

CHAPTER 09

SUSTAINABILITY AND RESILIENCE



Plan Melbourne Outcome 6:
Melbourne is a sustainable and
resilient city

Plan Melbourne aims to create a resilient and sustainable city. It recognises the need to mitigate greenhouse gas emissions, reduce exposure to natural hazards, undertake whole of water cycle planning and design, and protect local waterways. It also encourages resource efficiency and promotes the benefits of urban cooling and greening.



Photo credit: Craig Moodie Photography

The Western Metro Region includes established urban areas in its east, rolling grasslands in its west, productive agriculture and globally recognised wetlands in its far south, and growing suburbs in its south, centre and north-west. To retain and enhance this valued diversity, regional decision-makers must implement policies and practices that respond to the region's future conditions.

Mitigating and adapting to climate change is a key challenge for the Western Metro Region. Heat waves have a greater negative effect on population health than any other climate-related issue, and by 2050 the Western Metro region will be hotter and drier. It will also experience lower rainfall and more extreme rainfall events and increased storm intensity. Valued coastal environments, coastal suburbs and infrastructure will be increasingly under pressure from storm surge, tidal inundation and sea level rise.

Coupled with urbanisation, increased temperatures and lower annual rainfall will place additional pressure on natural assets and marine ecosystems such as the Port Phillip Bay, Ramsar wetlands, creeks, river corridors, parks and other valued vegetation. These changes will also place pressure on agricultural production and drive the importance of whole of water cycle planning.

Ongoing challenges resulting from climate change, including bushfire risk, in combination with significant population growth will require deliberate, coordinated action by government agencies and authorities to create a sustainable, resilient Western Metro Region.

State of play

Energy networks

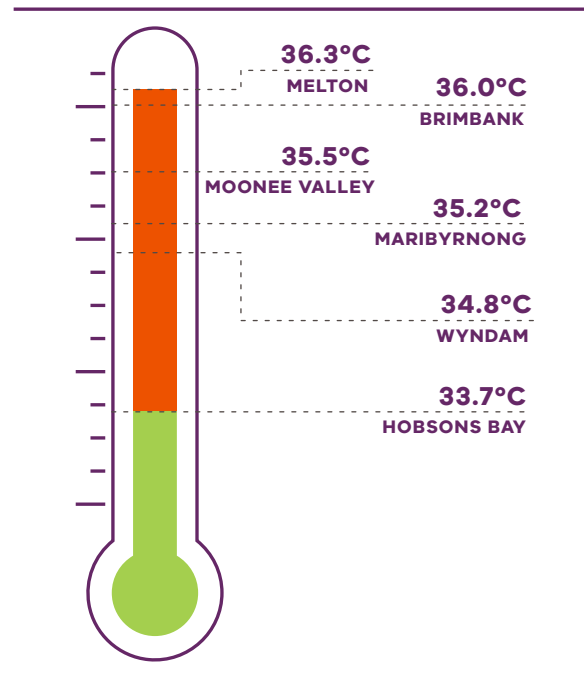
Melbourne's energy grid is transforming. The city's future grid will have a greater ability to export energy from individual properties or a local area, presenting a more flexible approach to energy production. It will be smarter, more reliable and provide greater energy security. Regional energy generation and storage is also a potential option, and the region's green wedge areas could provide an opportunity to support these facilities subject to environmental and landscape considerations.

Urban heat environments

By 2050 the average annual temperature in the Western Metro Region is forecast to increase between 0.9°C and 2.4°C under a medium emissions climate change scenario (Clarke, et al., 2019). As our climate warms the number of people exposed to the risk of mortality from heatwaves will increase. In 2018, it is estimated that around 285,000 residents in the Western Metro Region were exposed to high urban heat conditions, particularly in growth area communities (CRCWSC, 2019).

In 2018 the average land surface temperature (LST) in the Western Metro Region was 35.3°C, 1.3°C more than the metropolitan average. (DELWP, 2018c) LST was highest in Melton (36.3°C) and Brimbank (36.0°C) LGAs and coolest in Hobsons Bay LGA (33.7°C) as shown in Figure 23.

FIGURE 23. Average land surface temperature by LGA, 2018



Source: Department of Environment, Land, Water and Planning (2018) Land Surface Temperature Data, State of Victoria, Melbourne, Australia.

The combination of fewer trees and more hard surfaces means most of the Western Metro Region is exposed to higher urban temperatures during extreme and prolonged heat events. Older people, younger children, people with underlying health issues and those with fewer resources to adapt are more at risk on hot days and prolonged periods of hot weather.

The urban heat island effect refers to temperature differences attributable to urbanisation where suburbs perform differently due to variation in trees, vegetation and hard surfaces which can have multiple impacts on health, resource use and air quality (Sun et al., 2019).

Apart from the bayside Hobsons Bay LGA, the remainder of the Western Metro Region experiences high levels of urban heat, primarily due to lower levels of vegetation and large areas of land and surfaces without tree cover and access to water (Figure 25 and Figure 26).

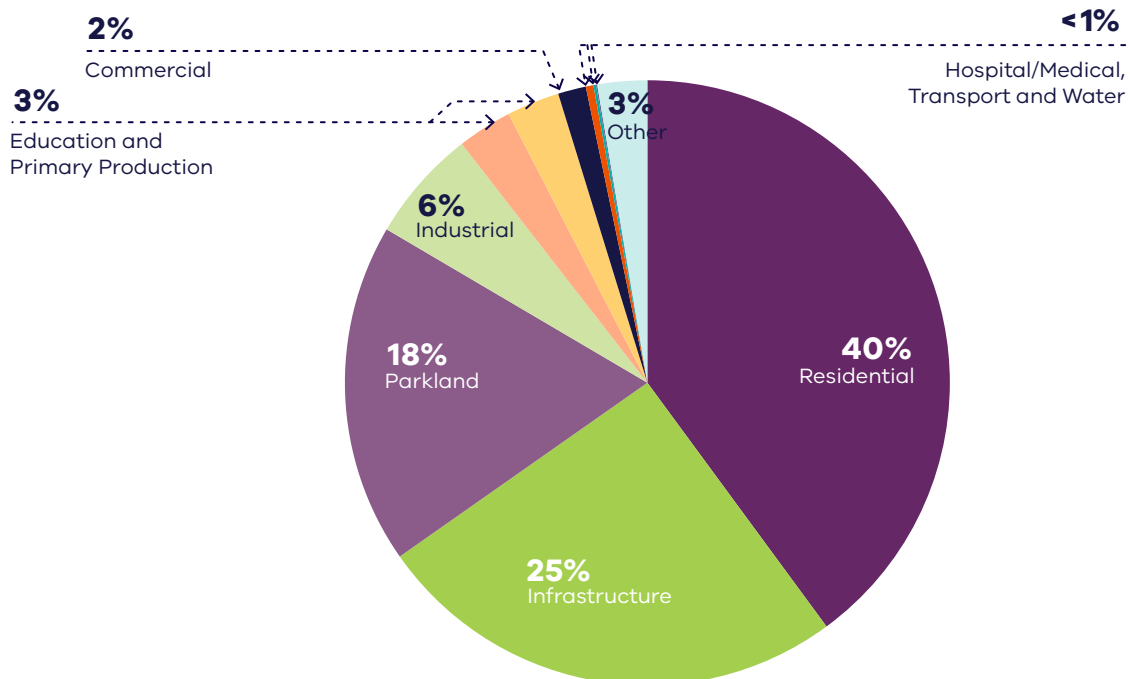
Urban tree canopy

In urban areas, trees positively contribute to urban cooling and neighbourhood character, offer amenity and recreation for residents and provide habitat for wildlife. In 2018 the Western Metro Region's total vegetation cover was 29 per cent, its combined shrub and tree cover was 11 per cent and its tree canopy cover was 6 per cent (Hurley et al., 2019a).

