SUBURBAN RAIL LOOP EAST

SRL East Draft Structure Plan

Integrated Water Management Strategy

More Homes For Victorians

VICTORIA State Government

Suburban Rail Loop

PREPARED FOR SUBURBAN RAIL LOOP AUTHORITY

SRL EAST DRAFT STRUCTURE PLAN – INTEGRATED WATER MANAGEMENT STRATEGY

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Contents

Appendices

Glossary and abbreviations

TERM	DEFINITION
AEP	Annual Exceedance Probability – refers to the probability of a flood event being equaled or exceeded in any given year. A 1% AEP is the percentage of likelihood of a flood of a given size or larger occurring in any given year. If a flood has an AEP of 1%, it has a one in 100 likelihood of occurring in any given year.
AJM JV	Aurecon Jacobs Mott MacDonald Joint Venture – SRLA's technical advisor
Alternative water and alternative water sources	Alternative water sources refer to any supplies other than Victoria's potable water network or 'grid'. Alternative water sources include rainwater, greywater, recycled water, groundwater, and stormwater. The use of alternative water sources needs to be safe, meet regulatory and environmental standards, and reflect community expectations.
BPEM	Best-Practice Environmental Management Guidelines This means they must reduce levels of certain pollutants from stormwater as defined in CSIRO, 1999 Urban stormwater best practice environmental guidelines.
Catchment	An area where water falling as rain is collected by the landscape, eventually flowing to a body of water such as a creek, river, dam, lake or ocean, or into a groundwater system.
Climate change	A long-term change of the earth's temperature and weather patterns, generally attributed directly or indirectly to human activities such as fossil fuel combustion and vegetation clearing and burning.
DEECA	The Department of Energy, Environment and Climate Action (DEECA) is a government department in Victoria, Australia.
DELWP	The Department of Environment, Land, Water and Planning (DELWP) is a former government department in Victoria, Australia (now referred to as DEECA).
EES	Environment Effects Statement
EPA Victoria	Environment Protection Authority Victoria
EPR	Environmental Performance Requirements
Flooding (stormwater)	Inundation by local runoff. Stormwater flooding can be caused by local runoff exceeding the capacity of an urban stormwater drainage system or by the backwater effects of mainstream flooding causing the urban stormwater drainage system to overflow.
Flow	Movement of water – the rate of water discharged from a source, given in volume with respect to time.
Impervious area	A surface or area within a catchment that significantly restricts the infiltration of water. Impervious surfaces can include concrete, road surfaces, roofs and saturated ground such as a lake or pond.
IWM	Integrated water management. A process that brings together all stakeholders involved in the planning and management of all water across the entire water cycle, to ensure that the liveability, resilience and sustainability outcomes that the community is seeking are maximised across the cities and regions.
km	Kilometres (unit of distance)
Liveability	A measure of a city's residents' quality of life, used to benchmark cities around the world. It includes socioeconomic, environmental, transport and recreational measures.
MARV	Mean Annual Runoff Volume
Megalitre (ML)	One million (1,000,000) litres.
MUSIC	Model for Urban Stormwater Improvement Conceptualisation is software designed to simulate rainfall and pollution generation which allows urban stormwater professionals to visualise a range of possible strategies for addressing the hydrology and pollution impacts of urban stormwater runoff
m	Metres (unit of distance or depth)
m AHD	Metres relative to the Australian Height Datum (unit for flood levels)
ML/day	Megalitres per day (unit of flow)
Open space	Includes land reserved for natural landscape, parklands, recreation and active sports.
Potable water	Water of suitable quality for drinking.
Rainwater	Water that has fallen as rain or has been collected from rainfall.

TERM	DEFINITION
Recycled water	Water derived from sewerage systems or industry processes that is treated to a standard appropriate for its intended use
Resilience	The capacity of individuals, communities, institutions, businesses, systems and infrastructure to survive, adapt and grow, no matter what chronic stresses or shocks they encounter, used commonly in reference to climate change.
Runoff	The portion of rainfall that ends up as streamflow, also known as rainfall excess.
SRL	Suburban Rail Loop
SRL East (the Project)	The first stage of SRL, with six underground stations connecting Box Hill and Cheltenham.
SRLA	Suburban Rail Loop Authority
Stormwater	Runoff from urban areas. The net increase in runoff and decrease in groundwater recharge resulting from the introduction of impervious surfaces such as roofs and roads within urban development.
Structure Plan Area	The extent of the land to which the Structure Plan applies. The Structure Plan will focus on areas near to the SRL station and locations with more significant future change. This area is smaller than the full Declared Planning Area.
TN	Total nitrogen
TP	Total phosphorus
TSS	Total suspended solids
Wastewater	Water that has had its quality affected by human influence, deriving from industrial, domestic, agricultural or commercial activities.
Waterway health	Waterway health is an umbrella term for the overall state of key features and processes that underpin functioning waterway ecosystems (such as species and communities, habitat, connectivity, water quality, riparian vegetation, physical form, and ecosystem processes such as nutrient cycling and carbon storage).
WSUD	Water Sensitive Urban Design Integrating the urban water cycle into urban design to minimise environmental damage and improve recreational and aesthetic outcomes. WSUD includes the use of passive irrigation techniques, and the incorporation of WSUD infrastructure such as swales, bio-filtration systems (rain gardens), permeable paving, and wetlands into the design.
UFZ	Urban Floodway Zone
VPP	The Victoria Planning Provisions is a document that provides a comprehensive set of planning provisions for Victoria. The VPPs are not a planning scheme and do not apply to any land. It is a statewide reference (template), used as required, to construct munic0ipal planning schemes.

Executive summary

As part of the Suburban Rail Loop (SRL) East project, Draft Structure Plans (Structure Plans) are being prepared for the neighbourhoods surrounding the new underground stations at Cheltenham, Clayton, Monash, Glen Waverley, Burwood and Box Hill.

The Structure Plans will set a vision and framework to guide urban growth and change in each neighbourhood, while protecting and preserving the character and features that people love about them now.

This Integrated Water Management (IWM) Strategy seeks to guide the preparation of IWM Plans for each SRL East Structure Plan Area by identifying potential IWM opportunities to minimise stormwater runoff and reduce localised flood risk, reduce reliance on potable water, and improve water quality, waterway and catchment health.

INTEGRATED WATER MANAGEMENT

Water is fundamental to achieving the vision for each SRL East Structure Plan Area and the vision theme of ‘Empowering Sustainability’. The existing and future water management and planning challenges including an increased population and warmer and drier conditions in the SRL East Structure Plan Areas require an IWM approach.

An IWM approach considers all elements of the water cycle including drinking water, sewage, recycled water and stormwater so that water is managed holistically to benefit the community and environment. Determining the optimum IWM solutions is founded on robust economic analysis to assess the range of servicing options available and understand the costs and benefits to the community and environment.

This IWM Strategy provides a preliminary assessment of potential IWM opportunities in the SRL East Structure Plan Area to be considered in more detail when preparing IWM Plans for the Structure Plan Areas in collaboration with stakeholders.

Issues and opportunities relating to IWM that impact structure planning in each SRL East Structure Plan Area are identified, and relevant recommendations are made.

IWM opportunities were quantified to confirm their potential contribution to the broader water balance for the existing scenario and ultimate development scenarios (2041) in the SRL East Structure Plan Areas.

The main IWM opportunities assessed were rainwater tanks and recycled water to meet non-potable demands, recycled water and stormwater harvesting to meet irrigation demands, and the passive irrigation of street trees. Other options such as permeable paving, bioretention swales and wetlands could be considered when preparing the IWM Plans.

FINDINGS

Potable water demand

Demand for potable water expected to double under the ultimate development scenario in the SRL East Structure Plan Areas, but introducing alternative water supply options like rainwater tanks and recycled water networks could significantly reduce this.

Reducing potable water demand with alternative water sources such as rainwater and recycled water can reduce pressure on existing water supply and drainage systems, reducing the need for costly infrastructure upgrades. Using rainwater for approved non-potable purposes conserves potable water and decreases the volume of stormwater runoff. Alternatively, recycled water could be used for approved non-potable purposes to reduce potable water demand and wastewater discharges to the environment.

Providing a non-potable water supply to open spaces can significantly contribute to achieving healthier, more inclusive and equitable communities by ensuring that open space is adequately maintained and accessible throughout varying climatic conditions. Opportunities to irrigate active open spaces with stormwater and recycled water exist in all SRL East Structure Plan Areas.

Mean annual runoff volume (MARV)

The mean annual runoff volume (MARV) in the ultimate development scenarios (2041) of the SRL East Structure Plan Areas could increase by approximately 10%. Rainwater tanks and minor contributions from the passive irrigation of street trees and stormwater harvesting could reduce the MARV. The harvesting objectives could be achieved by implementing the IWM opportunities identified in this IWM Strategy, but other options (such as leaky or smart rainwater tanks, permeable paving, rain gardens and other Water Sensitive Urban Design features) will need to be considered to achieve the infiltration objectives.

Reducing the MARV through structure planning and the development process can alleviate local flooding conditions by minimising the amount of stormwater that flows into drainage systems and natural waterways. Opportunities that capture and reuse rainwater will reduce stormwater and minimise pressure on local drainage infrastructure during storm events. This also facilitates infiltration and can reduce peak flow rates, mitigating flood risk, and protecting water quality to contribute to a more resilient urban environment.

The optimal water servicing solution will factor cost, infrastructure requirements and environmental impacts. For instance, rainwater tanks may be more feasible in lower density urban development types that can readily service the magnitude of alternative water demand with rainwater, while recycled water networks might be more suitable for densely populated areas with a source readily available. A detailed cost-benefit analysis when preparing the IWM Plans for the SRL East Structure Plan Areas will consider costs, benefits to the community and environment and sustainability goals to determine the most appropriate solution.

Stormwater performance objectives

This IWM Strategy adopts the performance objectives in the *EPA Victoria Publication 1739.1 – Urban stormwater management guidance (2021)* as the benchmark for stormwater management

Achieving best practice stormwater management creates more resilient and sustainable urban environments by preserving and enhancing the health of surrounding waterways to benefit communities and the natural environment. Rainwater tanks reduce mean annual pollutant loads by intercepting the runoff, and street trees improve water quality through infiltration. Rainwater tanks, with a minor contribution from street trees, could meet the EPA Victoria quantitative performance objectives for urban stormwater.

The combination of rainwater tanks and street trees could potentially reduce total suspended solids (TSS), total nitrogen (TN) and total phosphorus (TP) but potential reductions would not meet the current EPA Victoria quantitative performance objectives for urban stormwater. Additional interventions such as permeable paving, wetlands or bioretention swales will be required on individual lot development (‘on lot’) and across the SRL East Structure Plan Areas to meet the water quality performance objectives for urban stormwater.

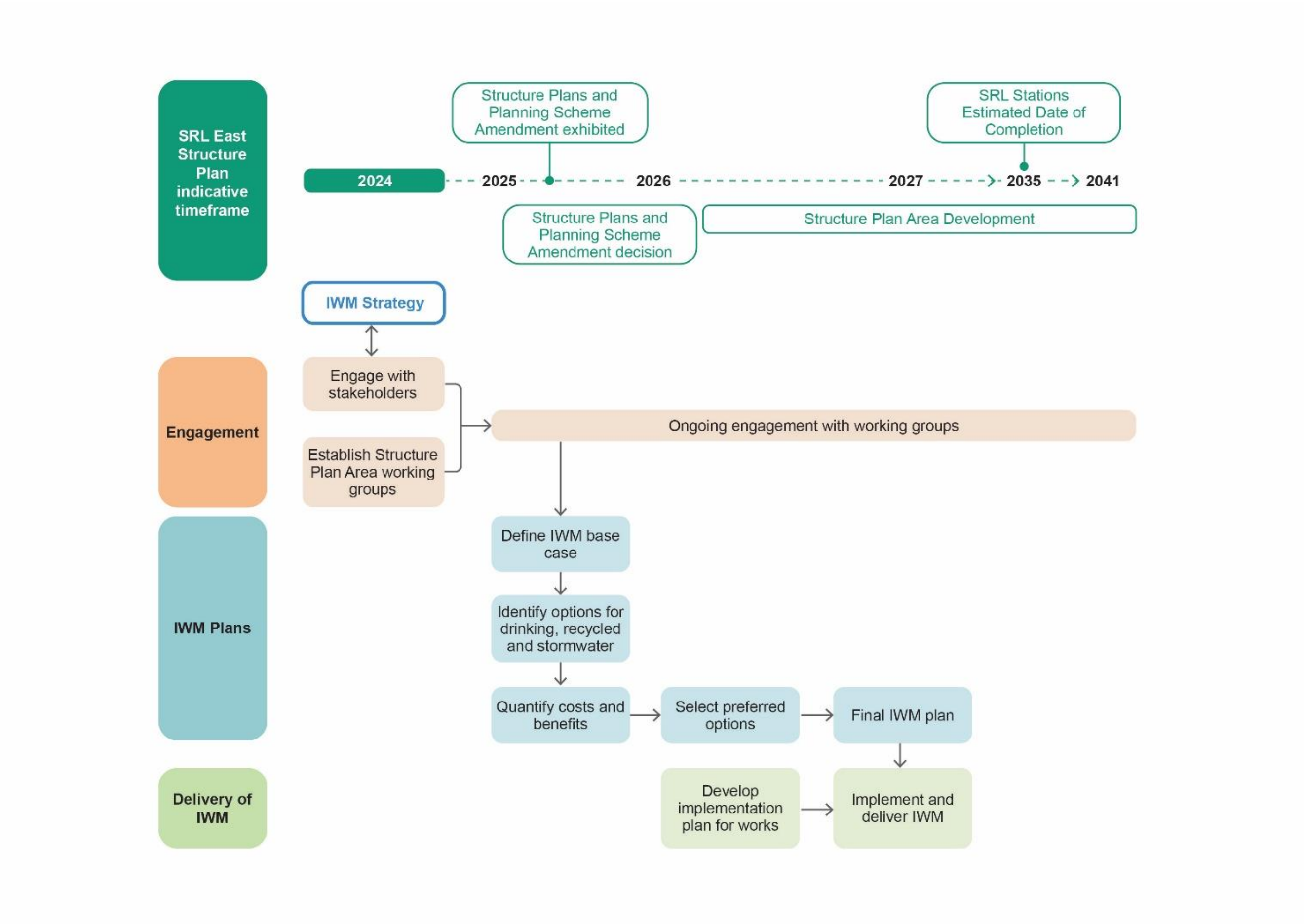
RECOMMENDATIONS

1. Prepare an IWM Plan for each SRL East Structure Plan Area. The IWM Plans should be developed in collaboration with stakeholders once each SRL East Structure Plan is developed. The IWM Plans should determine localised, contextual and implementable IWM interventions, including the consideration of the opportunities outlined below.

Other opportunities

1. The provision of alternative water reticulation (such as third pipe plumbing) to all new developments where alternative water supply networks exist or are planned by the relevant water retailer.
2. The use of rainwater tanks as part of place-based IWM interventions for harvesting stormwater and supply of non-potable water use (such as toilets, laundry and irrigation systems) as part of a development.
3. The incorporation of place-based IWM interventions that balance the objectives of reducing potable water use, manages the risk of flooding, and improves stormwater quality for all new development, including public realm works.

Recommended next steps for preparing the IWM Plans for each SRL East Structure Plan Areas in collaboration with stakeholders are shown in the Figure below.



IWM PLAN RECOMMENDED NEXT STEPS

1 Introduction

The Suburban Rail Loop (SRL) is a transformational project that will help shape Melbourne's growth in the decades ahead. It will better connect Victorians to jobs, retail, education, health services and each other – and help Melbourne evolve into a 'city of centres'.

SRL will deliver a 90-kilometre rail line linking every major train service from the Frankston Line to the Werribee Line via Melbourne Airport.

SRL East from Cheltenham to Box Hill will connect major employment, health, education and retail destinations in Melbourne's east and south east. Twin 26-kilometre tunnels will link priority growth suburbs in the municipalities of Bayside, Kingston, Monash and Whitehorse.

SRL East Draft Structure Plan (Structure Plan) Areas will surround the six new underground stations at Cheltenham, Clayton, Monash, Glen Waverley, Burwood and Box Hill.

1.1 Purpose of this IWM Strategy

This Integrated Water Management (IWM) Strategy seeks to guide the preparation of IWM Plans for each SRL East Structure Plan Area by identifying potential IWM opportunities to:

- Minimise stormwater runoff and seek to reduce localised flood risk
- Reduce reliance on potable water for new development
- Improve water quality, waterway and catchment health.

Issues and opportunities relating to IWM that impact structure planning in each SRL East Structure Plan Area are identified and relevant recommendations are made.

The IWM Strategy provides a preliminary assessment of the identified potential IWM opportunities in the SRL East Structure Plans. These opportunities will be considered in more detail when preparing IWM Plans for each SRL East Structure Plan Area in collaboration with stakeholders, including the Department of Energy, Environment and Climate Change (DEECA), Melbourne Water, South East Water, Yarra Valley Water and local governments.

