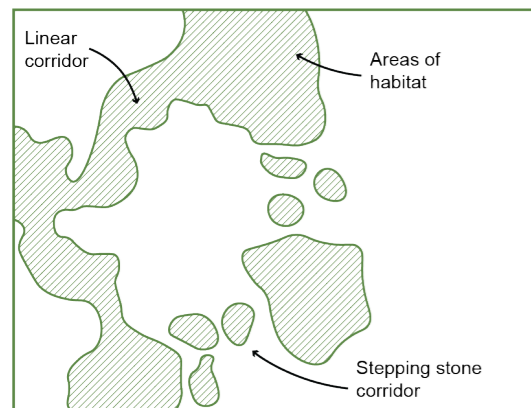


Figure 36: Restoration of endemic species diagram

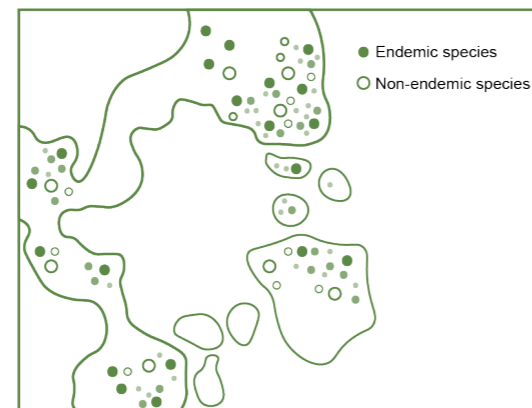


Figure 37: Network patches diagram

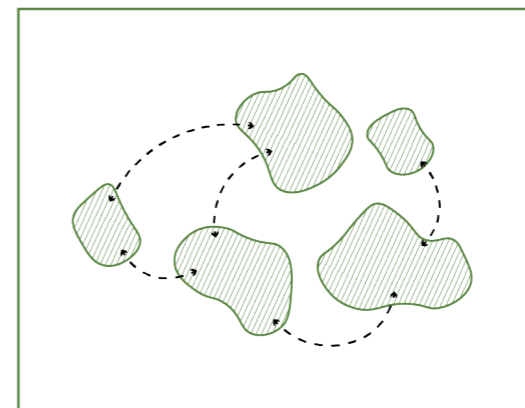
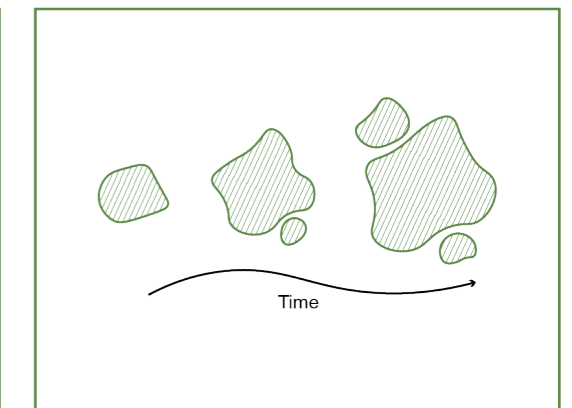
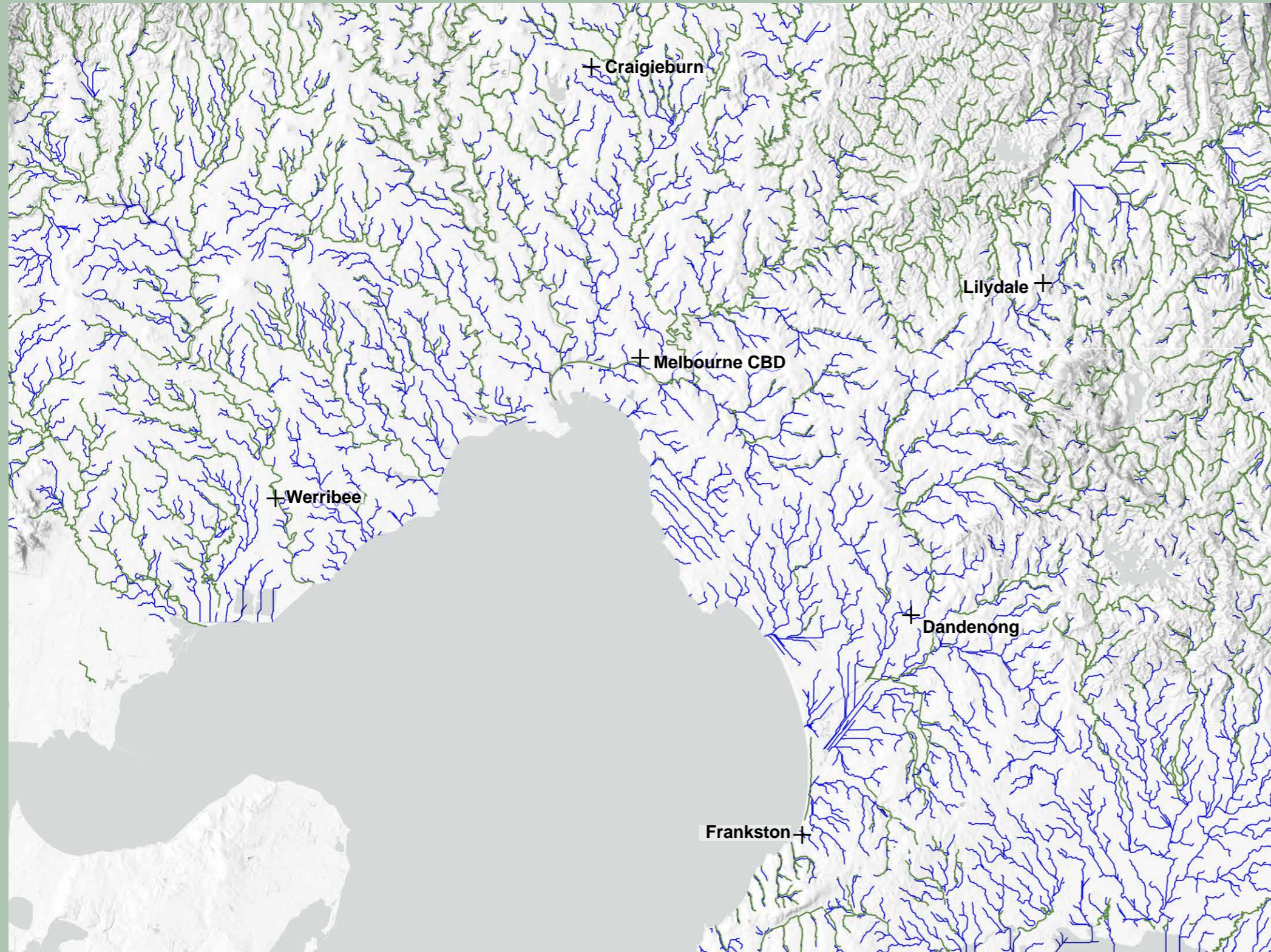