Within the region, residential land was the largest contributor of trees, followed by infrastructure land (primarily streets) and parkland (Figure 24) (Hurley, et al., 2019a).

Tree canopy cover varied between the six local government areas comprising the Western Metro Region, with the greatest proportion in established eastern LGAs including Moonee Valley and Maribyrnong and the least in growing western LGAs such as Melton and Wyndham (Hurley, et al., 2019b). All LGAs within the Western Metro Region experienced modest gains in tree canopy cover between 2014 and 2018 (Figure 27), most likely due to a significant focus in creating green public spaces in the western suburbs (Hurley, et al., 2019a). However, these gains were from a low base. The region had the lowest baseline tree canopy cover (5.8 per cent) compared to all other metropolitan regions.

FIGURE 24. Urban tree canopy cover by land use, 2018



Source: Hurley, J., et al. (2019) Melbourne Vegetation Cover 2018, Western Region, Department of Environment, Land, Water and Planning, Melbourne, Australia.

FIGURE 25. Heat vulnerability index map for the Western Metro Region, 2018

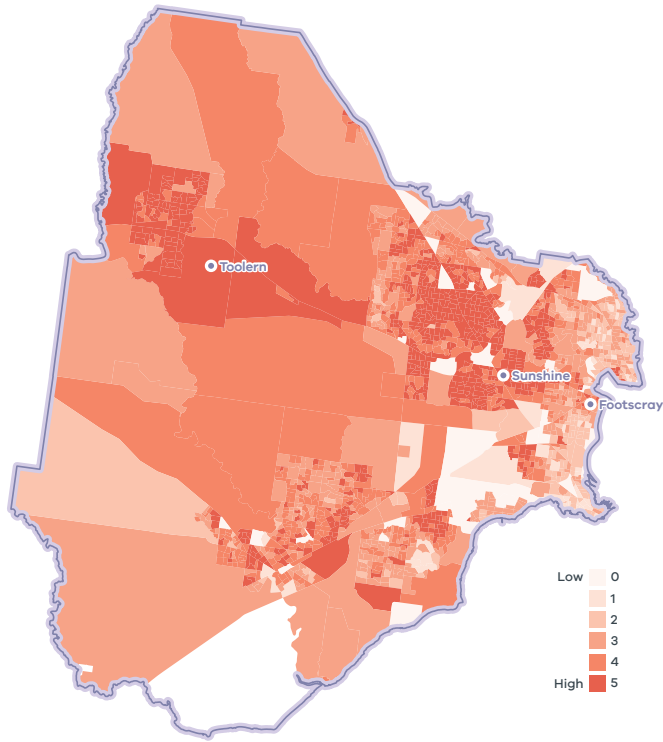


FIGURE 26. Western Metro Region tree canopy cover, 2018

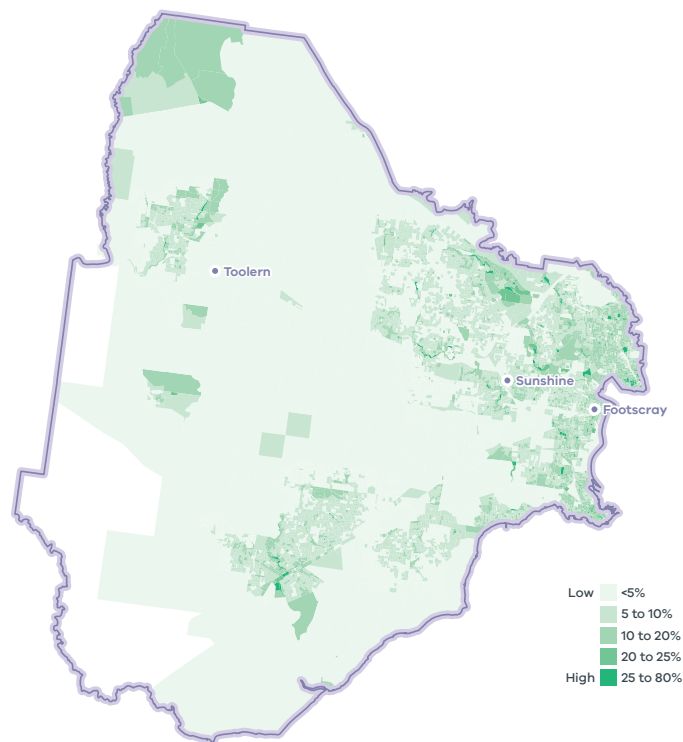
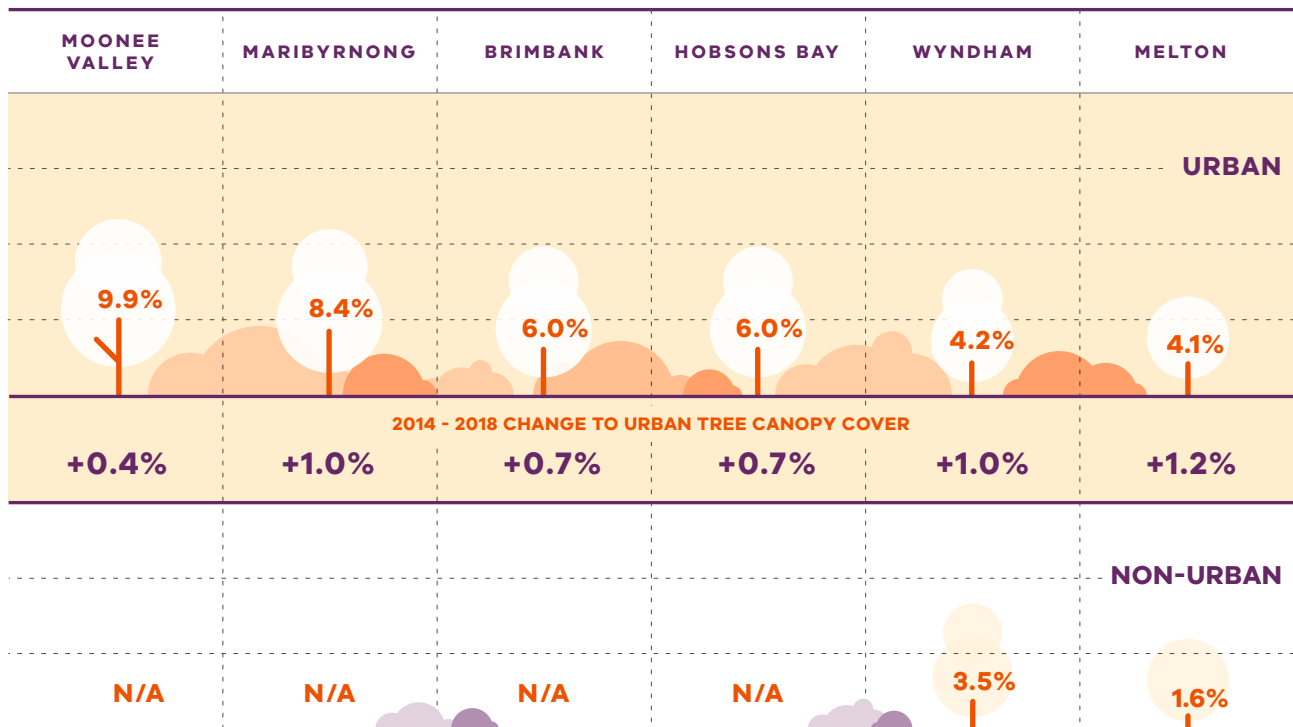


FIGURE 27. Tree canopy cover 2018, and tree canopy cover change 2014 to 2018, by LGA



Source: Hurley, J., Saunders, A., Amati, M., Boruff, B., Both, A., Sun, C., Caccetta, P., and Duncan, J. (2019) *Melbourne Vegetation Cover 2018, Western Region*, Department of Environment, Land, Water and Planning, Melbourne, Australia.
 Hurley, J., Saunders, A., Both, A., Sun, C., Boruff, B., Duncan, J., Amati, M., Caccetta, P. and Chia, J. (2019) *Urban Vegetation Cover Change in Melbourne 2014 - 2018*, Centre for Urban Research, RMIT University, Melbourne, Australia.