1.2 Project context

Construction of the SRL East underground stations is underway at Cheltenham, Clayton, Monash, Glen Waverley, Burwood and Box Hill. This provides an opportunity to enhance the surrounding neighbourhoods.

SRL East will support thriving and sustainable neighbourhoods and communities that offer diverse and affordable housing options, with easy access to jobs, transport networks, open space, and community facilities and services.

A vision for each SRL East Structure Plan Area and surrounds has been developed in consultation with the community and stakeholders. The visions set out the long-term aspirations for these areas, ensuring they are ready to meet the needs of Melbourne's growing population.

Figure 1.1 shows SRL East in the context of the entire SRL project and Melbourne's rail network.

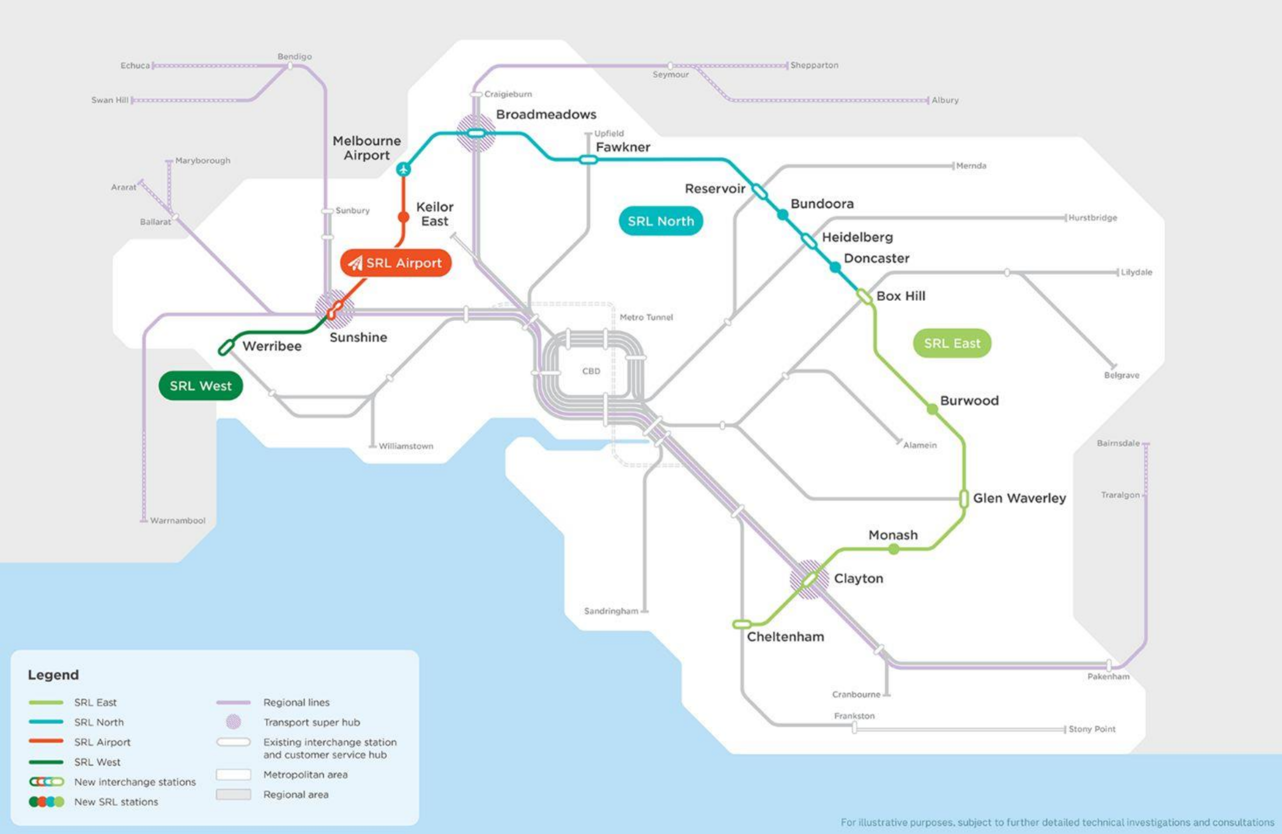


FIGURE 1.1 SRL EAST CONTEXT IN MELBOURNE'S RAIL NETWORK

1.3 Structure planning

Structure Plans are being prepared to help deliver the vision for each SRL East neighbourhood.

The Structure Plans cover defined Structure Plan Areas that can support the most growth and change. These areas cover a walkable catchment that extends out from the SRL station entrances. Additional places are included within each Structure Plan Area as required to make planning guidance more robust and effective, and to align with each community's aspirations and current and future needs.

A Structure Plan is a blueprint to guide how an area develops and changes over a period of time. Structure Plans describe how future growth within the area will be managed in an appropriate and sustainable way to achieve social, economic and environmental objectives. The Structure Plans cover a wide range of matters, such as transport connections and car parking, housing and commercial development, community infrastructure, urban design, open space, water and energy management, climate resilience and sustainability.

By tailoring planning decisions to reflect the needs of a defined area, Structure Plans give effect to the policies and objectives set for these areas and cater for changing community needs. They also provide certainty for residents, businesses and developers by identifying the preferred locations and timing of future land uses, development and infrastructure provision.

Structure Plans take a flexible and responsive approach that enables places to evolve over time.

Planning scheme amendments will be required to implement the Structure Plans into the planning schemes of the cities of Bayside, Kingston, Monash and Whitehorse.

1.4 Structure of this IWM Strategy

- **Section 1** provides an introduction and context of this IWM Strategy.
- **Section 2** explains the approach of the IWM Strategy.
- **Section 3** defines the six SRL East Structure Plan Areas.
- **Section 4** details the background of the IWM Strategy and summarises policies and guidelines.
- **Section 5** provides a preliminary analysis of potential IWM opportunities in each SRL Structure Plan Area. It identifies the issues, challenges and opportunities relating to IWM that will influence development in each Structure Plan Area.
- **Section 6** sets out recommendations to consider when preparing IWM Plans and the next steps.

1.5 Interactions with other technical reports

Given the integrated nature of IWM, it is recognised that other plans and reports informing the preparation of this IWM Strategy will also deliver sustainability and water benefits. The IWM Strategy was prepared in collaboration with the technical work of multiple disciplines and should be read in conjunction with these SRL East plans and reports:

- **Urban Design Reports** – these reports set the basis for the urban design components of the SRL East Structure Plan Areas. The Urban Design Reports seeks to delivery high density and high quality development for living and working in response to the increased accessibility bought about by the SRL. It divides the Structure Plan Area into a series of neighbourhoods and proposes a distinct urban form character for each neighbourhood.
- **Utilities Servicing Technical Report** – this report outlines the adequacy of the utility service provision to support the forecast demand for growth within the SRL East Structure Plan Areas.
- **Climate Response Plans** – each SRL East Structure Plan Area has the vision Theme 5 to 'Empower Sustainability'. In alignment to the IWM Strategy, the SRL East Draft Structure Plan – Climate Response Plans also recommend that an IWM Plan is prepared for each Structure Plan Area (AJM JV 2025).
- **Flooding Technical Report** – this report outlines existing flooding conditions in each SRL East Structure Plan Area and makes recommendations for managing flood risk. IWM solutions do not typically solve 1% AEP flooding (annual exceedance probability; a one in 100 likelihood of occurring in any given year) although they can increase the resilience of communities during such an event.
- **Open Space Technical Report** – this report reinforces the importance of open space quality, function and connectivity in the SRL East Structure Plan Areas and provides recommendations to maximise positive change through development of the Structure Plans.

2 Approach to the IWM Strategy

This section outlines the approach used to inform assessment of the IWM opportunities for the Structure Plan Areas, including preparation of a water balance.

2.1 Need for an Integrated Water Management Strategy

Water is fundamental to achieving the vision for each SRL East Structure Plan Area and the vision theme of 'Empowering Sustainability' by providing:

- Healthy, inclusive and equitable communities
- Greener walkable and cyclable neighbourhoods
- Environmental protection with improved canopy cover that promotes biodiversity and green corridors
- Improved climate resilience through landscaping and biodiversity, reducing urban heat island impacts
- A circular economy and waste reduction.

The existing and future water management and planning challenges in the SRL East Structure Plan Areas require an IWM approach. These challenges include increases in development density and population, the potential increase in flood risk, and warmer and drier conditions.

An IWM approach has potential to enhance water security while providing value to the community by leveraging opportunities to optimise water management. All elements of the water cycle are considered including drinking water, sewage, recycled water and stormwater so that water is managed holistically to benefit the community and environment.

IWM will improve liveability by ensuring fit-for-purpose water is available in the SRL East Structure Plan Areas, which will improve resilience to a warmer and drier climate and facilitate sustainable growth in the decades to come. Determining the optimum IWM solutions needs to be based on a robust economic analysis to assess the range of servicing options available and to understand the costs and benefits.

Urban development and redevelopment present the greatest opportunities to build the required infrastructure and create demand for alternative water sources in the SRL East Structure Plan Areas. Industrial or commercial uses may be attracted to Structure Plan Areas where a reliable alternative water source is available (particularly in the Monash Structure Plan Area).

An IWM approach is required by Water for Victoria and the IWM Framework for Victoria to deliver community value.

This IWM Strategy will guide the preparation of IWM Plans for each SRL East Structure Plan Area by identifying potential IWM opportunities. The IWM Strategy provides a preliminary assessment of three IWM opportunities that can influence the development of the Structure Plans and future water planning relevant to the SRL East Structure Plan Areas. These three IWM opportunities are outlined in the next Section 2.2.

2.2 What can structure planning address?

Existing planning policies require stormwater management through best practice environmental management (BPEM) (see Section 4) to be achieved through development applications. This typically results in rainwater tanks and/or rain gardens being developed as part of a development. However, IWM involves more than achieving stormwater quality management and requires a holistic consideration of where water is used, how demand will change over time in the SRL East Structure Plans, and how recycled water and stormwater can be used as a resource to create a circular economy and build healthy, climate resilient communities.

To quantify water demand within the SRL East Structure Plan Areas, a preliminary water balance was prepared to assess the potential scale of IWM opportunities that could be implemented. The quantifiable IWM opportunities are explored in Section 2.3 and Section 2.4.

Using existing IWM policies, frameworks and guidelines, this IWM Strategy was prepared to inform the SRL East Structure Plans. Primarily using the Integrated Water Management Framework strategic outcomes and the Water Oriented Precinct Planning Principles of Melbourne Water (see Section 4), given structure planning's ability to influence, direct and plan for strategic water outcomes across the outcomes and principles provided in Table 2.1.

TABLE 2.1 STRUCTURE PLANNING RECOMMENDATIONS AND ALIGNMENT TO IWM FRAMEWORKS

IWM STRATEGIC OUTCOMES	WATER ORIENTED DESIGN PRINCIPLES – THEMES
Safe, secure and affordable water supplies in an uncertain future	Water services
Existing and future flood risks are managed to maximise outcomes for the community	Flooding and drainage
Healthy and valued waterways and marine environments	Catchment
Healthy and valued urban and rural landscapes	Landscape
-	Partnerships

2.3 IWM opportunities assessment

The three IWM opportunities assessed for each SRL East Structure Plan Area were:

1. Reduce reliance on potable water for new development – potable water demand could be reduced by using alternative water sources (such as rainwater, recycled water and stormwater) for non-potable uses such as toilets and laundry, outdoor use and to irrigate public open spaces.
2. Minimise stormwater runoff, improve water quality and reduce localised flood risk – stormwater runoff (or mean annual runoff volume, MARV) to the catchment receiving waters could be minimised by considering the following opportunities for alternative water:
   - Rainwater tanks that capture rainwater from roof areas for non-potable uses, which has the benefit of reducing reliance on potable water and reducing stormwater runoff
   - Passive irrigation of street trees using stormwater, which has the benefit of treating stormwater through infiltration and contributes to urban greening and cooling
   - Replacing potable water supply to irrigate passive or active open spaces with recycled water and stormwater harvesting from stormwater drains.
3. Opportunities to irrigate passive open spaces using recycled water or stormwater harvesting have also been identified.

Other IWM opportunities which could provide additional benefits to the community and environment include permeable paving and rain gardens (garden beds that filter stormwater runoff from surrounding areas or stormwater drains). These additional opportunities are discussed in Section 6.1.2.

2.4 Quantifying IWM opportunities

Each IWM opportunity is quantified to confirm its potential contribution to the broader water balance. A water balance was established to understand changes to potable water demand, the broader catchment water balance, and the impacts on stormwater flow and quality.

The general approach to establishing the water balance considered three scenarios: the existing scenario (2021) in each SRL East Structure Plan Area, and the developed scenario (2041) without IWM and with IWM, as summarised in Table 2.2. The modelling methodology for each scenario is further detailed in Appendix A-1, and inputs and assumptions associated with each scenario is provided in Appendix A-2.

TABLE 2.2 WATER BALANCE SCENARIOS

Existing (2021)	This scenario outlines the existing water balance of each SRL East Structure Plan Area, based on 2021 population and jobs data. Urban development types are not assigned in structure planning documents for the existing scenario, so existing planning zones were grouped together to approximate the existing scenario for assessing the water balance.
Developed (2041) without IWM	This scenario outlines the water balance for the planned development in each SRL East Structure Plan Area based on population and jobs data for 2041, without any IWM opportunities implemented. The scenario reflects the ultimate development in each SRL East Structure Plan Area and does not consider interim phases of development. Where required, data inputs from interdependent SRL East Structure Plan reports and plans were incorporated to inform the water balance for this scenario in each Structure Plan Area (see Section 1.5). Many assumptions and exclusions are relevant to this work (see Section 2.6). This scenario does not reflect the business-as-usual (BAU) level of stormwater management that will be required of new development, but rather presents the worst-case (no mitigation) option in each SRL East Structure Plan Area to enable the effects of IWM opportunities in the developed (2041 with IWM) scenario to be quantified.
Developed (2041) with IWM	This scenario outlines the water balance for the planned development in each SRL East Structure Plan Area based on population and jobs data for 2041, with IWM opportunities implemented. The scenario reflects the ultimate development in each SRL East Structure Plan Area in 2041 and does not consider interim phases of development. This scenario assumes 100% implementation of IWM opportunities across the SRL East Structure Plan Areas.

The two developed scenarios are referred to as 'ultimate development scenario' in this IWM Strategy to reflect when the development types are built in each Structure Plan Area to 100%. This can be in reference to, with IWM or without IWM opportunities implemented.

2.4.1 RAINWATER TANKS

Existing planning requirements requires development to manage stormwater (Best Practice Environmental Guidelines, see Section 4.5), and rainwater tanks are a common solution to achieving this. The sizing of rainwater tanks is driven by water quality measurements and not water quantity reduction as outlined in the updated stormwater management guidance of EPA Victoria 2021 (see Section 4.7).

The influence of rainwater tanks on reducing potable water demand and minimising urban runoff was assessed assuming that all new developments will include a rainwater tank.

In the IWM Assessment for SRL East Structure Plan Areas, the size (volume) of the rainwater tank for each urban development type was sized to maximise the volume available for non-potable water supply. Rainwater tanks have been sized to capture 90% of the non-potable water demand for each urban development type, and where this cannot be practicably achieved, to reduce the stormflow of each lot by 90%.See **Error! Reference source not found.**– Table A.12 for approximate tank sizes per average urban development type lot size.

In most urban development types (as per the SRL East Structure Plan – Urban Design Reports), the size of these rainwater tanks could be reasonably accommodated and for larger volumes, the ability to use multiple tanks (up to 100 kL) was assumed to be feasible. Where rainwater tanks are preferred, the storage solution should be optimised to suit the design and available space.

This scenario outlines maximum potential benefit of rainwater tanks. The influence of rainwater tanks should be optimised when preparing the IWM Plan for each SRL East Structure Plan Area.

The impact of rainwater tanks was modelled in MUSIC to quantify the non-potable water demands they meet, the additional on-lot recycled water requirements, and the reduction in urban runoff volume. Assumptions adopted to quantify the influence of rainwater tanks are outlined in **Error! Reference source not found.**.

2.4.2 PASSIVELY IRRIGATED STREET TREES

Street trees with a passive source of irrigation will typically increase canopy cover and help cool urban areas. The IWM assessment has maximised the potential benefits for passively irrigated street trees by assuming that trees can be planted on most streets in the SRL East Structure Plan Areas. Street trees were modelled at 8-metre intervals along roads (excluding laneways and major transport corridors) to assess the influence of passive irrigation on street trees to reduce urban runoff and the improvement to water quality was quantified using MUSIC.

The SRL East Structure Plan – Urban Design Reports recommend green street improvements in each Structure Plan Area. The Urban Design Reports provide streetscape guidelines and/or recommend streetscape improvements to existing local streets that support pedestrian connectivity and access to recreation facilities, enhanced environmental and biodiversity outcomes, and/or the potential to accommodate cycle and bus routes at appropriate locations.