Figure 38: Scalable interventions diagram



- Contemporary waterways
- Pre colonial waterways

Figure 39: Mapping contemporary waterways and pre colonial waterways



Reproduce

The pattern that made the whole is in each thread, and all the threads together make the whole. Stand close to the pattern and you can focus on a single thread; stand a little further back and you can see how that thread connects to others; stand further back still and you can see it all – and it is only once you see it all that you recognise the pattern of the whole in every individual thread. The whole is more than the sum of its parts, and the whole is in all its parts. This is the pattern that the Ancestors made.

Ambelin Kwaymullina, *Seeing the light: Aboriginal law, learning and sustainable living in country*, Indigenous Law Bulletin, May/June 2005.

15

Systemic approach

As detailed in Section 8, there are a range of current strategies, policies and activities that aim to deliver similar outcomes to the MBN project. The limited evidence for their impact in delivering large scale biodiversity outcomes is potentially indicative of a lack of system-scale thinking, which would allow smaller projects and targeted interventions to aggregate into city- and regional-scale infrastructures, both relying on and enabling multi-level governance and shared outcomes across jurisdictions, departmental ambits, and disciplinary perspectives. Such an approach would open up the possibility of the co-benefits of 'upstream' systems-level financing in which, for instance, improved health outcomes produce healthcare system savings which can be invested in environmental projects which produce those benefits, and so on, recognising that the interventions that produce health outcomes also tend to produce positive benefits for environment, safety, resilience, social fabric, equity, and so on. Systemic challenges must be approached systemically.

A systemic approach is the third Design Principle that will underpin the MBN project's governance and onground delivery, achieved by the below strategies.

Prototyping and small scale interventions

The design of the MBN project allows for a prototype model, of testing both physical interventions and organisational structures (e.g. insurance models, identified in workshops as a key barrier). Prototyping also allows for the project to respond to unpredictability, whilst moving forward nonetheless, through enabling a practice of ongoing engagement and learning, and by deliberately designing-in adaptation.