Natural hazards – bushfire risk

Bushfire risk within the Western Metro Region primarily exists due to the forests and extensive grasslands situated in its west. Large areas of this land are subject to state planning policy for bushfire (Clause 13.02), Bushfire Prone Areas (BPA) and the Bushfire Management Overlay (BMO). The likelihood of a bushfire, its severity and intensity depend on a site’s location and surrounding landscape characteristics.

The BMO aims to strengthen community resilience to bushfire by considering bushfire measures as part of the design process and ensuring new development achieves an acceptable level of bushfire risk in areas of highest bushfire risk. However, there is still a need to strengthen the resilience of settlements and communities to bushfire. Strategic risk-based planning that prioritises the protection of human life over other policy considerations should extend to sensitive uses and uses that encourage high visitation to the green wedges during hotter months.

The frequency and intensity of bushfires and grassfires in the Western Metro Region is forecast to increase with climate change, posing a serious threat to the region’s communities, infrastructure and high-value forests, grasslands and ecosystems. Planning for the risk of bushfire will be vital as the climate warms and overall rainfall decreases.

Flooding risk and waterway health

Despite anticipated reductions in the overall average annual rainfall, it is predicted that climate change will result in a greater incidence of heavy rainfall events in the Western Metro Region. This will present a greater risk of stormwater inundation to both private and public property in low-lying urban areas in the Maribyrnong Catchment as well as middle and emerging outer suburbs in the Werribee Catchment (DELWP, 2018a). Rainfall intensification and resultant higher volume stormwater flows will also accelerate riverbank erosion and flush litter and chemicals from the stormwater system, degrading the water quality of the region’s creeks, rivers, wetlands and coastline.

Harvesting stormwater and increasing water infiltration are important in dense suburbs to reduce runoff and service vegetation. Stormwater and recycled water can support the maintenance of water-reliant facilities and amenities such as sporting fields and gardens, contribute to more resilient vegetation, reduce demand on drinking supplies and improve the environment of receiving streams and rivers.

Sea level rise and coastal inundation risk

The coastline and bay have significant value to the Victorian community for a range of cultural, recreational, environmental and economic values, but both are under pressure from urbanisation and climate change (DELWP, 2017b). Coastal suburbs, including Altona, Seaholme and Williamstown, lie on relatively flat terrain, with some parts lower than sea level. Damage to these areas from flash flooding, storm surges and tidal inundation from Port Phillip Bay will continue to impact public and private infrastructure (DELWP, 2018a). Additionally, marine and coastal environments will experience increases in water temperature and rising sea levels. Storm surges will become more frequent, exposing riverine estuaries and the coastline to tidal inundation and erosion (DELWP, 2017b).

As projected average temperatures continue trending upwards through this century, so too will global mean sea levels as oceans partially absorb atmospheric heat and glaciers and polar ice caps continue to melt. Accordingly, state planning policy recognises the need to plan for anticipated sea level rise to Port Phillip Bay (Melbourne Water, 2017). Given the uncertainty of our climate change future, planning policy will need to be responsive to future recalibration of sea levels.

Wastewater treatment facilities

Located south-west of Werribee, Melbourne Water's Western Treatment Plant processes approximately half of Melbourne's sewerage and provides an internationally recognised wetland habitat for migratory birds. (DELWP, 2018a) In addition, City West Water operates the smaller Altona Treatment Plant, and the Melton Recycled Water Plant also treats wastewater (DELWP, 2018a).

Together these facilities produce around 40 billion litres of recycled water for non-drinking purposes, which is distributed throughout the region to irrigate crops, public open spaces and residential properties as well as support industrial and manufacturing processes (DELWP, 2018a). As the region's population and urban land area continues

to grow, demand for water will grow as well. Increased competition between various recycled water users will challenge regional water services to significantly expand the recycled water network and improve its output and efficiency.

Resource efficiency and waste and resource recovery

In 2013/14 Greater Melbourne had a 73 per cent resource recovery rate, with 805,000 tonnes of food and garden waste sent to landfill. By 2042, it is projected waste volumes will grow by 63 per cent to 16.5 million tonnes each year (Metropolitan Waste and Resource Recovery Group, 2016).

There are several sites across the Western Metro Region undertaking waste and/or resource recovery activities, which are important at the state level, including the Ravenhall Precinct, the Wyndham Refuse Disposal and Recycling Facility, the Brooklyn Precinct, the Laverton Precinct and the Owens Illinois glass reprocessing facility in Spotswood (Sustainability Victoria, 2018).

Sustainability in the built environment

In 2013, residential buildings were responsible for nearly 12 per cent of Australia's national greenhouse gas emissions, and commercial buildings contributed just over 11 per cent. The majority of these emissions were generated through the consumption of grid-supplied electricity to power appliances, lighting, and predominantly heating, ventilation and cooling (HVAC) systems (Australian Sustainable Built Environment Council, 2016).

As average temperatures rise due to climate change, greater numbers of people are expected to seek comfort indoors during periods of hot weather. This, combined with population growth and overall poor-performing building stock, means our city lacks energy efficiency and resilience on hot days. Maximising opportunities to incrementally improve the performance of buildings will reduce our reliance on appliances to cool buildings and contribute to a lower likelihood of blackouts during periods of hot weather.

Local councils within the Western Metro Region are active in adopting policies and strategies to reduce carbon emissions and improve the sustainability of the built environment. Many are innovators and leaders in environmentally sustainable design (ESD) and are implementing new practices to improve the energy efficiency of civic buildings and reduce emissions from operations.

Several LGAs are members of the Council Alliance for a Sustainable Built Environment (CASBE), an association committed to designing and applying a range of practical methodologies to increase sustainability outcomes for new buildings. The Built Environment Sustainability Scorecard (BESS) is an online tool developed by CASBE that assesses the sustainability of proposed developments. It aims to reduce waste and improve energy efficiency from the outset of the construction phase, through to occupation. As well as onsite energy generation, BESS promotes the use of energy-efficient appliances, thermally-efficient glazing, wall cladding and insulation, water-efficient fittings and fixtures, thermal comfort and overall environmentally sustainable performance.

Other rating systems being increasingly utilised by the building design industry to measure and assess the performance of ESD principles include Green Star (Green Building Council of Australia, 2021), NatHERS (Department of Industry, Science, Energy and Resources, 2021) and MUSIC (eWater, 2021).

Regional strengths

- There are opportunities for increased use of recycled water from several locations within the region.
- Waste and resource recovery hubs provide significant opportunities for investment in recycling.

Regional challenges

- The region has large areas of high urban heat and heat vulnerable communities.
- Expanding the tree canopy is difficult due to the region's hot and dry microclimate and the lack of a consistent, reliable water supply.
- Coastal environments, suburbs and infrastructure are all under increasing risk from storm surge, tidal inundation and sea level rise.
- Access to treated wastewater from the Western Treatment Plant is a challenge due to the high levels of salinity.
- Bushfire and grassfire pose risk to community, infrastructure and high-value grasslands and ecosystems.