Assumptions adopted to quantify the influence of street trees are outlined in **Error! Reference source not found.**

2.4.3 PUBLIC OPEN SPACE ASSESSMENT

Active (irrigated) and passive (not irrigated) public open space is present all Structure Plan Areas. All open space in the Structure Plan Areas present an opportunity to introduce an alternative water supply to these sites to provide open space that can support increasing canopy cover, biodiversity and creating effective green cool places.

Opportunities to irrigate active open spaces with stormwater from Melbourne Water drains were quantified. For this assessment, it was assumed that connections requiring a pipe diversion of 250 metres long or less from a stormwater drain would be acceptable. It was assumed that stormwater will be diverted into and harvested from underground stormwater storage tanks. No testing of this concept has been undertaken to date. The impact of irrigating active open space with stormwater from the drainage network was quantified using MUSIC modelling.

For active open space that is not in proximity to a Melbourne Water drain, water volumes for irrigation were quantified that could be provided with recycled water.

Passive open spaces located near a Melbourne Water drain are presented in each Structure Plan Area in Section 5 as an opportunity. Passive open spaces that aren't near a Melbourne Water drain could be activated with stormwater from Council drains or recycled water if this source is available in the Structure Plan Area.

2.5 IWM Plans

An IWM Plan should be developed for each SRL East Structure Plan Area in collaboration with relevant stakeholders. The IWM Plans should outline the optimum water servicing solutions for each Structure Plan Area. These solutions will vary between the Structure Plan Areas depending on the flood risk, water infrastructure servicing required, available space, and the alternative water opportunities available.

Preparing an IWM Plan takes time, with many stakeholders interested in water management outcomes. The IWM Forums[1] are responsible for delivering IWM actions for all water-related outcomes across Melbourne and should be leveraged to develop IWM Plans for the SRL East Structure Plan Areas. The IWM Plans will balance decision-making on the optimal water servicing solution with input from relevant stakeholders.

2.6 Assumptions and limitations

The following assumptions and exclusions apply to the IWM Strategy:

- IWM options explored for the IWM Strategy focused on reducing potable demand and stormwater and improving water quality in the SRL East Structure Plan Areas. Maximising recycled water use and the subsequent reduction in wastewater discharge or associated water quality improvements outside the Structure Plan Areas was not considered.
- The water balance modelling is based on population and employment projections, consistent with the Business and Investment Case (BIC) prepared for the Suburban Rail Loop (August 2021), for the Structure Plan Area as presented in the SRL East Draft Structure Plan - Urban Design Report (AJM JV 2025)
- The water balance does not account for interim states of future development and compares the existing scenario (2021) with the 100% ultimate development scenario (2041) and shows maximum development impact. The urban development type that remains consistent between the existing and ultimate development scenarios is the land denoted as 'Civic Areas' as shown on the maps in the IWM opportunity assessments provided in Section 5. Civic Areas are parcels of land where land use is not envisaged to substantially change. The IWM assessments do not make allowance that some areas in the Structure Plan Areas may not be developed; they assume maximum development.
- The stormwater quantitative performance represents 100% implementation of IWM opportunities across the SRL East Structure Plan Areas and so shows the maximum capacity for pollutant reduction / flow reduction using the modelling assumptions in **Error! Reference source not found.**.
- The water demands and supplies for the existing and ultimate development scenarios are summarised in Table 2.3.

TABLE 2.3 SUMMARY OF WATER DEMAND AND SUPPLIES

DEMANDS	EXISTING (2021) WATER SUPPLIES	DEVELOPED (2041 WITHOUT IWM) WATER SUPPLIES	DEVELOPED (2041 WITH IWM) WATER SUPPLIES
On-lot potable	Potable water	Potable water	Potable water
On-lot non-potable	Rainwater tanks (~100% non-potable demand)	N/A	Rainwater tanks (<90% non-potable demand) Recycled water top-up
Public open space	Potable water	Potable water	Stormwater harvesting Recycled water top-up

- Stormwater harvesting to irrigate active open spaces was considered as a method of reducing potable water demand and mean annual runoff volumes. The summaries against the quantitative performance objectives for urban stormwater provided in Section 5 do not account for the effect this may have on stormwater quality via interception.

[1] IWM Forums identify, prioritise and oversee the implementation of collaborative water opportunities across Victoria. The IWM Forums bring together organisations with an interest in the water cycle, recognising that each has an important role to play in water management.

- As mentioned in Section 2.4.3, active open spaces with a nearby Melbourne Water stormwater drain were considered for the IWM assessment, as it was assumed this would provide sufficient flow for harvesting. It was assumed that connections requiring a pipe diversion of 250 metres long or less would be feasible. It was also assumed that stormwater would be diverted into and harvested from underground storage tanks.
- The source of other alternative water supplied (through recycled water, sewer mining or other) and the timing of when it would be available is not confirmed in this IWM Strategy. This needs to be confirmed in collaboration with stakeholders, primarily South East Water and Yarra Valley Water.
- Flood studies, climate change conditions and relevant guidelines are all subject to change by the relevant regulatory authorities. This report is based on available information at the time of writing. It is likely that flooding and climate change conditions will change over the life of the structure plans.

2.7 Peer Review Report

This technical report has been independently peer reviewed by Warwick Bishop of Water Technology Pty Ltd. The peer review report is attached as Appendix C of this report, which sets out the peer reviewer's opinion on the SRL East Draft Structure Plan - Integrated Water Management Strategy.

3 SRL East Structure Plan Areas

This section defines the Structure Plan Area in each SRL East neighbourhood.

3.1 Cheltenham Structure Plan Area

The Cheltenham Structure Plan Area surrounds the SRL station at Cheltenham in the cities of Kingston and Bayside.

The Structure Plan Area is generally bordered by residential land north of Stayner Grove and Alison Street to the north, residential land east of Chesterville Road to the east, Park Road to the south and Middleton Street and Worthing Road to the west.

The Structure Plan Area is intersected by Nepean Highway and the Frankston Line.

The Cheltenham Structure Plan Area is shown in Figure 3.1.

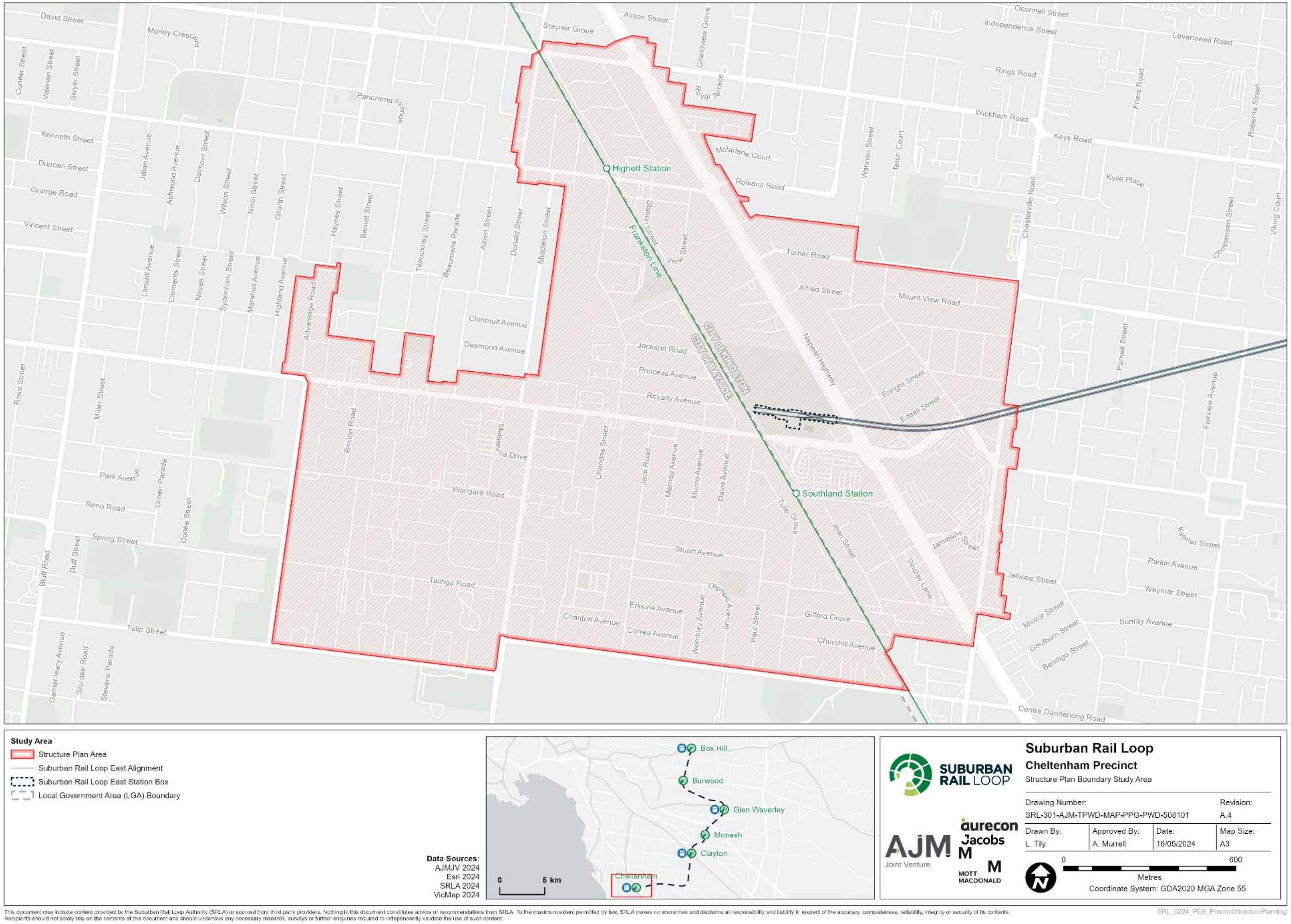


FIGURE 3.1 CHELTENHAM STRUCTURE PLAN AREA

3.2 Clayton Structure Plan Area

The Clayton Structure Plan Area surrounds the SRL station at Clayton in the cities of Monash and Kingston.

The Structure Plan Area is generally bordered by North Road / Wellington Road to the north, Ormond Road to the west, residential lots between Alward Avenue and Murdock Street, and parts of the Cranbourne / Pakenham Line to the south, and Kombi Road and Buckland Street to the east.

Dandenong Road is a major road, running in a north-west to south-east alignment through the edge of the Structure Plan Area. The existing Cranbourne / Pakenham Line intersects the Structure Plan Area in an east-west alignment.

The Clayton Structure Plan Area is shown in Figure 3.2.

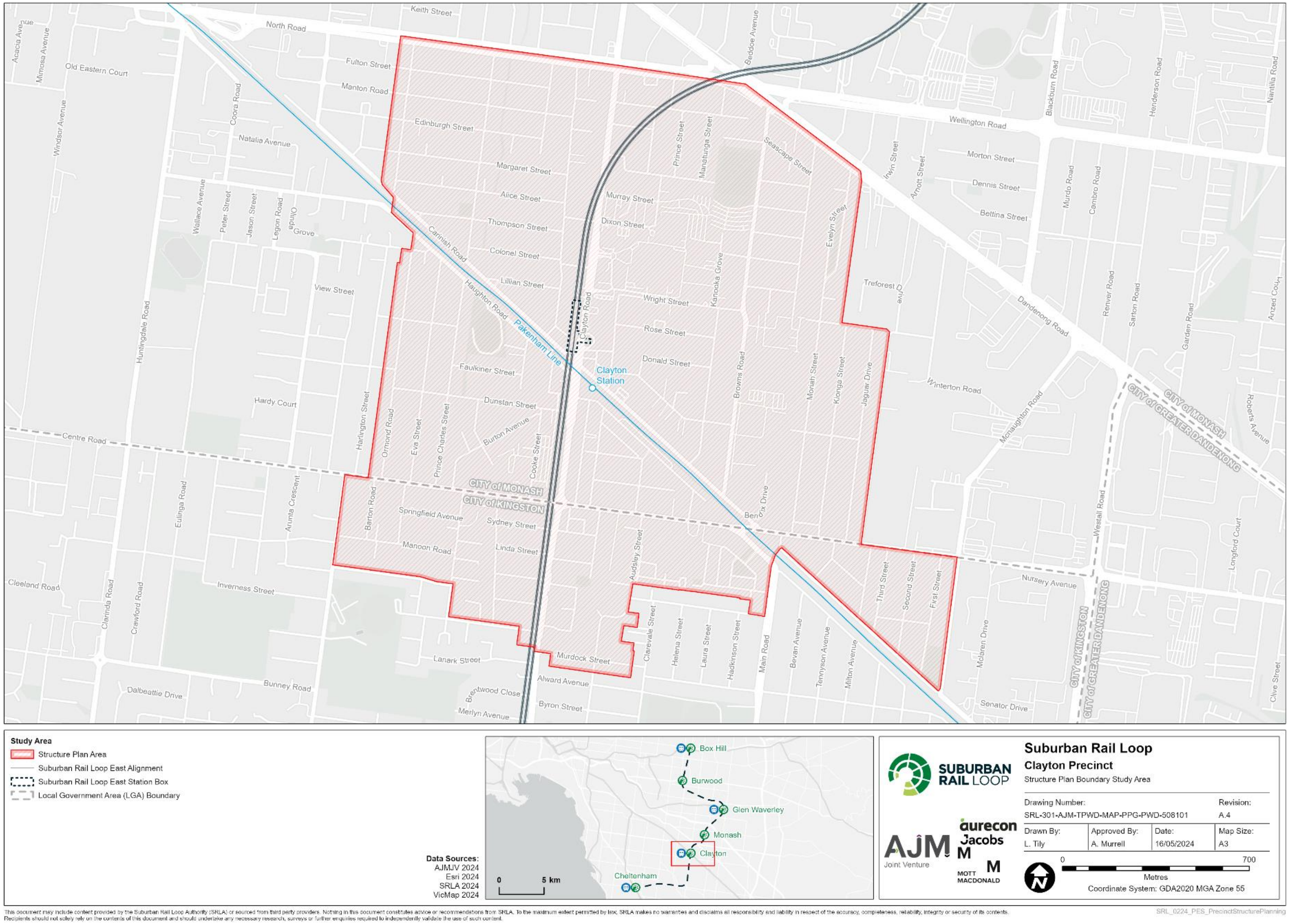


FIGURE 3.2 CLAYTON STRUCTURE PLAN AREA

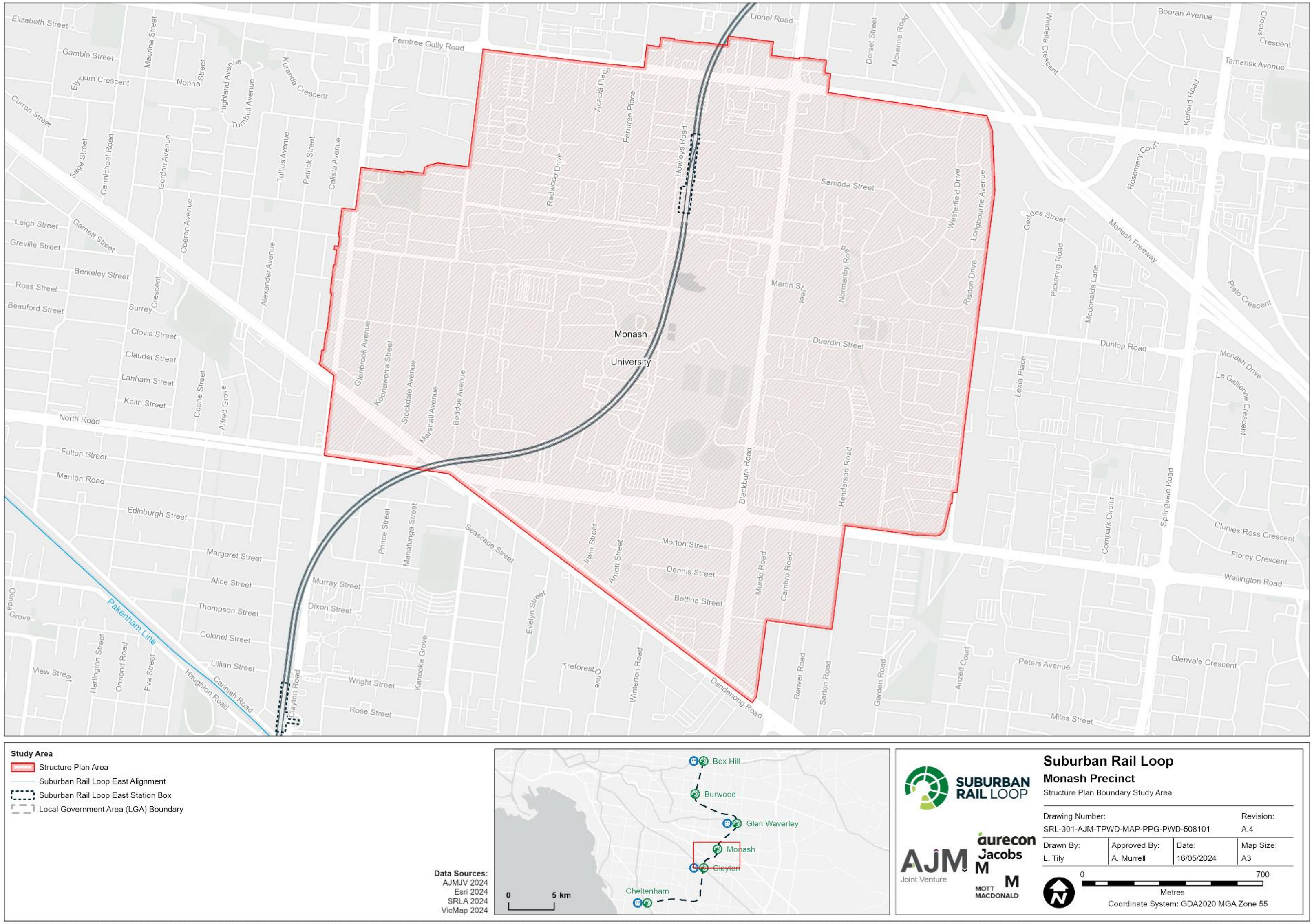
3.3 Monash Structure Plan Area

The Monash Structure Plan Area surrounds the SRL station at Monash in the City of Monash.