Modular, scalable prototyping enables this 'small pieces, loosely joined' form of organisation (the term is drawn from one of the key early books on the Internet's distributed

architecture). Megaprojects planning expert Bent Flyvbjerg describes this approach as 'building with Lego', and sees it as a key risk-management technique, as well as a way of unlocking creativity and forward momentum, via prototyping. Equally, Aldo Van Eyck's design strategy for Amsterdam's post-war playground makes clear a relationship with the ecological 'Several Small' principle above—multiple distributed small playgrounds provide far greater equity, diversity than a 'single large' playground, and form a loosely connected network of play across the city. Weaving biolinks in the same way provides a way of building momentum, diversity, equity, and ultimately connectivity.

Adaptive and modular

The project is adaptive and modular, in providing a toolkit of different planting guides and community engagement techniques that can be applied across the range of identified sites of intervention. It allows for different styles of ecologically appropriate interventions at each location that can be adapted to the site-specific and reflect local community needs, values and interests. This model was successfully applied at the Shimokitazawa railway project in Japan: a multi-strategy urban greening and cultural transformation project built on the land released by sinking the subway tracks in this Tokyo suburb. The vacant and unused area includes kitchen spaces, play equipment, public art, gardening activities and an education program. Bonus Track, by Tsubame Architects, is particularly interesting as it emerged from substantial co-design work with neighbourhood residents, and is composed of a series of highly adaptable, wooden, low-rise building structures with carefully curated retail, food, and cultural activities, alongside a new kindergarten and community garden, within an essentially car-free environment.

Spreading not scaling

The systemic design principles that underpin the MBN project support the 'spreading' of the biocorridors throughout the city, with an emphasis on creating community capacity to expand the initiative; rather than a focus on a large-scale 'top down' scaled project. This both reflects the existing work to care for local areas by community groups, and the desire for the project to be sustained outside of grant funding rounds. This model of 'spreading' is captured in the work of architect Jane Martin in San Francisco who helped spawn a social movement which has increased biodiversity and public amenity across the city's pavements. She lobbied the Department of Public Works to create a more affordable new Sidewalk Landscaping Permit, enabling the practices to spread. Currently, over 15,000 square feet of concrete, along sidewalks and street meridians, have been converted into sustainable gardens creating urban habitats for birds, bees, butterflies. The policy change was supported by a website that provides how-to guidance enabling the movement to spread. This approach connects with the above principle of 'adaptive and modular' and the tool-kit developed through the MBN project.

Nested governance

The approach will need to work across scales separately, but also consider how it fits together; as well as addressing broader policy goals. MBN will need to develop guidelines for different types of sites that can be adjusted to both site specific conditions as well as the type of benefits (e.g. biodiversity, open public space) each site is aiming to achieve. This nested systems approach will also consider decision-making cultures at different scales (e.g., from participative to representative). This nested governance approach will also include the development of systems-financing, which will be established in the future stages of the MBN.

Public ownership and participation

This project has revealed the underutilised public spaces of infrastructure sites throughout the city. While managed by a range of different stakeholder; these spaces are in public ownership, and thus belong to the communities. As social, cultural, and environmental needs change, the opportunities and restrictions that govern the sites must change too. Such changes might be in habits, expectations, and assumptions, or in 'external' factors like changing demographics, shifting health profiles, or the increasing impact of climate and biodiversity crises. Contemporary policymaking processes realise that regulation and policy must change as the situation does, and thus restrictions are not set in stone, but fluid, open and constantly adapting to changing circumstances. Or at least they should be. Unlocking imagination as to what biocorridors can do is part of the wider task for this project; much of the remaining work is in technically realising the huge opportunities for public participation, care, and engagement by sharing stewardship responsibilities for these increasingly essential but previously overlooked spaces.

Next Steps and Future Directions

Overall, the MBN project will require collaboration across government departments and agencies at a state level, as well as connecting with council departments and communities groups. The project design will combine both a top-down and bottom-up approach to capture the strengths and opportunities at all levels.