Directions and strategies

The directions identified to achieve the 2050 vision for the Western Metro Region in terms of sustainability and resilience and Outcome 6 of Plan Melbourne are:

Direction 24	Increase the number of cool places across the region, particularly for communities vulnerable to urban heat and areas experiencing high urban heat
Direction 25	Increase the tree canopy across the Western Metro Region to 20 per cent coverage by 2050
Direction 26	Manage the impact and risk of sea level rise
Direction 27	Plan for future land use to utilise forecast recycled water from the Western Treatment Plant
Direction 28	Increase the retention and reuse of water in the urban environment
Direction 29	Minimise and reduce risk from bushfire in Wyndham and Melton.
Direction 30	Respond to the transformation of the energy supply network
Direction 31	Protect sites of strategic importance for recycling and plan for the expansion of key sites for future resource recovery needs

Each direction is implemented through regionally-specific strategies identified in this LUF.






Map 10 shows how sustainability and resilience will be enhanced across the Western Metro Region by 2050 as a result of these directions and strategies, together with Plan Melbourne and other strategies and initiatives as outlined in Appendix 01.







Photo credit: Craig Moodie Photography

MAP 9. Western Metro Region sustainability and resilience state of play

Precincts and Activity Centres

-  National employment & innovation cluster (NEIC)*
-  Metropolitan activity centre
-  Metropolitan activity centre (future)
-  Major activity centre
-  Major activity centre (future)






Transport

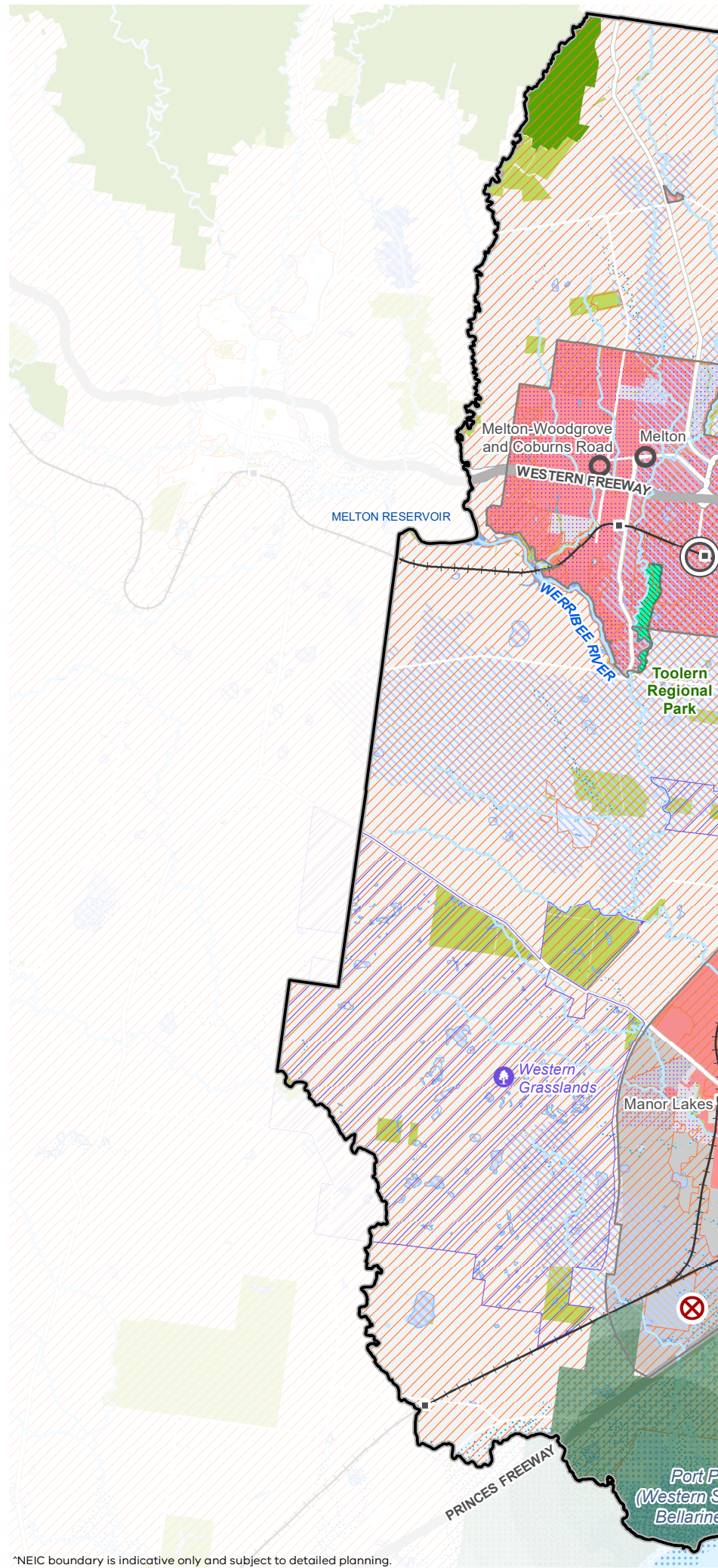
-  State-significant road corridor
-  Road network
-  Train station
-  Rail network

Environment

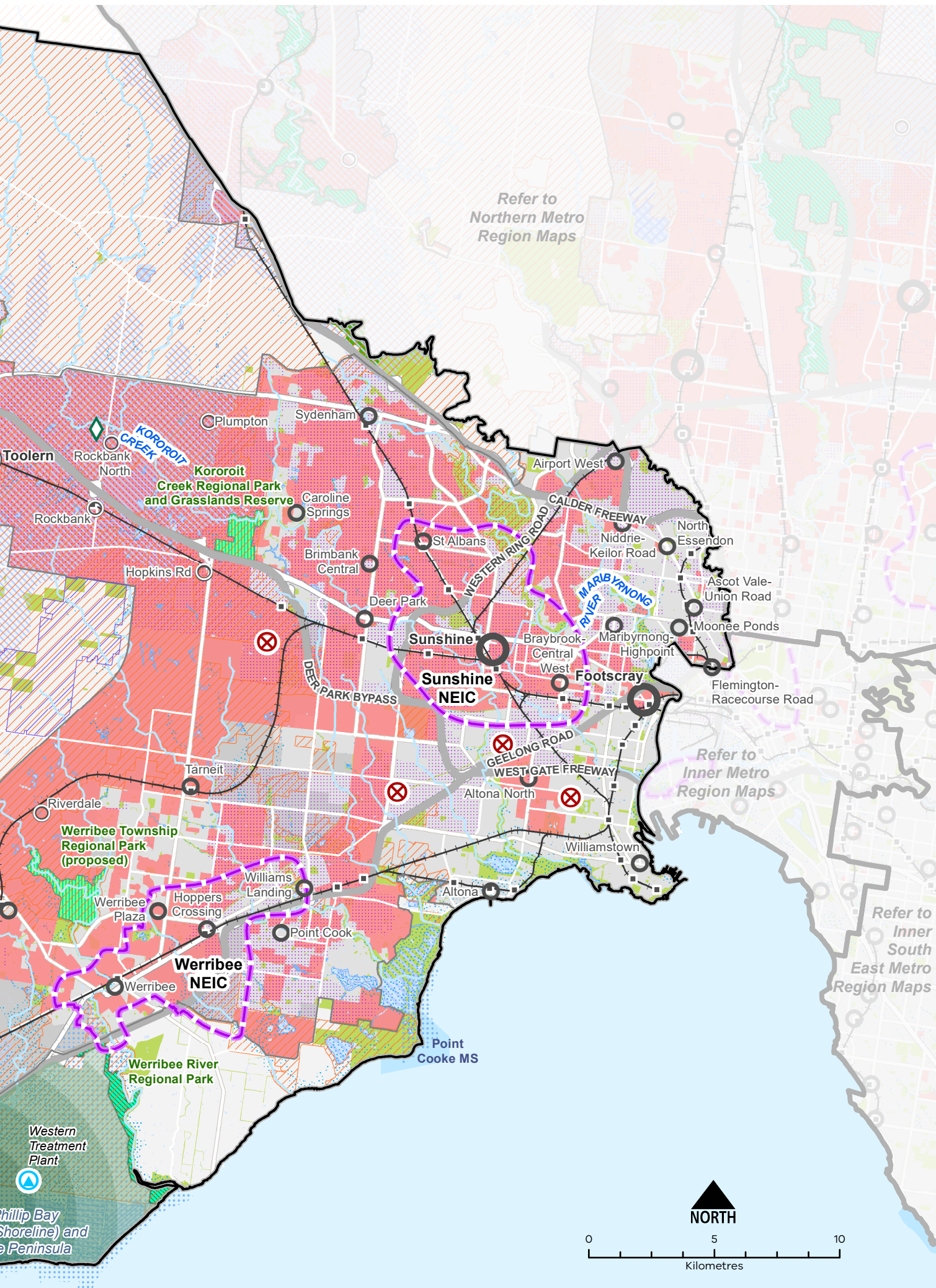
-  Conservation reserve - emerging
-  National park/state park
-  Western Grassland Reserve
-  Regional Park - expanded/improved
-  Regional Park - proposed
-  Future regional active open space
-  Public open space
-  Marine/coastal national parks and reserves
-  Wetlands
-  Ramsar wetlands
-  Waterway
-  Areas subject to flooding (existing planning controls)
-  Priority stormwater sub catchments
-  Wastewater treatment plant & buffer
-  Waste facility
-  Reservoir
-  Waterbody
-  Bushfire risk area (Bushfire Management Overlay + bushfire prone area)
-  High heat vulnerability areas (HVI >3)
-  High land surface temperatures