It is generally bordered by Wellington Road and Princes Highway to the south, Gardiner Road and residential properties between Clayton Road and Dover Street to the west, land north of Ferntree Gully Road to the north and a reservation for a future road, which forms a natural barrier to properties to the east.

Monash University Clayton campus is located in the Monash Structure Plan Area.

The Monash Structure Plan Area is shown in Figure 3.3.



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SRL_0224_PES_PrecinctStructurePlanning

FIGURE 3.3 MONASH STRUCTURE PLAN AREA

3.4 Glen Waverley Structure Plan Area

The Glen Waverley Structure Plan Area surrounds the SRL station at Glen Waverley in the City of Monash.

It is generally bordered by residential properties along Madeline Street to the north, Danien Street and The Outlook to the east, Waverley Road to the south and Kinnoull Grove and Rose Avenue to the west.

Coleman Parade and the existing Glen Waverley Line intersect the centre of the Structure Plan Area in an east-west alignment.

Key arterial roads include Springvale Road which intersects the Structure Plan Area in a north-south alignment, and High Street Road and Waverley Road.

The Glen Waverley Structure Plan Area is shown in Figure 3.4.

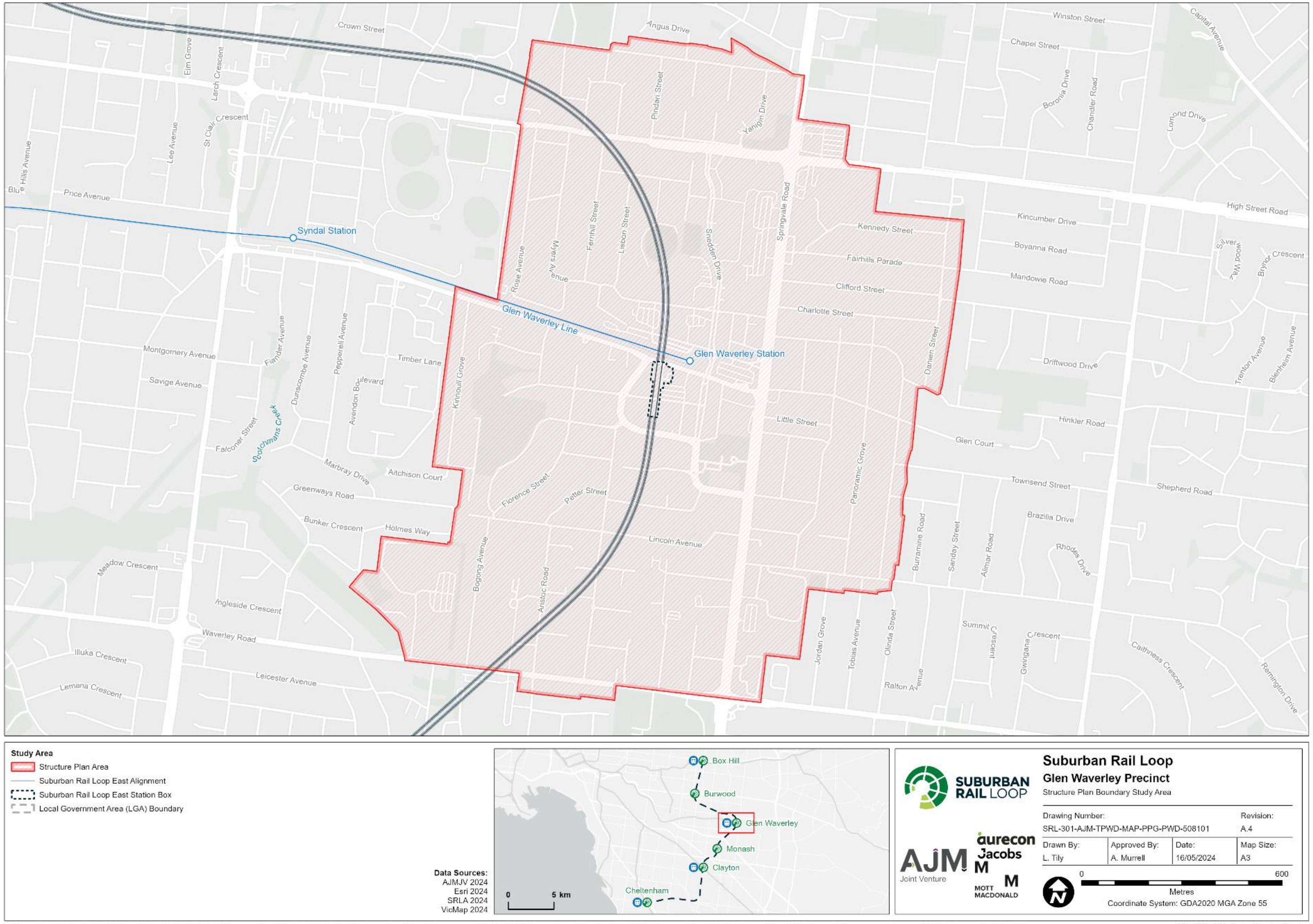

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FIGURE 3.4 GLEN WAVERLEY STRUCTURE PLAN AREA

3.5 Burwood Structure Plan Area

The Burwood Structure Plan Area surrounds the SRL station at Burwood. The Structure Plan Area is mainly located in the City of Whitehorse, with the southern portion south of Highbury Road extending into the City of Monash.

The Structure Plan Area is generally bounded by Uganda Street, Deakin University, Inverness Avenue, Bronte Avenue and Yarra Bing Crescent to the north, Andrews Street, Wridgway Avenue, Prospect Street and Huntingdale Road to the east, Zodiac Street, Ashwood Drive, Carmody Street and Barlyn Road to the south and Sixth Avenue, Evans Street, Warrigal Road, Parer Street and Meldan Street to the west.

Burwood Highway intersects the centre of the Structure Plan Area in an east-west alignment.

Deakin University Burwood campus is located in the Structure Plan Area.

The Burwood Structure Plan Area is shown in Figure 3.5.

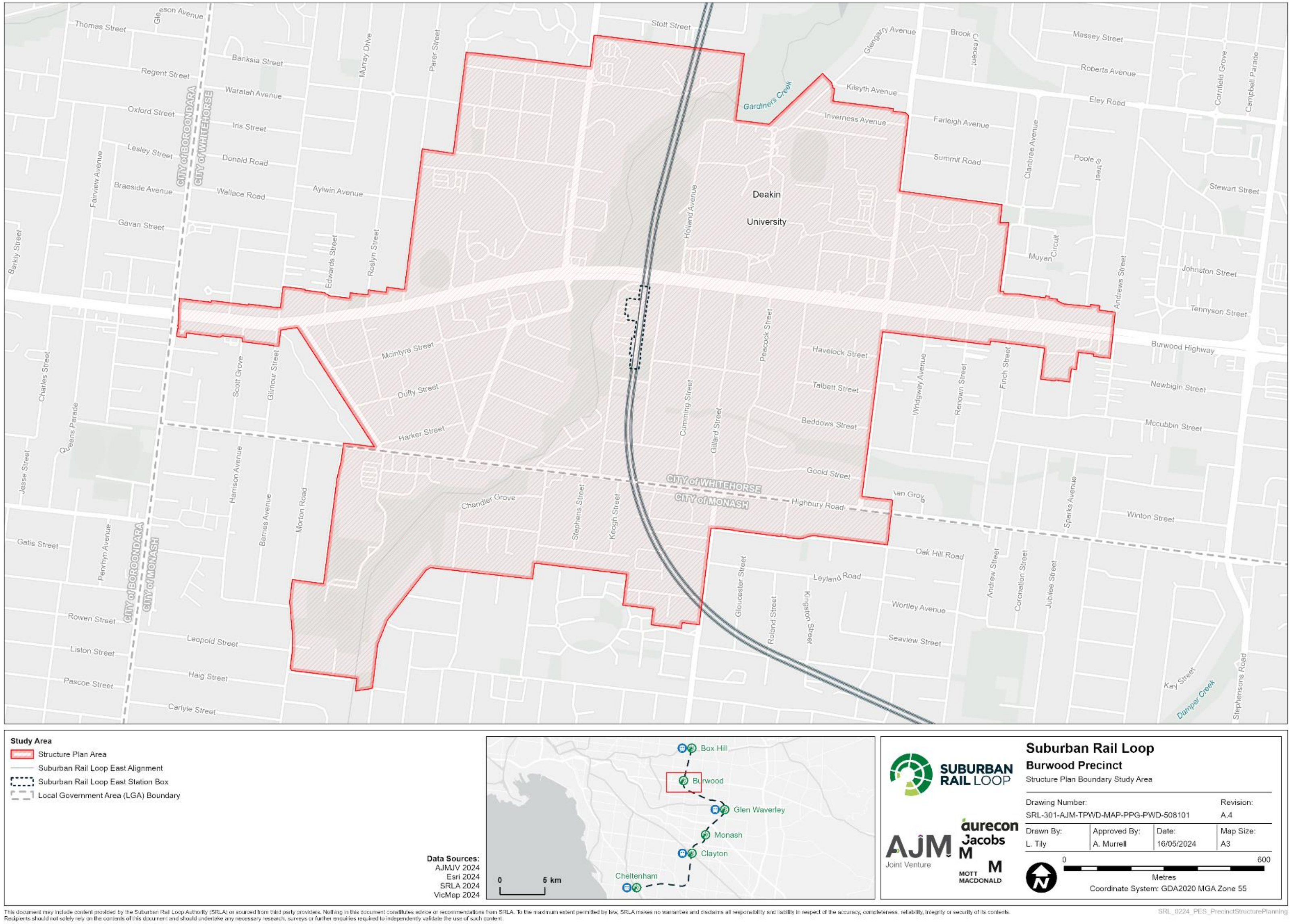


FIGURE 3.5 BURWOOD STRUCTURE PLAN AREA

3.6 Box Hill Structure Plan Area

The Box Hill Structure Plan Area surrounds the SRL station at Box Hill in the City of Whitehorse.

It is generally bordered by Severn Street and McKean Street to the north, Clota Avenue and Laburnum Street to the east, slightly west of Elgar Road to the west and Canterbury Road to the south.

Whitehorse Road / Maroondah Highway and the existing Belgrave / Lilydale Line intersect the centre of the Structure Plan Area in an east-west alignment. The main road corridors include Whitehorse Road, Elgar Road and Station Street.

The Box Hill Structure Plan Area is shown in Figure 3.6.

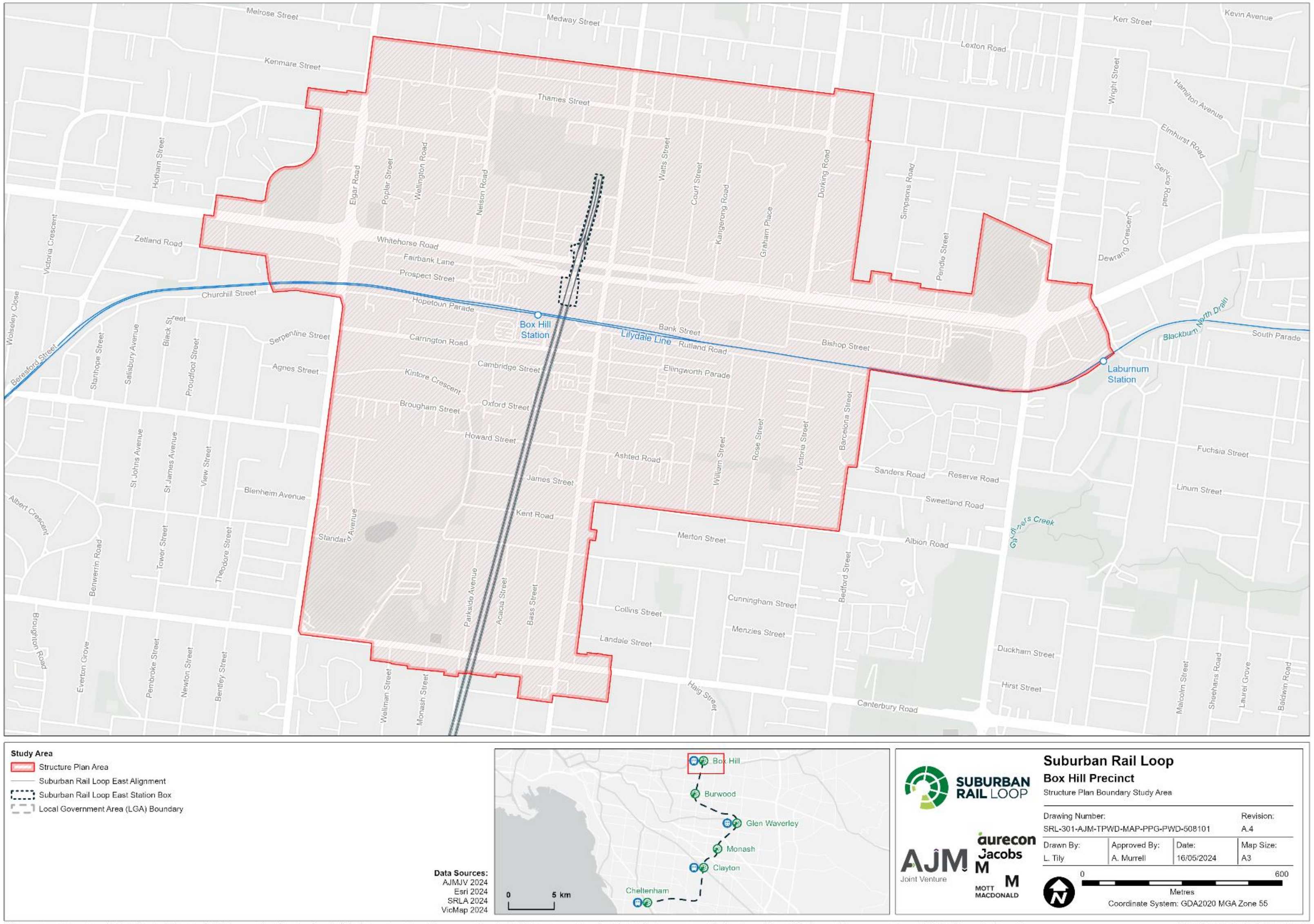


FIGURE 3.6 BOX HILL STRUCTURE PLAN AREA

4 Policy, frameworks and guidelines

This section summarises policies, frameworks and guidelines relevant to this IWM Strategy. Additional relevant policies, frameworks and guidelines are summarised in **Error! Reference source not found.**

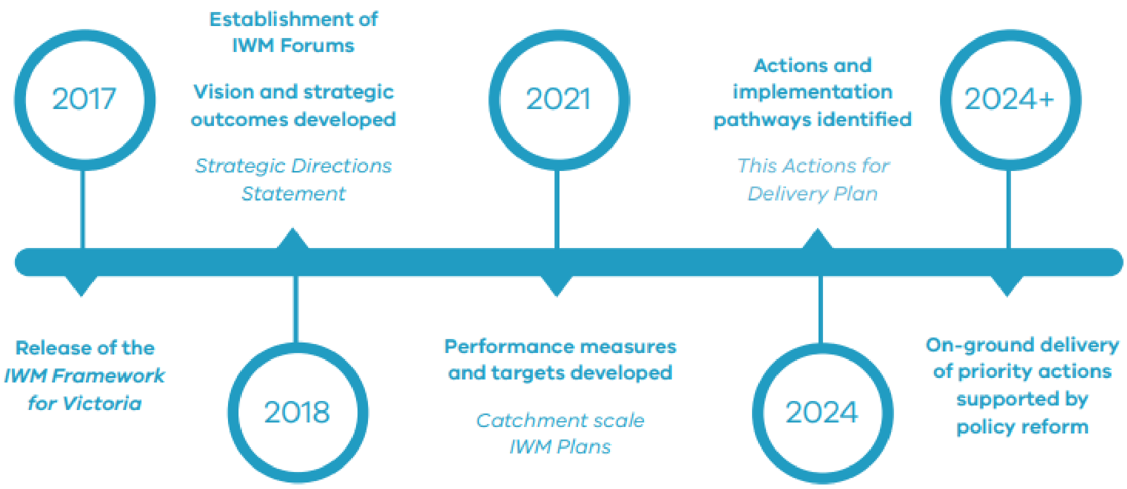
4.1 Integrated Water Management Framework for Victoria

The IWM Framework for Victoria (DELWP 2017) provides guidance for government, the water sector and community to work together to better plan and deliver water management solutions for Victoria's towns and cities. IWM requires a holistic view of the issues and opportunities for water management. It provides the opportunity of place-based IWM outcomes to reduce flooding, reduce potable water demand, maintain amenity, defer upgrades in the sewerage and drainage network, and reduce insurance liabilities.