The next steps for the MBN project will include:

- LMCF, alongside other philanthropies, support a phase 2 development to prototype some interventions along some of the key corridor opportunities defined by phase 1's analysis.
- Involve a series of local councils, those most likely to form a 'coalition of the willing', based around the key corridor opportunities
- DEECA, DTP, Melbourne Water and related at the Victorian Government level support 'from above'. Developing both digital twin projects, as well as integration with large public projects such Melbourne Arts Precinct's MAP CO, Arden Macauley, Suburban Rail Loop.
- Working with Infrastructure Victoria on a repositioning of the Biodiversity Network as core infrastructure
- Traditional Owners such as Wurundjeri and Bunurong, join as primary project partners, engaged around indigenous knowledge-led approaches to system health
- Key community groups identified as key delivery partners at neighbourhood scale, in-depth mapping of community groups around case study corridors.
- Related LMCF project join project consortium (for example Regen Melbourne, both from Swimmable Birrarung and Regen Streets perspectives)
- Underpinning all this, and leading in terms of strategic design and system stewardship approaches, OFFICE, MSD and Melbourne Biodiversity Institute join forces to provide technical design and research expertise. Broader University of Melbourne research functions join as co-funder.
- Enacting case study projects at priority locations
- Monitoring and evaluation of the success of the case study sites, and identify key learnings to inform adjustments to project design
- Seeking funding, resources, and strategic focus for broad project expansion across key corridors, enabling the project to spread and diversify its intervention points, and ultimately reconnect to form systems of biocorridors



Figure 71: Buried waterway in Reservoir

Footnotes

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Appendix 1

Overview of key policies relevant to the MBN project

Policy	Policy overview	Relevant sections of alignment	Notes/additional information
Victorian Climate Adaptation Plan 2017-2020 Climate Change Victoria (Released 2016)	This plan defines Victoria's climate change action priorities and sets out the government's strategic priorities, measures and responses for adaptation in Victoria. This is a requirement under the Climate Change Act 2010.	Managing the impacts on the natural environment is identified as a core policy area for the plan. This includes protecting biodiversity (Section 5.3.1)	The adaptation plan also identifies the need for spatial decision support tools to identify how and when biodiversity is vulnerable to climate change impacts.
Plan Melbourne 2017-2050 Department of Environment, Land, Water and Planning (Released 2017)	A strategy to guide the growth of the city for the next 35 years for the vision of Melbourne. Supporting jobs, housing and transport as well as a legacy of distinctiveness, livability and sustainability.	Principle 4: Environmental resilience and sustainability Objective 4.1 Create more great public places across Melbourne Objective 4.4.1 Protect and enhance the metropolitan water's edge parklands	In addition to Objective 4.1, Plan Melbourne also has aligned objectives for: -Strengthen community participation in the planning of our city (Objective 4.6) -Protect and restore natural habitats (Objective 6.5)
Protecting Victoria's Environment - Biodiversity 2037 Environment Victoria (Released 2017)	The Victorian State Government's policy response to addressing the decline in biodiversity. The plan aims to stop the decline of native plants and animals and improve our natural environment.	The entire document details Victoria's commitment to protecting biodiversity, and obligation to meet the United Nations' Convention of Biological Diversity.	The Biodiversity plan sets out a long term vision for biodiversity in the state supported by two goals -Victorian's value nature -Victoria's natural environment is healthy
Healthy Waterways Strategy 2018-28 Melbourne Water (Released 2018)	The Healthy Waterways Strategy 2018-28 sets a long-term vision for managing the health of rivers, wetlands and estuaries in the Port Phillip and Westernport region, in order to protect and improve their value to the community.	Aligned with the Yarra River 50 Year Community Vision	The document highlights the Yarra as a 'connected network of thriving green spaces that nurture biodiversity, and deepen the relationship between people and nature.'

Policy	Policy overview	Relevant sections of alignment	Notes/additional information
Living Melbourne: Our metropolitan urban forest Resilient Melbourne and The Nature Conservancy (endorsed by 32 other governance bodies)	A strategy for a greener, more liveable Melbourne.	Action 1: Protect and restore species habitat, and improve connectivity Action 4: Collaborate across sectors and regions	The entire document advocates for, and delivers a strategy to achieve, a greener and more liveable Melbourne.
Open Space for Metropolitan Melbourne, 2021 Environment Victoria (Released 2021)	A strategic framework to guide the planning, acquisition, design, management, use and maintenance of the Melbourne metropolitan open spaces network - and how to enact that framework.	Goal 2, Healthier Biodiversity. A healthy environment is fundamental to healthy society. And our diverse ecosystems and plants and animals - especially those that are threatened and endangered - also need high-quality, connected open space; landscapes, coastlines and waterway corridors.	Also see Principle 4: Environmental resilience and sustainability Protecting Melbourne's biodiversity and natural assets is essential for remaining a productive and healthy city. There is an urgent need for Melbourne to adapt to climate change and make the transition to a low-carbon city.
State of the Environment Biodiversity Update 2021 Report Commissioned for Environmental Sustainability Victoria (Released 2021)	A review of the public policy context for biodiversity and conservation and management in Victoria, and research supporting scientific assessments. The report addresses: -Fire -Climate change -Invasive plants and animals -Threatened species and communities -Wetlands and rivers -Forests -Victoria's biodiversity targets	The report identifies poor status on the extent and condition of native vegetation the state, and insufficient data to report on -suitable habitats -management in priority locations -Victoria's valuing nature The report also cites the Trust for Nature Habitat 141 corridor as a successful landscape bio-link project.	Also see the associated Victorian Government response to the State of the Yarra and its Parklands 2018 report.
Yarra Strategic Plan (Burndap Birrarung burndap umarkoo) Victoria State Government (Released 2022)	Ten year plan which gives a strategy for the communities long-term vision for the Yarra and supports collaborative management of the river and its lands.	10 year performance objectives include: A healthy river and lands -improving the water quality of the Yarra River and protecting its land, floodplains and billabongs to achieve greater biodiversity.	The other aligned 10 year performance objective are for a culturally diverse river corridor Quality parklands for a growing population Protecting the natural beauty of the Yarra River corridor