Land use/Administration

-  Regional boundary
-  Green wedge land
-  Growth
-  Urban area
-  Urban growth boundary



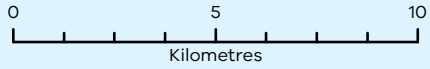
*NEIC boundary is indicative only and subject to detailed planning.



Refer to Northern Metro Region Maps




Refer to Inner Metro Region Maps

Refer to Inner South East Metro Region Maps







MAP 10. Western Metro Region sustainability and resilience 2050

Precincts and Activity Centres

-  National employment & innovation cluster (NEIC)*
-  Metropolitan activity centre
-  Major activity centre





Transport

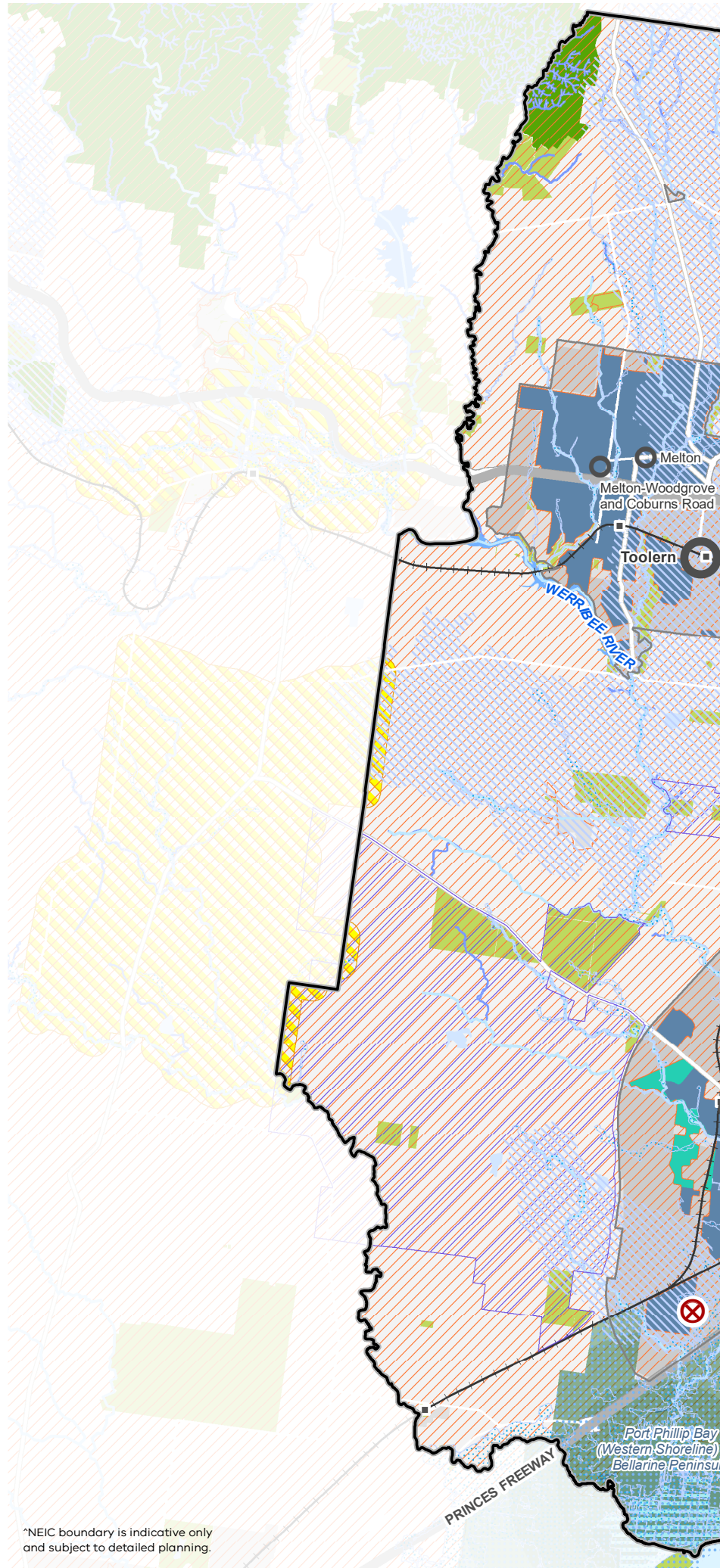
-  State-significant road corridor
-  Road network
-  Train station
-  Rail network