The IWM Framework supports the establishment of IWM Forums in each water catchment region of Victoria to coordinate delivery of IWM opportunities. The IWM Forums have been successful in their collaboration between agencies to lead, plan and deliver IWM projects throughout the Melbourne metropolitan region. All organisations with a water management responsibility (DEECA, Melbourne Water, South East Water, Yarra Valley Water, local governments) are IWM Forum members and are listed in Table 4.1.

While the IWM Framework is not legally binding, it represents the agreed-upon process and direction from the Managing Directors and Chief Executive Officers of IWM Forum organisations. Through effective collaboration, it aims to realise the Water for Victoria vision.

Figure 4.1 shows the journey of IWM in Victoria since the release of the IWM Framework for Victoria in 2017 and notes the many documents prepared to inform actions to deliver IWM initiatives. These include catchment-scale IWM Plans. The SRL East Structure Plan Areas are located in the Dandenong and the Yarra water catchments (see Figure 4.2 further below).



Source: DEECA 2024

FIGURE 4.1 JOURNEY OF IWM IN VICTORIA

4.1.1 IWM STAKEHOLDERS

Organisations with an interest or responsibility in IWM in the SRL East Structure Plan Areas are listed in Table 4.1.

TABLE 4.1 IWM STAKEHOLDERS IN SRL EAST STRUCTURE PLAN AREAS

STAKEHOLDER	ACCOUNTABILITY
Melbourne Water	Floodplain management authority, up to 1% AEP including climate change flood events (20%, 10%, 5%, 2, 1%, 1% including CC) with regards to Melbourne Water assets and major waterways Catchment management authority.
Bayside City Council Kingston City Council Monash City Council Whitehorse City Council	Local drainage authority, up to 20% AEP including climate flood events with regards to Council drainage assets.
South East Water Yarra Valley Water	Water retailers – water services to the SRL East Structure Plan Areas
Department of Energy, Environment and Climate Action (DEECA)	Leading the IWM Plans for SRL East Structure Plan Areas that deliver on strategic targets.
Environment Protection Authority (EPA) Victoria	Environmental regulator – stormwater quality and quantity.

4.1.2 STRATEGIC TARGETS

The catchment-scale IWM Plans prepared by IWM Forum members drive an integrated approach to water management that deliver clear outcomes for each catchment. Setting targets is key to driving outcomes. Targets of the catchment-scale IWM Plans that are relevant to the SRL East Structure Plan Areas are summarised in Table 4.2.

The assessment of IWM opportunities in the SRL East Structure Plan Areas are summarised against these targets in Section 5.7.

TABLE 4.2 CATCHMENT-SCALE IWM PLAN TARGETS

DANDENONG CATCHMENT SCALE INTEGRATED WATER MANAGEMENT PLAN (DELWP 2018)	YARRA CATCHMENT SCALE INTEGRATED WATER MANAGEMENT PLAN (DELWP 2018B)
To reduce potable water demand, the catchment targets are: • 11 gigalitres/year of alternative water sources that substitute potable mains supply by 2030 for the catchment.	To reduce potable water demand, the catchment targets are: • 14 gigalitres/year of alternative water sources that substitute potable mains supply by 2030 for the catchment.
To reduce Annual Average Damages (AAD) delivered by flood management initiatives, the catchment targets are: • $9 to 64 million reduction in AAD delivered by flood management initiatives by 2030 for the catchment.	To reduce AAD delivered by flood management initiatives, the catchment targets are: • $10 million reduction in AAD delivered by flood management initiatives by 2030 for the catchment.
To achieve healthy and valued waterways, the catchment targets are: • 11 gigalitres/year of mean annual urban runoff volume reduction by 2030 for the catchment • 19 gigalitres/year of mean annual urban runoff volume reduction by 2050 for the catchment.	To achieve healthy and valued waterways, the catchment targets are: • 21 gigalitres/year of mean annual urban runoff volume reduction by 2030 for the catchment • 71 gigalitres/year of mean annual urban runoff volume reduction by 2050 for the catchment.
To achieve healthy and valued landscapes, the catchment targets are: • 11% and 23% of street trees are supported with permanent irrigation from an alternative water supply by 2030 and 2050 respectively, for the catchment • 19% and 45% of active public open space (sports fields and organised recreation) is supported by an alternative	To achieve healthy and valued landscapes, the catchment targets are: • 8% and 21% of street trees are supported with permanent irrigation from an alternative water supply by 2030 and 2050 respectively, for the catchment • 18% and 50% of active public open space (sports fields and organised recreation) is supported by an alternative

DANDENONG CATCHMENT SCALE INTEGRATED WATER MANAGEMENT PLAN (DELWP 2018)	YARRA CATCHMENT SCALE INTEGRATED WATER MANAGEMENT PLAN (DELWP 2018B)
water source by 2030 and 2050 respectively, for the catchment • 4% and 10% of passive public open space (parklands and gardens) is supported by an alternative water source by 2030 and 2050 respectively, for the catchment.	water source by 2030 and 2050 respectively, for the catchment • 2% and 30% of passive public open space (parklands and gardens) is supported by an alternative water source by 2030 and 2050 respectively, for the catchment.

4.2 IWM Action Plans

IWM Action Plans set out the individual actions, or projects, that stakeholders are delivering to progress the strategic outcomes established by the IWM Forums. Current action plan projects the IWM Forums are considering which are located within SRL East Structure Plan Areas, are summarised in Table 4.3. These actions provide opportunity to work with lead agencies when preparing IWM Plans for each SRL East Structure Plan Area to optimise and refine IWM opportunities within them, building on the work currently underway.

Existing IWM actions and projects underway should be considered when developing the SRL East Structure Plans and IWM Plans.

TABLE 4.3 IWM ACTION PLAN PROJECTS UNDERWAY IN STRUCTURE PLAN AREAS

ACTION, STATUS AND LEAD AGENCY	DESCRIPTION (DEECA 2024 & DEECA 2024B)
Dingley Recycled Water Scheme Status: Detailed design Lead agency: South East Water	The Dingley Recycled Water Scheme will deliver Class A recycled water to around 40 sites across the Kingston, Bayside, Monash and Dandenong local council areas. The scheme is designed to supply 1.8 gigalitres of recycled water per year. Stage 1 of the scheme involves the design and construction of a transfer main from the Eastern Treatment Plant. Investigation works for the transfer main are complete. Construction of the transfer main will commence around June 2024. Stage 2 of the action will focus on multiple reticulation networks and is expected to commence upon completion of Stage 1 in 2025. This action provides an important contribution to long-term water security and liveability outcomes for agriculture, golf tourism, and community sport and recreation spaces.
Eastern Alternative Water Scheme – Stage 1 Status: Feasibility and concept Lead agency: Yarra Valley Water	The Eastern Alternative Water Scheme will explore opportunities for alternative water supply and use in the eastern region of Melbourne. Possible sources include high-quality recycled water, stormwater, rainwater and greywater, which can be used for non-drinking water purposes such as flushing toilets, clothes washing, irrigation, car washing, watering gardens and other industrial uses. Developing alternative water schemes will strengthen the water system's climate resilience, help customers save drinking water and improve waterway health and liveability.
Stronger state building and plumbing regulations to improve the water efficiency of buildings Status: Business Case Lead agency: DEECA	Review existing and consider new improved water efficiency building and plumbing requirements via a Regulatory Impact Statement process. This includes evaluating the costs and benefits of: (a) requiring a broader range of developments to install rainwater tanks, and (b) raising water efficiency of water appliances and fixtures such as toilets, taps and showers. While this action will be implemented as part of the Central and Gippsland Region Sustainable Water Strategy, it is relevant to development across the state. Regular maintenance is needed for rainwater tanks to function correctly, so ways to improve the maintenance and functionality of tanks will also be assessed to help increase water efficiency and support implementation of any future rainwater tank requirements.
Central Reserve, Glen Waverley stormwater harvesting Status: Detailed design Lead agency: Monash City Council	Central Reserve in Glen Waverley is a high-profile sporting precinct which includes multiple ovals and facilities. Stormwater will be sourced from local council drains, treated and harvested to provide an irrigation supply to 5 hectares of active public open space. The water will reduce reliance on drinking water sources and support liveable communities. This site is directly south and outside of the Glen Waverley Structure Plan area, but could have benefits to the upstream catchment in the Structure Plan Area.

ACTION, STATUS AND LEAD AGENCY	DESCRIPTION (DEECA 2024 & DEECA 2024B)
Gardiners Creek naturalisation – Highbury to Warrigal Status: idea development Lead agency: Monash City Council	Historically, Gardiners Creek has been highly modified and concrete-lined. Sections have been progressively naturalised and the reach adjacent to Burwood Station will be naturalised as part of SRL East. The is an opportunity to restore the creek corridor between Highbury Road and Warrigal Road to enhance biodiversity and habitat for native species, and improve community experience, use and recreation in the area.
Investigate Stormwater Harvesting Opportunities within Whitehorse Status: Feasibility and concept Lead agency: Whitehorse City Council	Whitehorse City Council endorsed its IWM strategy in 2022. One of the outcomes is that all water is valued as a resource. The council and community recognise that water is not an endless resource, so are finding practical ways to reduce dependence on drinking water and make good use of stormwater, rainwater and wastewater, wherever possible. This action seeks to undertake a high level feasibility assessment of stormwater harvesting and large-scale Water Sensitive Urban Design to provide water security for council facilities and open space, improve the health of local waterways and improve greening and cooling in the municipality.
Audit of existing Water Sensitive Urban Design assets Status: Feasibility and concept Lead agency: Whitehorse City Council	The Whitehorse Integrated Water Management Strategy 2022–2042 commits to an audit of existing Water Sensitive Urban Design and vegetated assets to assess functionality, recommend maintenance requirements and rectification works, and determine renewal costs to inform future maintenance budgets. The audit seeks to verify treatment performance of existing assets and finalise their contribution towards strategy targets. The findings will improve the planning, design, management and construction of future assets to support better water quality leaving the catchments. No results of this audit are currently available.
Cool and green streets Status: Feasibility and concept Lead agency: Monash City Council	This action aims to irrigate trees and vegetation within the Dandenong catchment with alternative water sources to support healthy canopy growth and urban cooling. It will apply Water Sensitive Urban Design solutions to support passive irrigation of these assets and enable infiltration of rainfall and stormwater runoff into soil and open space. Water Sensitive Urban Design options include raingardens, swales, permeable pavements and below-ground infrastructure to increase soil moisture around trees. Monash City Council has led the development of a passive irrigation kerb inlet prototype that will be tested through this action.
Develop guidance for stormwater harvesting and infiltration Status: in progress Lead agency: Melbourne Water, EPA Victoria and local government	Development guidance for cost-effective practical solutions and approaches at different spatial scales to achieve the flow volume reductions articulated in the Stormwater Management Guidelines (EPA Victoria Publication 1739:1).

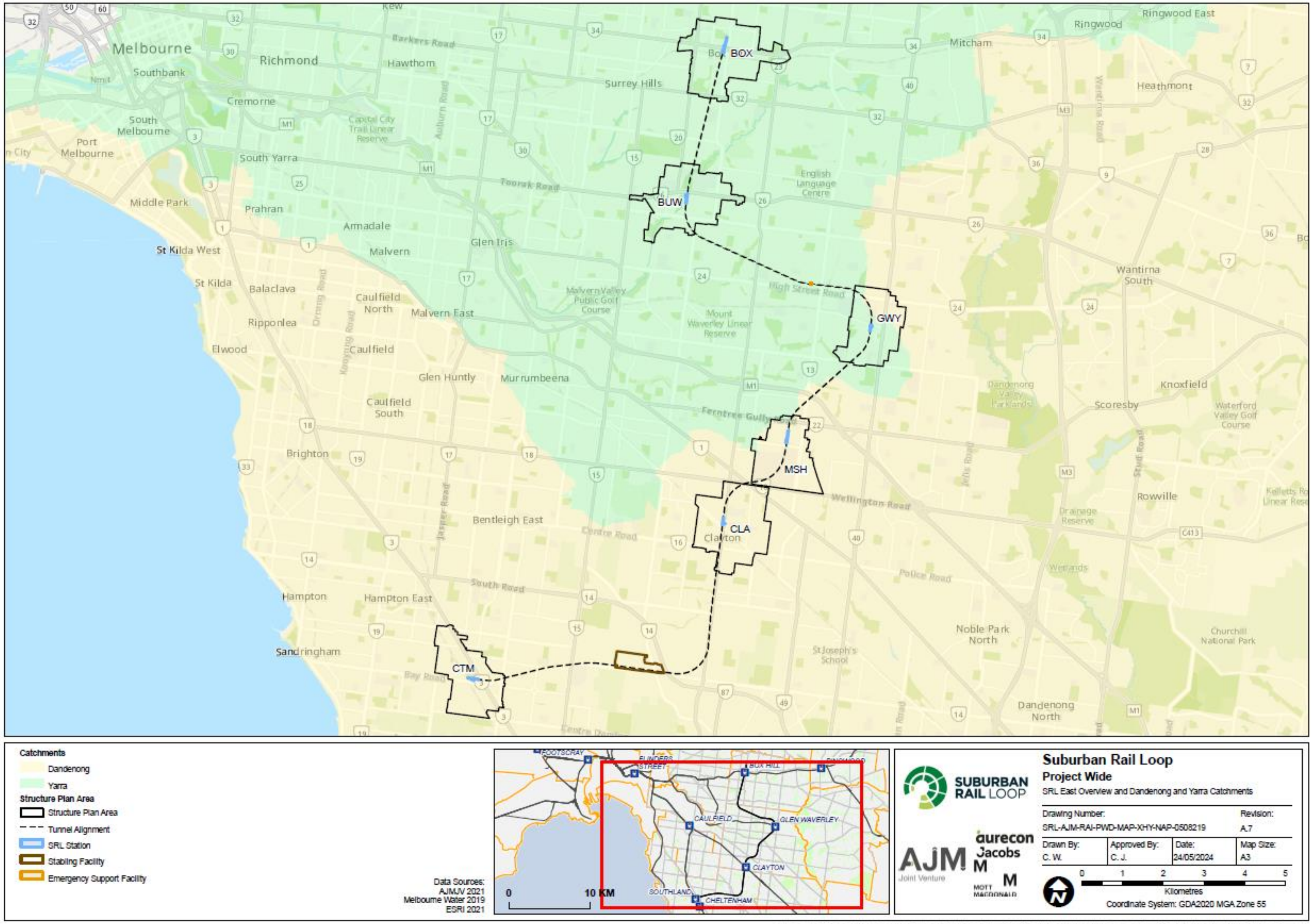


FIGURE 4.2 IWM CATCHMENTS PER STRUCTURE PLAN AREA

4.3 Water Oriented Precinct Planning Framework

Melbourne Water's Water Oriented Precinct Planning Framework (not yet published) seeks to integrate whole-of-water cycle management into urban planning and design. Water-oriented design enables new ideas, services and solutions that contribute to a sustainable, resilient and water smart city. Place-based collaboration and integration of water and land outcomes and IWM are fundamental to support precinct growth.

The Water Oriented Precinct Planning principles presented in Figure 4.3 are informed by the IWM targets for catchment-scale IWM projects already underway in the SRL East Structure Plan Areas (see Section 4.1.2).

Melbourne Water shared its Water Oriented Precinct Planning Framework with SRLA prior to their formal publication to inform the preparation of the SRL East Structure Plans. While the Framework is not a formal statutory planning document, it is the current thought leadership from Melbourne Water to achieving IWM outcomes through structure planning in Victoria.

The Water Oriented Precinct Planning Principles are categorised into the five themes shown in Figure 4.3.