Appendix 2

Precedent studies table

Project	Primary alignment	Key objective	Intended outcomes	Approach	Governance/delivery
Living Links Projects (Ongoing)	Biocorridor	Ecological corridor	Biodiversity	Mapping	Local council collaboration
Linking the Mornington Peninsula Landscape (2014-2023)	Biocorridor	Ecological corridor	Biodiversity	Land restoration	Supporting local landcare groups
Gondwana Link (2002-current)	Biocorridor	Ecological corridor	Biodiversity	Land restoration	Government working with local groups
FABRIcations - Ecological Energy Network (2015)	Biocorridor	Urban greening under high voltage powerlines	Urban green network	Speculative plan only	Speculative plan only
Life Elia (2011-2017)	Biocorridor	Urban greening under high voltage powerlines	Greening of 'edge' areas, biodiversity	Land management and restoration	Government and private
Woody Meadow Project (2016- current)	Urban greening	Improving the quality of low input landscapes	Public space and biodiversity	Planting and vegetation management	University and community groups

Girona Shores (2014-current)	Urban greening	Maintenance and upgrading of the town	Transforming 600 hectares of green and urban space	Vegetation management	Private initiative - turned government supported and community delivered
Greening the West (2011-current)	Urban greening	Maximise urban greening	Increased tree canopy and tree space	Government strategy	Government
Test Plot (2020-current)	Urban greening and community-led restoration	Rehabilitating a parkland	Biodiversity and community well-being	Community delivered land restoration	Community
Parramatta Ways (2017)	Urban connectivity	Networked public space	Improved walkability	Urban planning and tree planting	Government
Local Code (2013)	Urban strategy	Development of underutilised sites	Urban resilience (social, ecological, physical)	Digital tools and design prototypes	Research project
New National Parks (2023)	Regional strategy	New national parks	Biodiversity	Mapping	Government
Rainproof Amsterdam (2016)	Climate resilience	Private property interventions	Rainproofing the city	Community actions	Individual behaviour aligned with government strategy
Amsterdam RE-SILIO (2022)	Climate resilience	Blue-green roof installation for water retention	Minimise urban flooding and heat islands	Infrastructure delivery	Private-public partnership

Appendix 3

Workshops: Key priorities for each stakeholder group.

Practitioners	Local Councils	State Government	Volunteer Groups
<p>The need to bridge top-down and bottom-up strategies and delivery</p> <p>Tapping into community values, knowledge and expertise</p> <p>A 'beyond human planning' approach</p> <p>Engaging with privately owned spaces</p> <p>Investment in maintenance and care</p> <p>Long term future planning around climate risks</p>	<p>A need for mapping and measuring of open spaces</p> <p>Developing an approach for council-level opportunities</p> <p>Challenge of engaging with non-council managed spaces</p> <p>How to communicate the value and address many different ecological, community and economic objectives</p> <p>Challenge of safety and risk management (both actual and perceived)</p>	<p>Opportunity for enhanced engagement with community</p> <p>Social, biodiversity and economic value of these initiatives</p> <p>Need for collaboration across agencies</p> <p>Challenge of risk management</p> <p>Challenge of cyclical grant funding</p> <p>Need for investment into maintenance</p> <p>Role of project champions</p>	<p>The need to work at a river-system level</p> <p>Challenge of cyclical funding arrangements</p> <p>Key barriers for volunteer groups:</p> <ul style="list-style-type: none"> Age of participants Insurance Capacity building opportunities Role of advocacy and champions Long term future opportunities