Environment

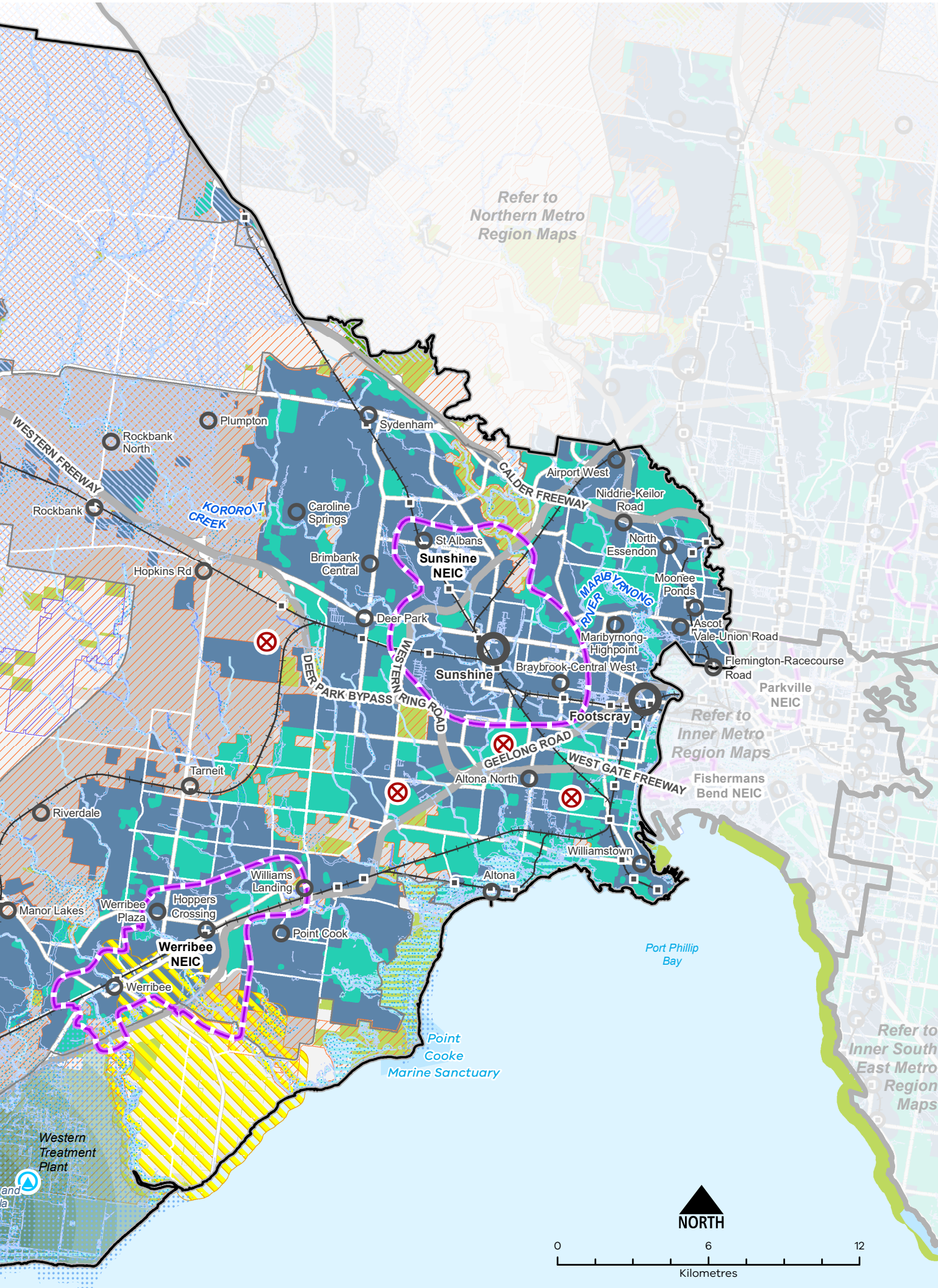
-  National park/state park
-  Western Grassland Reserve
-  Public open space
-  Marine/coastal national parks and reserves
-  Ramsar wetlands
-  Waterway
-  Areas subject to flooding (Melbourne Water)
-  Future coastal inundation risk
-  Priority waterways for enhanced vegetation
-  Priority areas For enhanced stormwater management
-  Wastewater treatment plant & buffer
-  Waste facility
-  Irrigation district
-  Reservoir
-  Waterbody
-  Bushfire risk area (Bushfire Management Overlay + bushfire prone area)
-  Priority - urban heat response
-  Priority - expand urban tree canopy cover

Land use/Administration

-  Regional boundary
-  Green wedge land
-  Growth area
-  Urban area



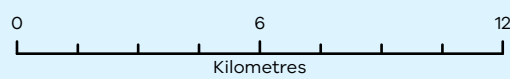
*NEIC boundary is indicative only and subject to detailed planning.



Refer to Northern Metro Region Maps

Refer to Inner Metro Region Maps

Refer to Inner South East Metro Region Maps



DIRECTION 24.**Increase the number of cool places across the region, particularly for communities vulnerable to urban heat and areas experiencing high urban heat**

Large areas of the Western Metro Region have high land surface temperature and heat vulnerable communities. Plan Melbourne notes that temperature decreases of between one degree Celsius and two degrees Celsius can have a significant impact on reducing heat-related morbidity and mortality (DELWP, 2017a).

Urban environments that stay cooler on hot days are more physically comfortable and continue to support physical movement and recreation. As the number and duration of hot days increases, these environments will be important to reduce the likelihood of heat-related illness. Cooler urban environments are characterised by more tree cover, fewer impermeable surfaces, more water infiltration into the ground and fewer heat-absorbing materials. Cooler places will help reduce urban temperatures and create comfortable local micro-climates in the Western Metro Region.

In addition to trees, green walls, shade structures and low heat absorbing materials can help reduce urban surface temperatures. Mitigating urban heat will be important in inner areas of the region, activity centres, the Sunshine and Werribee NEICs and around education and recreation facilities. Areas and facilities frequented by older people and children will need to provide for more active cooling of outdoor environments.

Buildings with vegetation and roof gardens will need to be combined with onsite water harvesting and storage to ensure vegetation health and reduce potable water demand.

Footscray and Sunshine metropolitan activity centres have communities vulnerable to urban heat, along with Melton, Melton-Woodgrove and Coburns Road, Sydenham, Airport West, Caroline Springs, Niddrie-Keilor Road, St Albans, Brimbank Central, Deer Park, Maribyrnong-Highpoint, Braybrook-Central West, Altona North, Tarneit, Manor Lakes, Williams Landing, Werribee, Hoppers Crossing, Werribee Plaza and Point Cook major activity centres. These communities are at a higher risk of heat-related illness during periods of multiple hot days (Sun, et al., 2019).

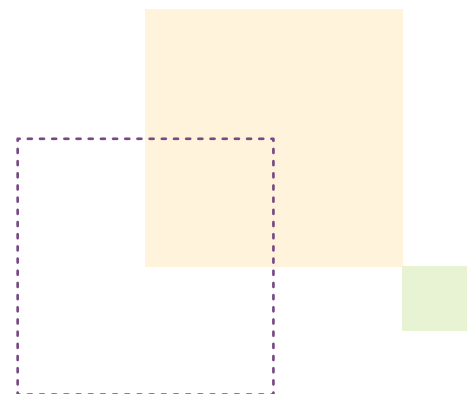
As shown in **Map 9** there are also large areas of high urban surface temperatures in suburbs to the east and west of the Metropolitan Ring Road, and north and south of the Western Freeway, which absorb and retain heat.

STRATEGY 99. Increase tree canopy in areas with high urban heat vulnerability and high urban heat locations.

STRATEGY 100. Design and develop outdoor spaces that are cool on hot days through materials, vegetation and water sensitive urban design, particularly in:

- Footscray and Sunshine metropolitan activity centres
- Melton, Melton-Woodgrove and Coburns Road, Sydenham, Airport West, Caroline Springs, Niddrie-Keilor Road, St Albans, Brimbank Central, Deer Park, Maribyrnong-Highpoint, Braybrook-Central West, Altona North, Tarneit, Manor Lakes, Williams Landing, Werribee, Hoppers Crossing, Werribee Plaza and Point Cook major activity centres.

STRATEGY 101. Encourage green roofs and green structures with climate resilient planting and irrigation particularly on apartment developments in areas with high urban heat and large commercial, industrial, education and health developments.



DIRECTION 25.**Increase the tree canopy across the Western Metro Region to 20 per cent coverage by 2050**

Canopy trees are particularly effective at lowering daytime air temperatures at ground level through transpiration and shading. In the absence of water, increased tree canopy cover and the clustering of trees provides the greatest response to the challenge of urban heat.

Expanding the region's tree canopy cover can be achieved by planting new canopy trees and preserving existing vegetation. However, ongoing development and climate change will place pressure on the urban forest above and beyond limitations already experienced in the Western Metro Region due to its relatively hot, dry microclimate. Reliable, consistent access to water for irrigation will be critical to the expansion of the region's tree canopy cover. Species selection and soil attenuation will also be important to ensure the success of planting in the Western Metro Region.

While residential land currently provides most of the tree canopy cover in the region, tree canopy should be expanded on other land uses. For example, rail corridors, streets, school grounds and parklands can contribute to achieving an increased tree canopy cover. Waterway corridors offer considerable opportunity to expand tree cover along their riparian zones, which play a key role in improving waterway health.