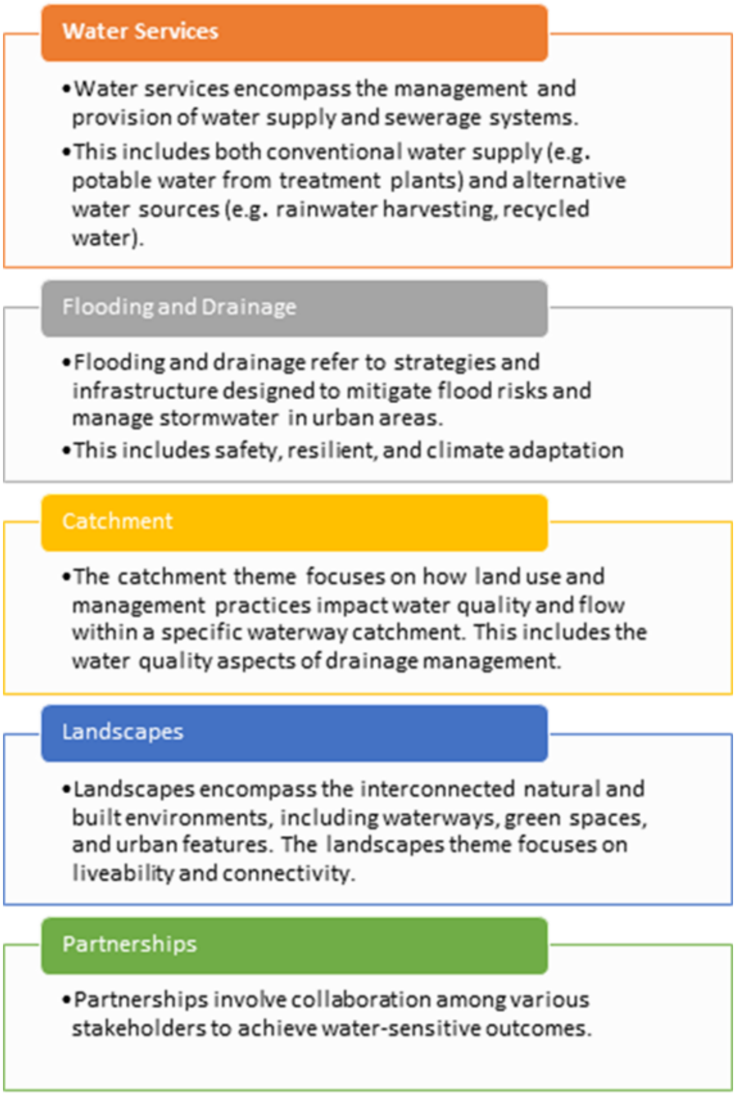


FIGURE 4.3 WATER ORIENTED DESIGN PRINCIPLES (MELBOURNE WATER, UNPUBLISHED)

This IWM Strategy explores opportunities to inform the SRL East Structure Plans that align with the principles of the catchment-scale IWM targets and the Water Oriented Design Principles to meet the requirements of policies and guidelines relevant to the SRL East Structure Plans.

4.4 Victoria Planning Provisions

The Victoria Planning Provisions (VPPs) are established under Part 1A of the *Planning and Environment Act 1987* (Vic).

Clause 14.02–1S, Clause 19.03–3S and Clause 53.18 of the VPPs set out objectives and policies relating to IWM and are summarised below. The clauses apply equally to each SRL East Structure Plan Area as they are contained in the local planning policies of each municipal planning scheme.

4.4.1 CLAUSE 14.02-1S – CATCHMENT PLANNING AND MANAGEMENT

Clause 14.02–1S seeks to protect and restore Victoria's catchments and waterways through consideration of the entire catchment including estuaries, bays, water bodies, groundwater and the marine environment.

Policies relevant to achieving this are:

- Retain natural drainage corridors with vegetated buffer zones at least 30 metres wide along each side of a waterway
- Require measures to minimise the quantity and retard the flow of stormwater from developed areas and to filter sediment and wastes from stormwater before its discharge into waterways, including the preservation of floodplain or other land for wetlands and retention basins
- Ensure that development at or near waterways provides for the protection and enhancement of the environmental qualities of waterways and their instream uses.

The relevant policy listed under this Clause is *Urban Stormwater – Best Practice Environmental Management Guidelines* (Victorian Stormwater Committee 1999), which is summarised in Section 4.5.

4.4.2 CLAUSE 19.03-3S – INTEGRATED WATER MANAGEMENT AND CLAUSE 53.18 – STORMWATER MANAGEMENT IN URBAN DEVELOPMENT

Clause 19.02–3S seeks to ensure that stormwater generated from all forms of urban development is managed in an integrated way to mitigate the impacts of stormwater runoff on the environment, property and public safety, and to provide cooling, local habitat and amenity benefits. It sets a policy to require adoption of an integrated approach to the planning, design and assessment of new developments which brings all the elements of the water cycle together, including sewage management, water supply, stormwater management and water treatment to maximise community and environmental benefits.

The policy is implemented through particular provisions of Clause 53.18, which seek to ensure that stormwater in urban development, including retention and reuse, is managed to mitigate the impacts of stormwater on the environment, property and public safety, and to provide cooling, local habitat and amenity benefits.

The objectives and policies that seek to achieve IWM and stormwater management are summarised in Appendix B .

4.5 Best Practice Environmental Management Guidelines

The CSIRO in conjunction with the Victorian Stormwater Committee released the *Urban Stormwater Best Practice Environmental Guidelines (*BPEM Guidelines) in 1999. These guidelines are a reference document under VPP Clause 14.02-1S – *Catchment planning and management*, which requires most developments to design urban stormwater systems to meet the BPEM Guideline water quality objectives for total suspended solids (TSS), total phosphorus (TP), total nitrogen (TN) and litter. The BPEM Guidelines do not include performance objectives for reducing stormwater flow volumes.

The BPEM Guidelines are the minimum requirement for stormwater management as it is a requirement of the current planning schemes relevant to the SRL East Structure Plan Areas.

4.6 Healthy Waterways Strategy 2018-28

The Healthy Waterways Strategy 2018–28 (Melbourne Water 2018) is the overarching planning document for the management of rivers, wetlands and estuaries in the Port Phillip and Westernport region. The Strategy is underpinned by a single regional 50-year vision and aims to ensure that rivers, wetlands and estuaries and their value to the community is protected and improved. The Healthy Waterways Strategy is a reference document under the VPP Clause 12.03 – *Water bodies and wetlands*.

The Healthy Waterways Strategy provides an understanding of the existing conditions to overall health of waterways within the SRL East Structure Plan Areas. Stormwater is the main driver of degraded water quality and flow regimes in urban areas and the Strategy introduced targets to increase stormwater harvesting and infiltration.

The Healthy Waterways Strategy Stormwater Targets Practitioners Note July 2021 translates the Healthy Waterway targets for meeting stormwater management in addition to BPEM, by defining regions.

The SRL East Structure Plan Areas are not located within the Stormwater or Vegetation priority Healthy Waterway Strategy areas.

While the Melbourne Water Healthy Waterways Strategy is a reference document of the VPPs, meeting the translated objectives of EPA Victoria Publication 17391 – *Urban stormwater management guidance*, it is not mandated through the planning scheme.

4.7 EPA Victoria Publication 1739.1 – Urban stormwater management guidance

EPA Victoria Publication 1739.1 – *Urban stormwater management guidance* (2021) builds on previous guidance (BPEM Guidelines 1999 and Healthy Waterway Strategy) and is considered the current stormwater management guidance document in Victoria. The guidance outlines targets for water quality and flow reduction volumes via stormwater harvesting and infiltration targets.

EPA Victoria Publication 1739.1 provides guidance for developers and technical consultants who create new impervious surfaces, such as roads, subdivisions and other developments. The quantitative performance objectives for urban stormwater in the EPA Victoria guidance are detailed in Table 4.4 . The rainfall band relevant to the SRL East Structure Plan Areas is confirmed in the Healthy Waterways Strategy Stormwater Targets Practitioners Note July 2021 (see Section 4.6).

TABLE 4.4 EPA VICTORIA QUANTITATIVE PERFORMANCE OBJECTIVES FOR URBAN STORMWATER

<table>
<tr><th>INDICATOR</th><th>PERFORMANCE OBJECTIVE</th></tr>
<tr><td>Total suspended solids (TSS)</td><td>80% reduction in mean annual load</td></tr>
<tr><td>Total phosphorus (TP)</td><td>45% reduction in mean annual load</td></tr>
<tr><td>Total nitrogen (TN)</td><td>45% reduction in mean annual load</td></tr>
<tr><td>Litter</td><td>70% reduction in mean annual load</td></tr>
<tr><td>Flow (water volume)</td><td>Non-priority areas rainfall bands relevant to the Structure Plan Areas
<table>
<tr><th>Rainfall band</th><th>Harvest / evapotranspire (% mean annual impervious run-off)</th><th>Infiltrate / filter (% mean annual impervious run-off)</th></tr>
<tr><td>700</td><td>27</td><td>9</td></tr>
<tr><td>800</td><td>26</td><td>11</td></tr>
</table>
</td></tr>
</table>

Source: EPA Victoria Publication 1739.1 – *Urban stormwater management guidance* (2021)

While the objectives of EPA Victoria Publication 1739.1 are not currently enforced by the planning schemes, this IWM Strategy adopts these performance objectives as the benchmark for IWM opportunities to achieve best practice stormwater management. Evaluation of the IWM opportunities against these performance objectives are provided for each Structure Plan Area in Section 5.

As per the IWM Actions listed in Section 4.2, Melbourne Water and EPA Victoria are developing guidance for cost-effective practical solutions and approaches at different spatial scales to achieve the stormwater flow volume reductions set out in EPA Victoria Publication 1739:1.

4.8 EPA Victoria Publication 1911.2 – Technical information for the Victorian guideline for water recycling

Section 2.1.3 of EPA Victoria Publication 1911.2 – *Technical information for the Victorian guideline for water recycling* confirms the intended use of recycled water for residential and commercial use as outlined in Table 4.5. For this IWM assessment, water use is quantified for all urban development types for washing machines, toilet flushing and irrigating gardens. Other water uses volumes were not estimated.

TABLE 4.5 INTENDED USE OF RECYCLED WATER

RESIDENTIAL	COMMERCIAL
• Washing machines • Car washing • External cleaning • Toilet flushing • Garden watering.	• Construction (for example road compaction) • Dust suppression • Fire protection • Commercial car washing facilities or depots • Commercial laundries or washing machines at non-residential facilities • Toilet flushing at non-residential facilities • Heating/cooling (air-conditioning) systems

Source: EPA Victoria Publication 1911.2

5 IWM opportunity assessment

Structure Plans are being prepared for the neighbourhoods surrounding the SRL East stations. The population and jobs forecast, urban design built-form and water catchment characteristics for each SRL East Structure Plan Area are unique to each one and are considered accordingly.

This section provides the IWM assessment for each SRL East Structure Plan Area to show how the identified potential IWM opportunities can be applied and tailored to each Structure Plan Area.

5.1 Cheltenham Structure Plan Area

5.1.1 SPATIAL CONTEXT

A breakdown of land types in the Cheltenham Structure Plan Area that informed the IWM assessment is provided in Table 5.1. A detailed breakdown of land use for the existing and ultimate development scenarios in the Structure Plan Area is provided in **Error! Reference source not found.**– Table A.3 and Table A.7.

The Cheltenham Structure Plan Area urban development types (ultimate development) that form the basis of the IWM scenario assessment are shown in Figure 5.1. Rainwater tanks were modelled as an on-lot IWM opportunity for each urban development type (excluding Civic Areas). Opportunities to irrigate active open space via stormwater harvesting or recycled water are identified.

The roads where passively irrigated street trees are feasible are shown in Figure 5.2.

How these IWM opportunities impact quantifiable metrics in the Cheltenham Structure Plan Area are described below.

TABLE 5.1 LAND TYPE BREAKDOWN – CHELTENHAM STRUCTURE PLAN AREA

LAND TYPE	AREA (HA)	PORTION OF STRUCTURE PLAN AREA
Lot – developable	272	73%
Lot – non-developable (Civic Areas)	17	5%
Roads	66	18%
Open space	16	4%

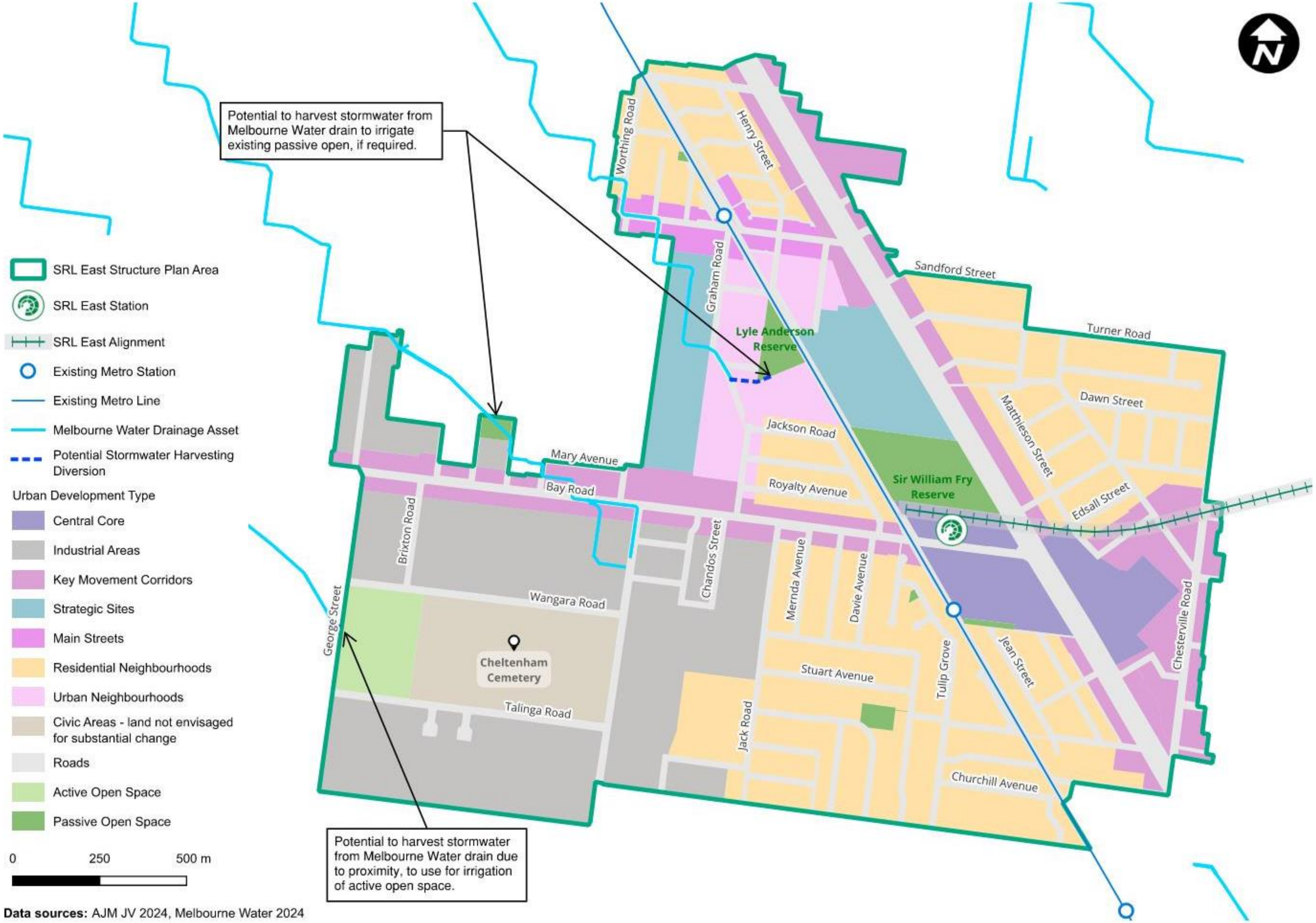


FIGURE 5.1 URBAN DEVELOPMENT TYPES AND OPEN SPACE IRRIGATION OPPORTUNITIES IN THE CHELTENHAM STRUCTURE PLAN AREA

FIGURE 5.2 ROADS WHERE PASSIVE IRRIGATION OF STREET TREES IS FEASIBLE IN THE CHELTENHAM STRUCTURE PLAN AREA

5.1.2 WATER BALANCE

5.1.2.1 Water supply assessment

Table 5.2 and Figure 5.3 show the water supply balance in the Cheltenham Structure Plan Area for the existing scenario and the ultimate development scenario, with and without IWM.

The following conclusions can be summarised from the water supply assessment:

- Potable water demand is expected to increase 108% due to resident and worker population growth
- Alternative water supplies could reduce reliance on potable water by 37%:
  - » Rainwater tanks could reduce reliance on potable water by 32%.
  - » Recycled water to top up rainwater tank supplies could reduce reliance on potable water by 3%.
  - » Using alternative water to irrigate active open space (Wangara Road Golf Driving Range) could reduce reliance on potable water by 2% (stormwater harvesting 1% and supplemented by recycled water 1%).
- Lyle Anderson Reserve and Eddie Reserve are located in proximity of a Melbourne Water drain and present an opportunity to harvest stormwater to introduce irrigation to passive open spaces. There are additional passive open space areas that could be activated with stormwater from Council drains or recycled water if available in the Structure Plan Area. It is assumed that potable water is not currently used to irrigate these open spaces, so the water balance assessment has not quantified the opportunity.

TABLE 5.2 WATER SUPPLY BALANCE PER DEVELOPMENT SCENARIO – CHELTENHAM STRUCTURE PLAN AREA

WATER SUPPLY BALANCE	EXISTING (2021)		DEVELOPED (2041 – WITHOUT IWM)		DEVELOPED (2041 – WITH IWM)	
	(ML/YEAR)		(ML/YEAR)	(% CHANGE FROM BASE CASE)	(ML/YEAR)	(% CHANGE FROM DEV CASE WITHOUT IWM)
Total water demand	718		1867	161%	1867	**0%**
Potable water demand	896		1867	108%	1172	**-37%**
	NON-POTABLE SOURCES	(% OF TOTAL SUPPLY)	NON-POTABLE SOURCES	(% OF TOTAL SUPPLY)	NON-POTABLE SOURCES	(% OF TOTAL SUPPLY)
Non-potable water demand	On-lot rainwater tanks	5%	On-lot rainwater tanks	0%	On-lot rainwater tanks	**32%**
					On-lot recycled water (top-up)	**3%**
					Stormwater harvesting for irrigation	**1%**
					Recycled water for irrigation	**1%**

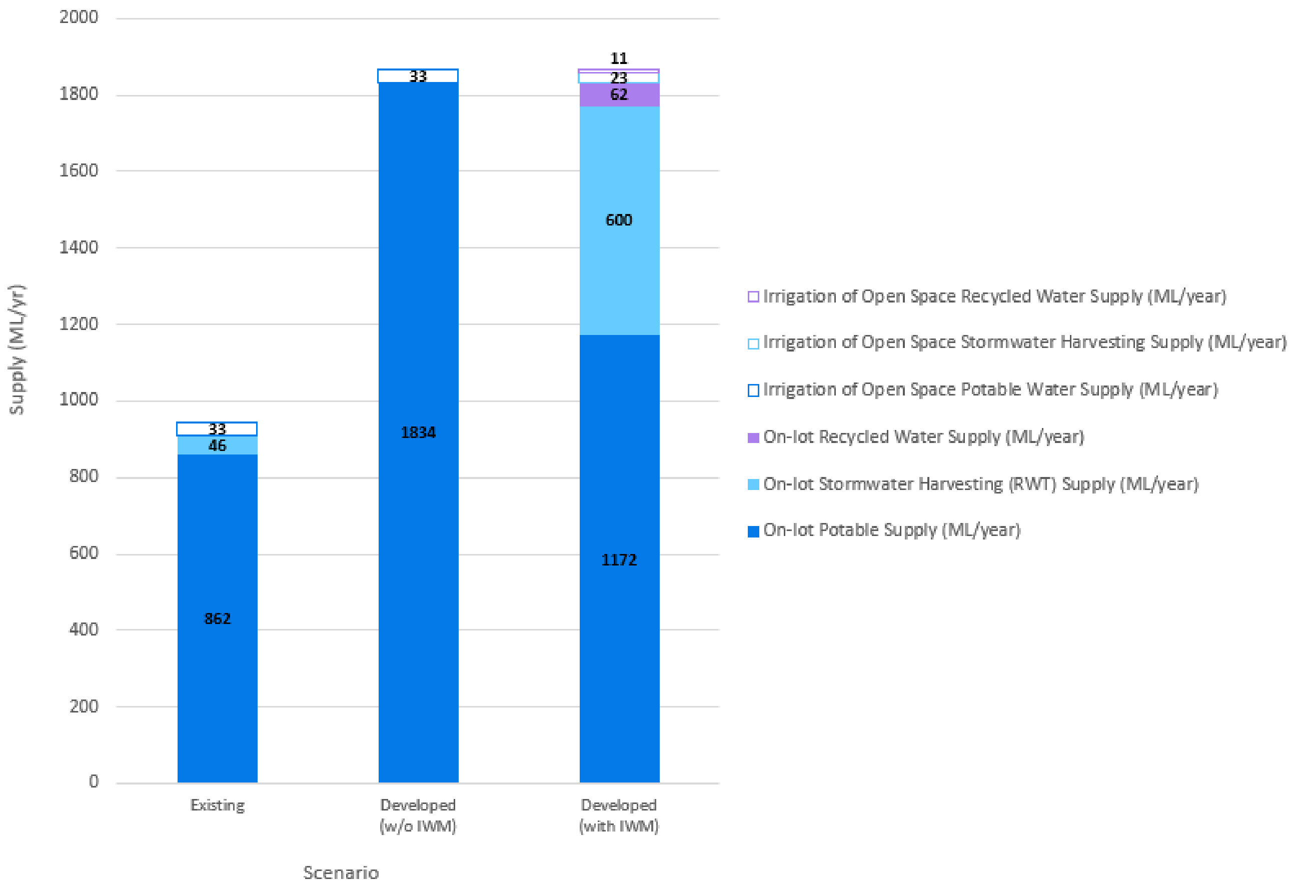


FIGURE 5.3 WATER SUPPLY BALANCE PER DEVELOPMENT SCENARIO – CHELTENHAM STRUCTURE PLAN AREA

5.1.2.2 Stormwater assessment

Table 5.3 and Figure 5.4 show the water balance for stormwater presented as mean annual runoff volume (MARV) for each scenario in the Cheltenham Structure Plan Area.

The following conclusions can be summarised from the stormwater assessment:

- MARV could increase by 10% in the ultimate development scenario in the Structure Plan Area without IWM initiatives
- IWM opportunities modelled could reduce the MARV by 33% under the ultimate development scenario:
  - Rainwater tanks could harvest 600 ML/year (31%)
  - Passively irrigated street trees could evapotranspire 18 ML/year (1%)
  - Stormwater harvesting to irrigate active open space could harvest 23 ML/year (1%).

TABLE 5.3 CATCHMENT WATER BALANCE PER DEVELOPMENT SCENARIO – CHELTENHAM STRUCTURE PLAN AREA

WATER BALANCE COMPONENTS	EXISTING (2021)	DEVELOPED (2041 – WITHOUT IWM)		DEVELOPED (2041 – WITH IWM)	
	ML/YEAR	ML/YEAR	% CHANGE FROM EXISTING (2021) SCENARIO	ML/YEAR	% CHANGE FROM DEVELOPED (2041 - WITHOUT IWM) SCENARIO
Mean annual runoff volume (MARV)	1750	1930	10%	1290	-33%
IWM OPPORTUNITIES				**ML/YEAR**	**% OF DEVELOPED (2041 – WITHOUT IWM) SCENARIO MARV**
On-lot rainwater tanks				-600	-31%
Street trees				-18	-1%
Stormwater harvesting to irrigate public open space (POS)				-23	-1%

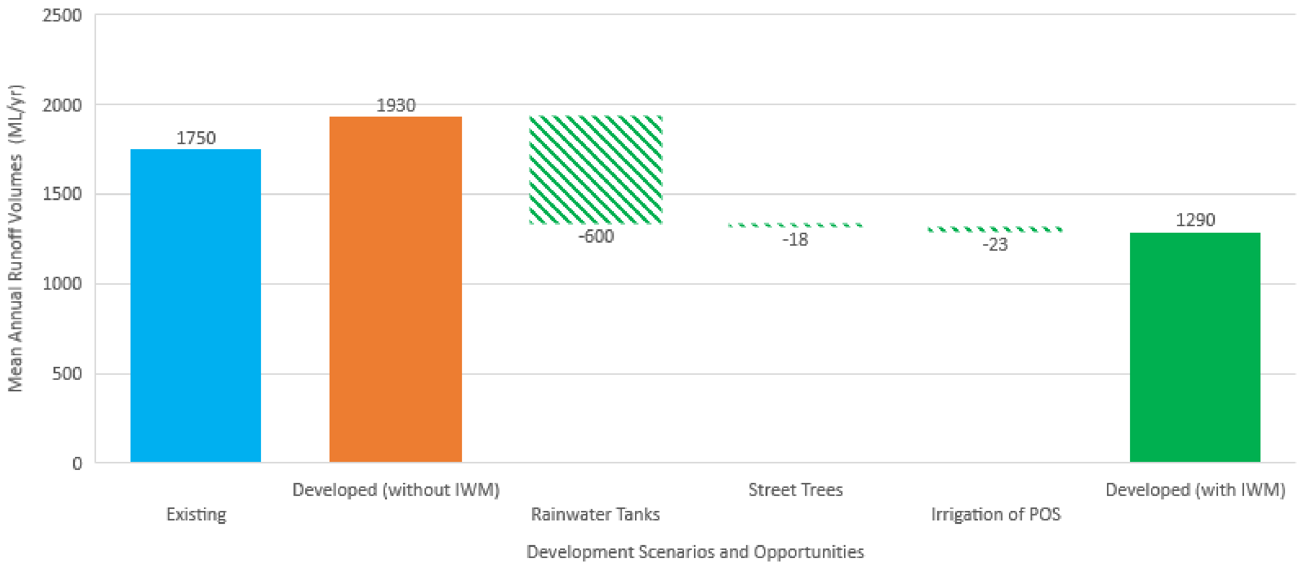


FIGURE 5.4 MEAN ANNUAL RUNOFF VOLUMES PER DEVELOPMENT SCENARIO AND THE IMPACTS OF IWM OPPORTUNITIES – CHELTENHAM STRUCTURE PLAN AREA

5.1.3 STORMWATER PERFORMANCE OBJECTIVES

The assessment of achieving the quantitative performance objectives for urban stormwater set in EPA Victoria Publication 1739.1 – *Urban stormwater management guidance* in the Cheltenham Structure Plan Area is provided in Table 5.4.

The following conclusions can be made from the assessment:

- Rainwater tanks will reduce mean annual pollutant loads by intercepting the runoff, and street trees will improve water quality through infiltration

- Rainwater tanks, with a minor contribution from street trees, will meet the volume harvesting / evapotranspiration quantitative performance objective for urban stormwater, with a 32% reduction in mean annual impervious runoff
- The combination of rainwater tanks and street trees could reduce total suspended solids (TSS) by 33%, total phosphorus (TP) by 35%, total nutrients (TN) by 32% and gross pollutants by 77%. These potential reductions will not meet the current quantitative performance objectives for urban stormwater for TSS, TP and TN. More interventions will be required on-lot and across the Structure Plan Area.

TABLE 5.4 QUANTITATIVE PERFORMANCE OBJECTIVES FOR URBAN STORMWATER – CHELTENHAM STRUCTURE PLAN AREA

WATER QUALITY	TARGET	DEVELOPED (2041 – WITHOUT IWM)	DEVELOPED (2041 – WITH IWM)	
	(% REDUCTION IN MEAN ANNUAL LOAD)	(KG/YEAR)	(KG/YEAR)	(% REDUCTION IN MEAN ANNUAL LOAD)
Total suspended solids (TSS)	80%	256,895	173,188	33%
Total phosphorus (TP)	45%	588	401	32%
Total nitrogen (TN)	45%	4855	3174	35%
Gross pollutants (GP)	70%	76,648	17,500	77%
FLOW VOLUME	**TARGET**	**DEVELOPED (2041 – WITHOUT IWM)**	**DEVELOPED (2041 – WITH IWM)**	
	(% MEAN ANNUAL IMPERVIOUS RUNOFF)			
Harvest / evapotranspire	26 to 27%	0%	32%	
Infiltrate / filter	9 to 11%	0%	0%	

5.1.4 DISCUSSION

The modelled scenario for the Cheltenham Structure Plan Area forecasts that resident and worker population growth could increase demand for potable water by 108% to 1,867 ML/year in 2041.

Introducing alternative water supply options such as rainwater tanks and recycled water could reduce this to 1,172 ML/year (a 31% increase in potable demand). This is based on the sizing of the rainwater tanks modelled for each development type to meet 90% of the non-potable water demand.

After maximising the use of rainwater tanks and stormwater harvesting to provide non-potable water, the demand for recycled water could be reduced to 73 ML/year. The majority (85%) of this would be for on-lot use with the remainder (15%) used to irrigate active open spaces.

The optimum reliance on rainwater or recycled water for non-potable demands would need to be considered when preparing the Cheltenham Structure Plan Area IWM Plan.

Opportunities for stormwater harvesting were identified at Lyle Anderson Reserve, Eddie Reserve and Wangara Road Golf Driving Range due to their proximity to a Melbourne Water drain. All other open spaces (and recommended new open spaces) could be supported by recycled water to reduce demand on the potable water supply and deliver on the urban greening and climate resilient vision for the Cheltenham Structure Plan Area and surrounds.

The ultimate development scenario in the Cheltenham Structure Plan Area MARV could increase marginally (10% to 1930 ML/year) unless measures are introduced to reduce this impact. The modelled scenario, MARV could be reduced by a third (to 1290 ML/year), mostly from the sizing of rainwater tanks with minor contributions from the passive irrigation of street trees and stormwater harvesting. Reducing the MARV can contribute to alleviating local flooding conditions and minimise the pressure on local drainage infrastructure during storm events.

Rainwater tanks and the passive irrigation of street trees will contribute to achieving quantitative performance objectives for urban stormwater for gross pollutants (litter) but other treatment options (such as stormwater wetlands at a regional scale or rain gardens at an individual lot scale) need to be considered to achieve the objectives for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN).

The stormwater harvesting target of 27%(see Table 5.4) could be achieved by implementing the identified IWM opportunities, but other options (such as permeable paving and rain gardens) will need to be considered to achieve the 11% infiltration target.

5.2 Clayton Structure Plan Area

5.2.1 SPATIAL CONTEXT

A breakdown of land types in the Clayton Structure Plan Area that informed the IWM assessment is provided in Table 5.5. A detailed breakdown of land use for the existing and ultimate development scenarios in the Structure Plan Area is provided in **Error! Reference source not found.**– Table A.3 and Table A.7.

The Clayton Structure Plan Area urban development types (ultimate development scenario) that form the basis of the IWM scenario assessment are shown in Figure 5.5. Rainwater tanks were modelled as an on-lot IWM opportunity for each urban development type (excluding Civic Areas). Modelled opportunities to irrigate active open space via stormwater harvesting or recycled water are identified.

The roads where passively irrigated street trees are feasible are shown in Figure 5.6.

How these IWM opportunities impact quantifiable metrics in the Clayton Structure Plan Area are described below.