A key challenge for increasing tree canopy is the ability to retrofit existing urban areas for trees and green infrastructure due to the availability of public and private space and the multiple functions of public land and publicly accessible places. For example, there are potential conflicts with electrical powerlines, underground cabling, gas and stormwater pipe works and regulation, and transport movement.

In the Western Metro Region, tree planting will need to avoid remaining areas of natural treeless grassland as these are some of the most precious remaining natural assets in the region.

The Greening the West program brings together government departments, agencies and other stakeholders to coordinate and accelerate greening across the region.

All Western Metro Region LGAs have endorsed the *Living Melbourne: Our Metropolitan Urban Forest* strategy, specifying a regional target of 20 per cent total tree canopy and 30 per cent combined tree canopy and shrubs by 2050 (The Nature Conservancy and Resilient Melbourne, 2019). To support this commitment, the tree canopy target is accompanied in Table 15 by an aspirational distribution of tree canopy cover across four

different land use types, adapted by DELWP from several related datasets (Hurley, et al., 2019a) (Urlich & Hardy, 2020) (PSMA Australia Limited, 2021).

TABLE 15. Western Metro Region tree canopy cover target and aspirational distribution

2018 TREE CANOPY COVER: 5.5%	
2050 TREE CANOPY COVER TARGET: 20%	
(+14.5% OR +7,680 HECTARES ADDITIONAL TREE CANOPY COVER)	
Residential, commercial, industrial and primary production	45%
Streets, roads and rail	25%
Parks, open space and waterways	25%
Education and hospital/medical	5%

STRATEGY 102. Increase the tree canopy across the Western Metro Region particularly in:

- emerging areas in Wyndham and Melton LGAs experiencing high urban heat vulnerability
- established areas within Moonee Valley, Maribyrnong and Brimbank LGAs experiencing high urban heat.

STRATEGY 103. Protect more trees on private land outside of locations identified for higher levels of housing and mixed-use change.

STRATEGY 104. Support alternative siting of buildings and more compact building forms to retain mature canopy vegetation.

STRATEGY 105. Increase tree canopy along urban waterways and on streetscapes, public land, large developments within activity centres, open spaces and road reserves, and large commercial and industrial sites.

STRATEGY 106. Use the region's open space network to strengthen its tree canopy and urban greening, aided by water sensitive urban design and stormwater harvesting.

STRATEGY 107. Encourage tree planting as part of the redevelopment of key sites and activity centres and along key pedestrian and active transport links.

DIRECTION 26. **Manage the impact and risk of sea level rise**

Coastal areas are susceptible to rising sea levels as well as storm surges. Much work has been undertaken at the state level to determine the impact of sea level rise by 2100 in areas along Port Phillip Bay in the Western Metro Region.

Future planning must anticipate the impacts of storm surge and coastal inundation. Several significant assets are located on or within close proximity to the coastline, including the Western Treatment Plant and the productive agricultural land surrounding it, the Ramsar wetlands and the suburbs of Altona, Seaholme and Williamstown. Regional planning must adopt a strategic approach to integrate and manage land use and infrastructure change to reduce the risk to communities, infrastructure and natural assets from coastal inundation and storm surge.

DELWP is undertaking a Local Coastal Hazard Assessment for Port Phillip Bay. The Local Coastal Hazard Assessment will provide better information about the expected impacts of coastal hazards such as erosion and inundation that are exacerbated by the effects of climate change. This information will better inform planning decisions in coastal areas around the bay.

- STRATEGY 108.** Consider current forecasts of the level of sea level rise and coastal impacts in land use and infrastructure decision-making along the coast.
- STRATEGY 109.** Encourage settlement planning for coastal environments and communities to respond to sea level rise and natural hazard risk.
- STRATEGY 110.** Limit the location of major land use change in locations with future coastal inundation.
- STRATEGY 111.** Factor climate impacts into the total life cost of major public land use and infrastructure investment in the coastal areas of the Western Metro Region.

DIRECTION 27. **Plan for future land use to utilise forecast recycled water from the Western Treatment Plant**

Plan Melbourne supports the use of all water sources, including recycled water, to ensure the city remains liveable and sustainable and to reduce reliance on drinking water. By 2050, Plan Melbourne identifies a greater contribution of recycled water to Melbourne's water supply mix.

Recycled water is produced in the Western Metro Region at the Western Treatment Plant, the Altona Treatment Plant and the Melton Recycled Water Plant. However, excess salinity presently degrades the quality of the recycled water produced by these facilities – particularly by the Western Treatment Plant – and this must be resolved before its benefit can be fully realised throughout the region.

Some areas of land within the Western Metro Region are already using recycled water, particularly the Werribee Irrigation District adjacent to the Western Treatment Plant. Opportunities to expand recycled water have been identified which, if realised, could significantly increase agricultural productivity and job creation for the region. Recycled water could also be used to irrigate additional open spaces, improve vegetation health and reduce the risk of bushfire and contribute to the resilience of the region. Access to recycled water could provide opportunities for a broader mix of uses, including uses in the green wedges.

As Melbourne grows, the need to treat wastewater and the potential need to discharge significant amounts of water into Port Phillip Bay will increase. This projected increase in recycled water is a major opportunity for the region. Planning should support the delivery of recycled water to agricultural and urban uses.

- STRATEGY 112.** Protect and buffer the Western Treatment Plant through appropriate planning zones as a waste-water management hub.
- STRATEGY 113.** Support land use that will enable greater recycled water use from the Western Treatment Plant (to best meet water needs as determined by the Central Sustainable Water Strategy, Melbourne Metropolitan Urban Water System Strategy and Integrated Water Management Forums).
- STRATEGY 114.** Implement integrated water management initiatives that improve water quality, reduce the impacts of stormwater inundation, and protect the region's key watercourse assets.

DIRECTION 28. **Increase the retention and reuse of water in the urban environment**

Planning for water is essential to support liveability, healthy ecosystems and urban cooling and greening. Integrated stormwater management, reducing runoff into waterways and wetlands, and water recycling will improve climate resilience and liveability. The Victorian Government's strategies *Water for Victoria* and *Integrated Water Management Framework for Victoria* provide the strategic framework for water management in Victoria.

Integrated stormwater management, reducing runoff into waterways and wetlands, and water recycling will improve climate resilience and liveability.

Parts of the Maribyrnong and Werribee catchments will continue to undergo significant land use change for housing, diversification of activity centres, and new road, health and education infrastructure. This will increase stormwater runoff and flooding and negatively affect water quality and waterway health for aquatic life. Responding to this change and supporting the health of the region's creeks, rivers, wetlands, estuaries and coastline will be an ongoing challenge to Port Phillip Bay, the Maribyrnong River, the Werribee River and Kororoit Creek.

Where areas of the Western Metro Region are subject to flooding, there is an opportunity to increase stormwater and floodwater harvesting capabilities. Improved stormwater storage capabilities and stormwater harvesting and management across the region could reduce the risk and cost of major rainfall events and minimise impacts such as pollution of the bay's marine environments.

Local capture of stormwater, water recycling, restoration and revegetation of urban waterways and greywater systems will improve the region's hydrological and ecological systems. This will reduce the impacts of flooding, support healthy vegetation and prepare for drying conditions by increasing permeable areas, increasing proportions of green space, avoiding paved areas and passively irrigating vegetation.

Development also increases the quantity of wastewater generated in urban areas, which provides another opportunity to diversify water sources. For example, wastewater can be recycled and used to irrigate public open space and sporting grounds. This will help improve water security as the climate warms and overall rainfall decreases. Further, wastewater contains nutrients and organic matter that could be used to create valuable products such as fertilisers and energy sources.

Given increasing limits in resource availability, this creates an opportunity to expand the benefits of wastewater management by exploring different options for resource recovery.

Harvesting stormwater and increasing water infiltration is important in dense suburbs to reduce runoff and service vegetation. Harvested stormwater can help maintain water-reliant facilities and amenities such as sporting fields and gardens. It can also contribute to more resilient vegetation and reduce demand on drinking water. Open spaces, pedestrian and cycling networks can all use WSUD to improve urban amenity and retain water in the urban environment.

There is a need to plan for integrated water management at a regional level to align state, regional and local policies. Within the Western Metro Region this relates particularly to planning for new communities in growth areas. However, improved integrated water management can also be achieved within the redevelopment of large sites or precincts in established urban areas.

STRATEGY 115. Improve regional water outcomes by aligning sub-catchment and local integrated water management planning with opportunities and directions identified at the catchment scale.

STRATEGY 116. Facilitate stormwater harvesting close to the source in priority sub-catchments.

STRATEGY 117. Facilitate stormwater harvesting at a range of scales throughout the region to achieve co-benefits that respond to urban heat, reduce runoff volume and velocity, service social infrastructure and trees.

STRATEGY 118. Embed integrated water management outcomes in the planning for growth areas and redevelopment within existing urban areas to deliver greater community benefits for liveability, water security and waterway health.

DIRECTION 29. **Minimise and reduce risk from bushfire in Wyndham and Melton**

The Western Metro Region is at risk from bushfires due to forest and grassland areas in Wyndham and Melton LGAs. The need to plan for the risk of bushfire to communities, infrastructure and natural environments will continue to increase as the climate warms and overall rainfall decreases.

The likelihood of bushfires and grassfires, and their severity and intensity, depends on the site's location and surrounding landscape characteristics. There are large areas of land, mostly beyond the urban area, already designated as bushfire prone areas governed by the state planning policy for bushfire (Clause 13.02) and the BMO. The BMO aims to strengthen community resilience to bushfire through development, by considering bushfire measures as part of the design process and by ensuring new development achieves an acceptable level of bushfire risk. However, there is also a need to strengthen the resilience of settlements and communities to bushfire through strategic, risk-based regional planning that prioritises the protection of human life over other policy considerations.

In order to prioritise the protection of human life from bushfire, population growth and development should be directed to low risk locations and areas that are safely evacuated. Development within areas of the highest bushfire risk must achieve acceptable levels of risk reduction. These areas should be avoided for development that will accommodate more vulnerable populations, such as the elderly or very young, that may have difficulties evacuating in the event of a bushfire.

Careful management of vegetation and water resources will be required across the Western Metro Region in response to bushfire risk. River and creek corridors will continue to be important as the climate warms to provide habitat, recreation and cooling. However, given their higher levels of vegetation, they will also pose bushfire risk. Vegetation management strategies, including selecting lower risk species and maintaining vegetation, will have a key role in mitigating risk in urban areas while recognising the value of these corridors for habitat and urban cooling.

STRATEGY 119. Avoid housing growth and sensitive land uses within and in proximity to bushfire prone areas in the Melton and Wyndham LGAs.

STRATEGY 120. Provide new and upgraded regional social infrastructure that provides refuge in extreme bushfire and weather events.

STRATEGY 121. Recognise and manage bushfire risk posed by vegetation within waterway corridors.

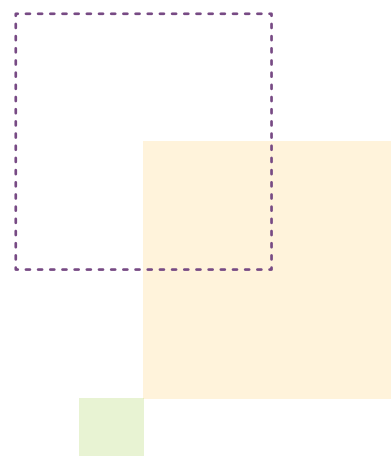
DIRECTION 30. **Respond to the transformation of the energy supply network**

In the future, electricity networks must be responsive to changing demands from traditional services while enabling new opportunities for energy resource sharing and balancing. Millions of customers generate electricity and over time will store it locally. These customers will be connected to the network and each other, enabling energy networks to act as platforms that match supply and demand and reduce the need for inefficient duplication of energy investments. At the same time, the state is working towards the decarbonisation of the broader energy supply network.

To support a renewable energy future and drive down emissions, major changes to the supply network are required. This includes the creation of local and regional renewable energy hubs across the state, improvements to crucial grid infrastructure, and support for more localised renewable energy generation and storage.

Large subdivisions and growth area development in the Western Growth Corridor must be planned to support this future energy network and avoid the need to retrofit energy infrastructure.

STRATEGY 122. Ensure subdivision and greenfield development can support the emerging energy supply network.



DIRECTION 31.**Protect sites of strategic importance for recycling and plan for the expansion of key sites for future resource recovery needs**

The *Statewide Waste and Resource Recovery Infrastructure Plan 2018* and the *Metropolitan Waste and Resource Recovery Implementation Plan 2016* aim to increase resource recovery. The metropolitan plan states there is sufficient capacity within existing resource recovery centres and transfer stations in the Western Metro Region. However, it identifies the need for additional organics/garden reprocessing within the north-west of the region – primarily within the Wyndham LGA – of 35,000 tonnes per annum capacity (Metropolitan Waste and Resource Recovery Group, 2016)

Waste and resource recovery hubs provide essential services to support waste and recycling for Victorian communities. There are five waste and resource recovery hubs of state importance for metropolitan Melbourne in the Western Metro Region:

- **Brooklyn Precinct:** reprocesses around 40 per cent of the state's metals as well as materials from the construction and demolition sector
- **Wyndham Refuse Disposal and Recycling Facility:** putrescible and solid inert landfill
- **Ravenhall Precinct (including Boral Quarry and Cleanaway Melbourne Regional Landfill Ravenhall):** largest putrescible landfill in the state, reprocessing construction and demolition materials
- **Laverton Precinct:** reprocesses metals, construction and demolition materials
- **Owens Illinois, Spotswood:** reprocesses used glass back into glass materials (Sustainability Victoria, 2018).

Waste and resource recovery hubs require buffers and protections to minimise impacts on communities, the environment and public health. There is also a need to support compatible land uses in and around the hubs and to identify adequate land and appropriate locations for future resource recovery infrastructure (Sustainability Victoria, 2018).

Waste and resource recovery hubs provide significant opportunities for investment in recycling. This includes co-location of industries operating in synergy with waste and resource recovery facilities, increasing economies of scale or co-locating industries requiring similar buffers, thereby creating jobs and increasing the volume of materials recovered (Sustainability Victoria, 2018).

Successful recycling in Victoria requires markets for recycled products. Infrastructure projects throughout the region help to strengthen these markets and reduce overall environmental impacts by using more recycled products and less virgin materials.

STRATEGY 123. Protect and buffer waste and resource recovery hubs of state importance, including the Brooklyn, Ravenhall and Laverton precincts and the Wyndham Refuse Disposal and Recycling Facility.

STRATEGY 124. Maintain adequate buffers and provisions to protect the Brooklyn, Ravenhall and Laverton precincts from residential encroachment and incompatible land uses and preserve the importance of the hubs for the long term.

STRATEGY 125. Ensure zoning can support complementary land uses to locate in and around the Brooklyn, Ravenhall and Laverton precincts and Wyndham Refuse Disposal and Recycling Facility.

ACTIONS – Sustainability and resilience

ACTION 16. Prepare a regional water infrastructure plan in conjunction with Integrated Water Management Forums to support state and local government and relevant agencies to prioritise and align water infrastructure needs and integrated water management outcomes

ACTION 17. Investigate options and land use protection for a Resource Recovery Centre and Transfer Station/s to support Melbourne's future resource and recovery needs.

ACTION 18. Prepare a regional bushfire response for suburban and peri-urban communities that are subject to bushfire risk.