TABLE 5.5 LAND TYPE BREAKDOWN – CLAYTON STRUCTURE PLAN AREA

LAND TYPE	AREA (HA)	PORTION OF STRUCTURE PLAN AREA
Lot – developable	267	71%
Lot – non-developable (Civic Areas)	19	5%
Roads	83	22%
Open space	8	2%

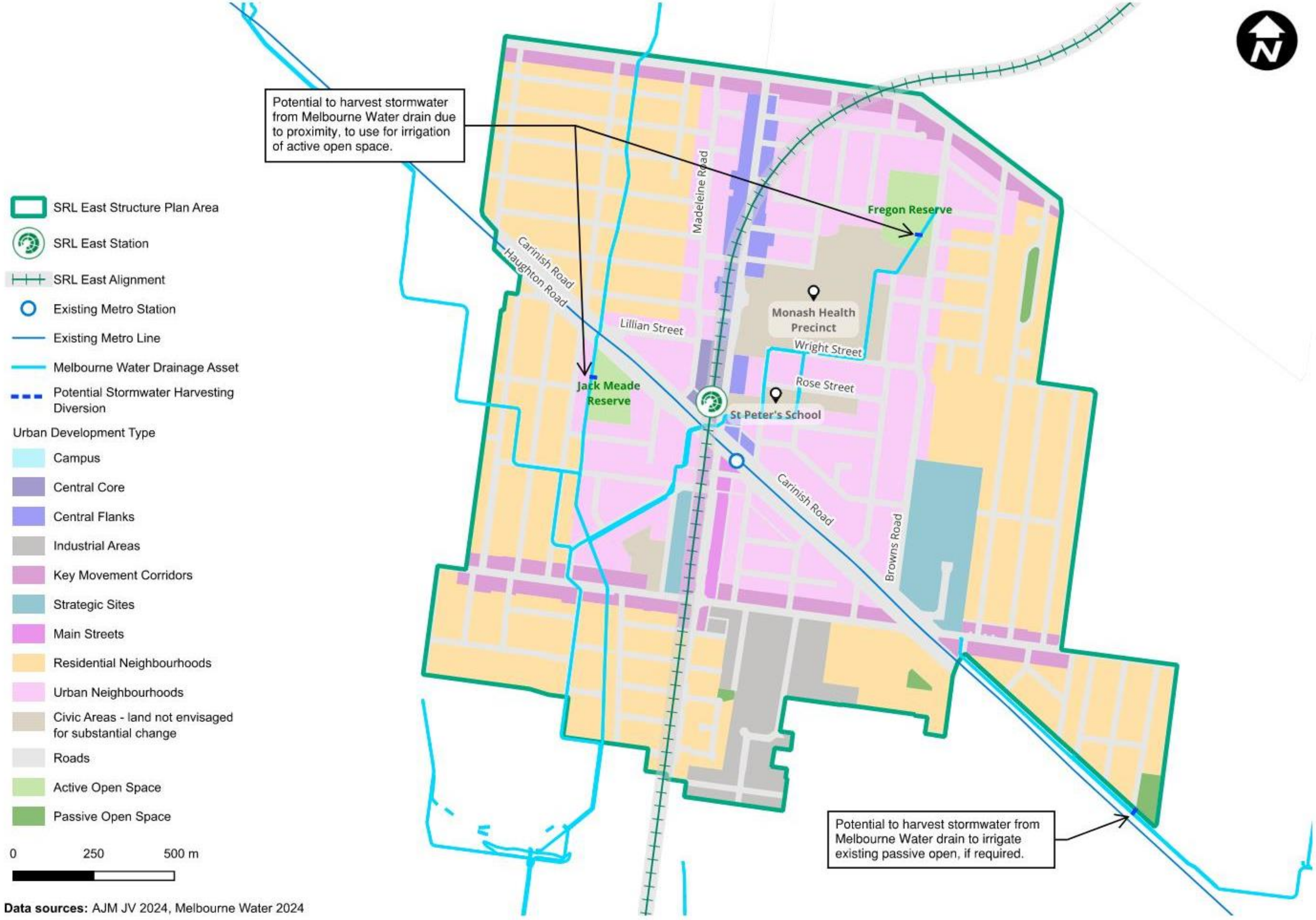


FIGURE 5.5 URBAN DEVELOPMENT TYPES AND OPEN SPACE IRRIGATION OPPORTUNITIES IN THE CLAYTON STRUCTURE PLAN AREA

FIGURE 5.6 ROADS WHERE PASSIVE IRRIGATION OF STREET TREES IS FEASIBLE IN THE CLAYTON STRUCTURE PLAN AREA

5.2.2 WATER BALANCE

5.2.2.1 Water supply assessment

Table 5.6 and Figure 5.7 show the water supply balance in the Clayton Structure Plan Area for the existing scenario and the ultimate development scenario, with and without IWM.

The following conclusions can be summarised from the water supply assessment:

- Potable water demand is expected to increase by 96% due to resident and worker population growth
- Alternative water supplies could reduce reliance on potable water by 36%:
  - Rainwater tanks could reduce reliance on potable water by 31%
  - Recycled water to top up rainwater tank supplies could reduce reliance on potable water by 4%
  - For projected growth in the Central Core urban development type, the modelled rainwater tanks will not meet 90% of the demand due to the significant demand this area represents for recycled water as a non-potable water source
  - Using alternative water (stormwater harvesting or recycled water) for irrigating active open spaces (Fregon Reserve, Jack Meade Reserve) could reduce reliance on potable water by 1%.
- First Street Reserve is located in proximity of a Melbourne Water drain and presents an opportunity to harvest stormwater to introduce irrigation to passive open spaces. There are additional passive open space areas that could be activated with stormwater from Council drains or recycled water if available in the Structure Plan Area. It is assumed that potable water is not currently used to irrigate these open spaces, so the water balance assessment has not quantified the opportunity.

TABLE 5.6 WATER SUPPLY BALANCE PER DEVELOPMENT SCENARIO – CLAYTON STRUCTURE PLAN AREA

WATER SUPPLY BALANCE	EXISTING (2021)		DEVELOPED (2041 – WITHOUT IWM)		DEVELOPED (2041 – WITH IWM)	
	(ML/YEAR)		(ML/YEAR)	(% CHANGE FROM EXISTING)	(ML/YEAR)	(% CHANGE FROM DEV CASE WITHOUT IWM)
Total water demand	1319		2451	86%	2451	**0%**
Potable water demand	1249		2451	96%	1572	**-36%**
	NON-POTABLE SOURCES	**(% OF TOTAL SUPPLY)**	**NON-POTABLE SOURCES**	**(% OF TOTAL SUPPLY)**	**NON-POTABLE SOURCES**	**(% OF TOTAL SUPPLY)**
Non-potable water demand	On-lot rainwater tanks	5%	On-lot rainwater tanks	0%	On-lot rainwater tanks	31%
					On-lot recycled water (top-up)	4%
					Stormwater harvesting for irrigation	1%
					Recycled water for irrigation	0%

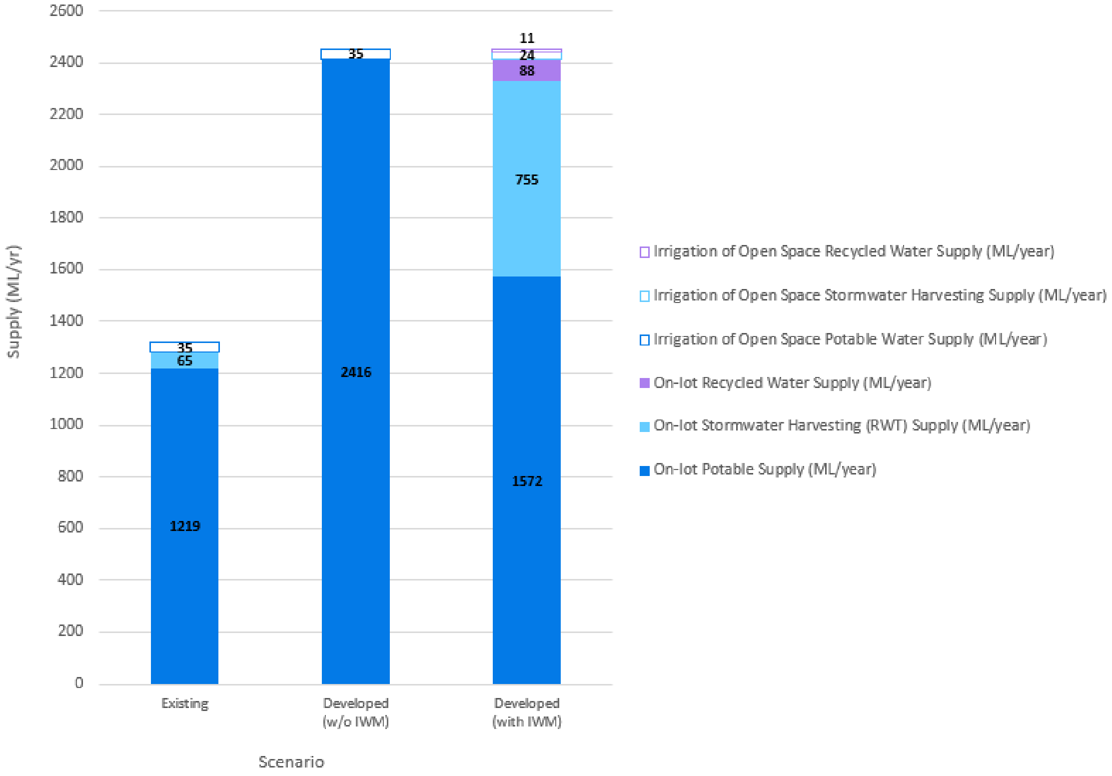


FIGURE 5.7 WATER SUPPLY BALANCE PER DEVELOPMENT SCENARIO – CLAYTON STRUCTURE PLAN AREA

5.2.2.2 Stormwater assessment

Table 5.7 and Figure 5.8 show the water balance for stormwater presented as mean annual runoff volume (MARV) for each scenario in the Clayton Structure Plan Area.

The following conclusions can be summarised from the stormwater assessment:

- MARV could increase by 13% with ultimate development in the Structure Plan Area
- IWM opportunities could reduce the MARV by 41% under the ultimate development scenario:
  - » Rainwater tanks could harvest 755 ML/year (38%)
  - » Passively irrigated street trees could evapotranspire 28 ML/year (1%)
  - » Stormwater harvesting to irrigate active open space could harvest 24 ML/year (1%).

TABLE 5.7 CATCHMENT WATER BALANCE PER DEVELOPMENT SCENARIO – CLAYTON STRUCTURE PLAN AREA

WATER BALANCE COMPONENTS	EXISTING (2021)	DEVELOPED (2041 – WITHOUT IWM)		DEVELOPED (2041 – WITH IWM)	
	ML/YEAR	ML/YEAR	% CHANGE FROM EXISTING (2021) SCENARIO	ML/YEAR	% CHANGE FROM DEVELOPED (2041 - WITHOUT IWM) SCENARIO
Mean annual runoff volume (MARV)	1756	1991	13%	1184	-41%
IWM OPPORTUNITIES				**ML/YEAR**	**% OF DEVELOPED (2041 – WITHOUT IWM) SCENARIO MARV***
On-lot rainwater tanks				-755	-38%
Street trees				-28	-1%
Stormwater harvesting to irrigate public open space (POS)				-24	-1%

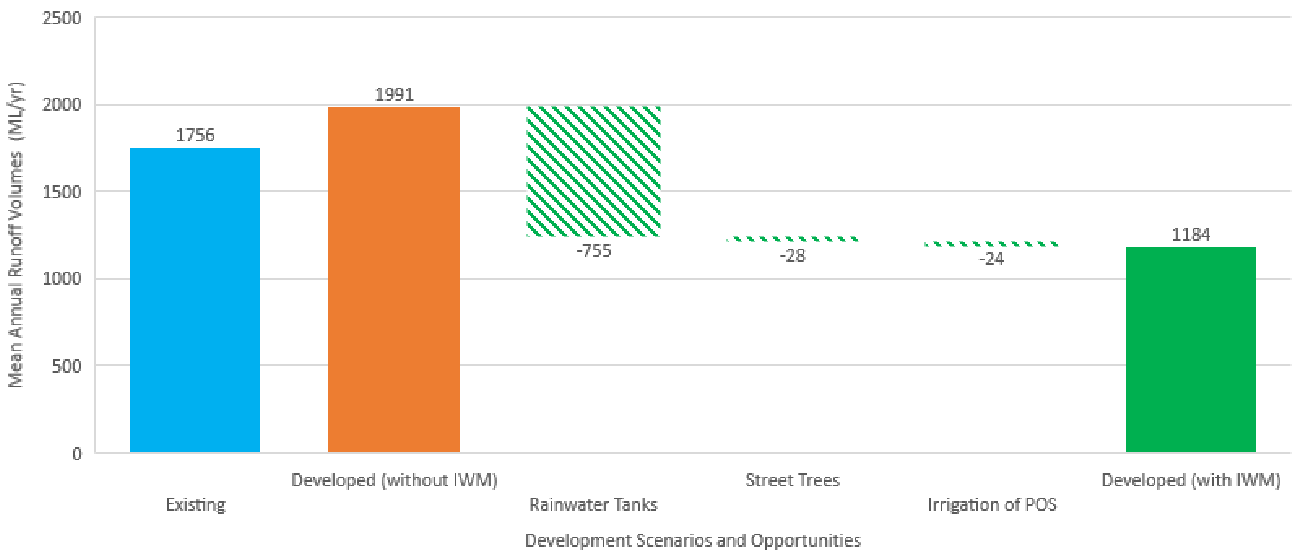


FIGURE 5.8 MEAN ANNUAL RUNOFF VOLUMES PER DEVELOPMENT SCENARIO AND THE IMPACTS OF IWM OPPORTUNITIES – CLAYTON STRUCTURE PLAN AREA

5.2.3 STORMWATER PERFORMANCE OBJECTIVES

The assessment of achieving the quantitative performance objectives for urban stormwater set in EPA Victoria Publication 1739.1 – *Urban stormwater management guidance* in the Clayton Structure Plan Area is provided in Table 5.8.

The following conclusions can be made from the assessment:

- Rainwater tanks will reduce mean annual pollutant loads by intercepting the runoff, and street trees will improve water quality through infiltration
- Rainwater tanks, with a minor contribution from street trees, will meet the volume harvesting / evapotranspiration quantitative performance objective for urban stormwater, with a 39% reduction in mean annual impervious runoff
- The combination of rainwater tanks and street trees could reduce total suspended solids (TSS) by 43%, total nitrogen (TN) by 41%, total phosphorus (TP) by 43% and gross pollutants by 76%. These potential reductions will not meet the current quantitative performance objectives for urban stormwater for TSS, TP and TN. More interventions will be required on-lot and across the Structure Plan Area.

TABLE 5.8 QUANTITATIVE PERFORMANCE OBJECTIVES FOR URBAN STORMWATER – CLAYTON STRUCTURE PLAN AREA

WATER QUALITY	TARGET	DEVELOPED (2041 – WITHOUT IWM)	DEVELOPED (2041 – WITH IWM)	
	(% REDUCTION IN MEAN ANNUAL LOAD)	(KG/YEAR)	(KG/YEAR)	(% REDUCTION IN MEAN ANNUAL LOAD)
Total suspended solids (TSS)	80%	287,805	165,155	43%
Total phosphorus (TP)	45%	633	373	41%
Total nitrogen (TN)	45%	4969	2818	43%
Gross pollutants (GP)	70%	79,400	19,378	76%
FLOW VOLUME	**TARGET**	**DEVELOPED (2041 – WITHOUT IWM)**	**DEVELOPED (2041 – WITH IWM)**	
	(% MEAN ANNUAL IMPERVIOUS RUNOFF)			
Harvest / evapotranspire	26 to 27%	0%	39%	
Infiltrate / filter	9 to 11%	0%	0%	

5.2.4 DISCUSSION

The modelled scenario for the Clayton Structure Plan Area forecasts that resident and worker population growth could increase demand for potable water by 96% to 2451 ML/year in 2041.

Introducing alternative water supply options such as rainwater tanks and recycled water could reduce this to 1572 ML/year (a 26% increase in potable demand). This is based on the sizing of the rainwater tanks modelled for each development type to meet 90% of the non-potable water demand, except for the Central Core.

After maximising the use of rainwater tanks and stormwater harvesting to provide non-potable water, the demand for recycled water could be reduced to 99 ML/year. The majority (89%) of this would be for on-lot use with the remainder (11%) used to irrigate active open spaces.

The optimum reliance on rainwater or recycled water for non-potable demands would need to be considered when preparing the Clayton Structure Plan Area IWM Plan.

Opportunities for stormwater harvesting were identified at Jack Meade Reserve, Frogon Reserve and First Street Reserve due to their proximity to a Melbourne Water drain. All other open spaces (and recommended new open spaces) could be supported by recycled water to further reduce the demand for potable water supply and deliver on the urban greening and climate resilient vision for the Clayton Structure Plan Area.

At ultimate development of the Clayton Structure Plan Area, MARV could increase marginally (13% to 1991 ML/year) unless measures are introduced to reduce this impact. The modelled scenario, MARV could be reduced by almost half (to 1184 ML/year), mostly from the sizing of rainwater tanks and with minor contributions from the passive irrigation of street trees and stormwater harvesting. Reducing the MARV could contribute to alleviating local flooding conditions and minimise the pressure on local drainage infrastructure during storm events.

Rainwater tanks and the passive irrigation of street trees will contribute to the quantitative performance objectives for urban stormwater for gross pollutants (litter) but other treatment options (such as stormwater wetlands at a regional scale or rain gardens at an individual lot scale) may need to be considered to achieve the objectives for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN).

The stormwater harvesting target of 27% (see Table 5.8) could be achieved by implementing the identified IWM opportunities but other options (such as permeable paving and rain gardens) will need to be considered to achieve the 11% infiltration target.

5.3 Monash Structure Plan Area

5.3.1 SPATIAL CONTEXT

A breakdown of land types in the Monash Structure Plan that informed the IWM assessment is provided in Table 5.9. A detailed breakdown of land use for the existing and ultimate development scenarios in the Structure Plan Area is provided in **Error! Reference source not found.**– Table A.3 and Table A.7.

The Monash Structure Plan Area urban development types (ultimate development) that form the basis of the IWM scenario assessment are shown in Figure 5.9. Rainwater tanks were modelled as an on-lot IWM opportunity for each urban development type (excluding Civic Areas). Opportunities to irrigate active open space via stormwater harvesting or recycled water are identified.

The roads where passively irrigated street trees are feasible are shown in Figure 5.10.

How these IWM opportunities impact quantifiable metrics in the Monash Structure Plan Area are described below.

TABLE 5.9 LAND TYPE BREAKDOWN – MONASH STRUCTURE PLAN AREA

LAND TYPE	AREA (HA)	PORTION OF STRUCTURE PLAN AREA
Lot – developable	264	58%
Lot – non-developable (Civic Areas)	123	27%
Roads	62	14%
Open space	5	1%

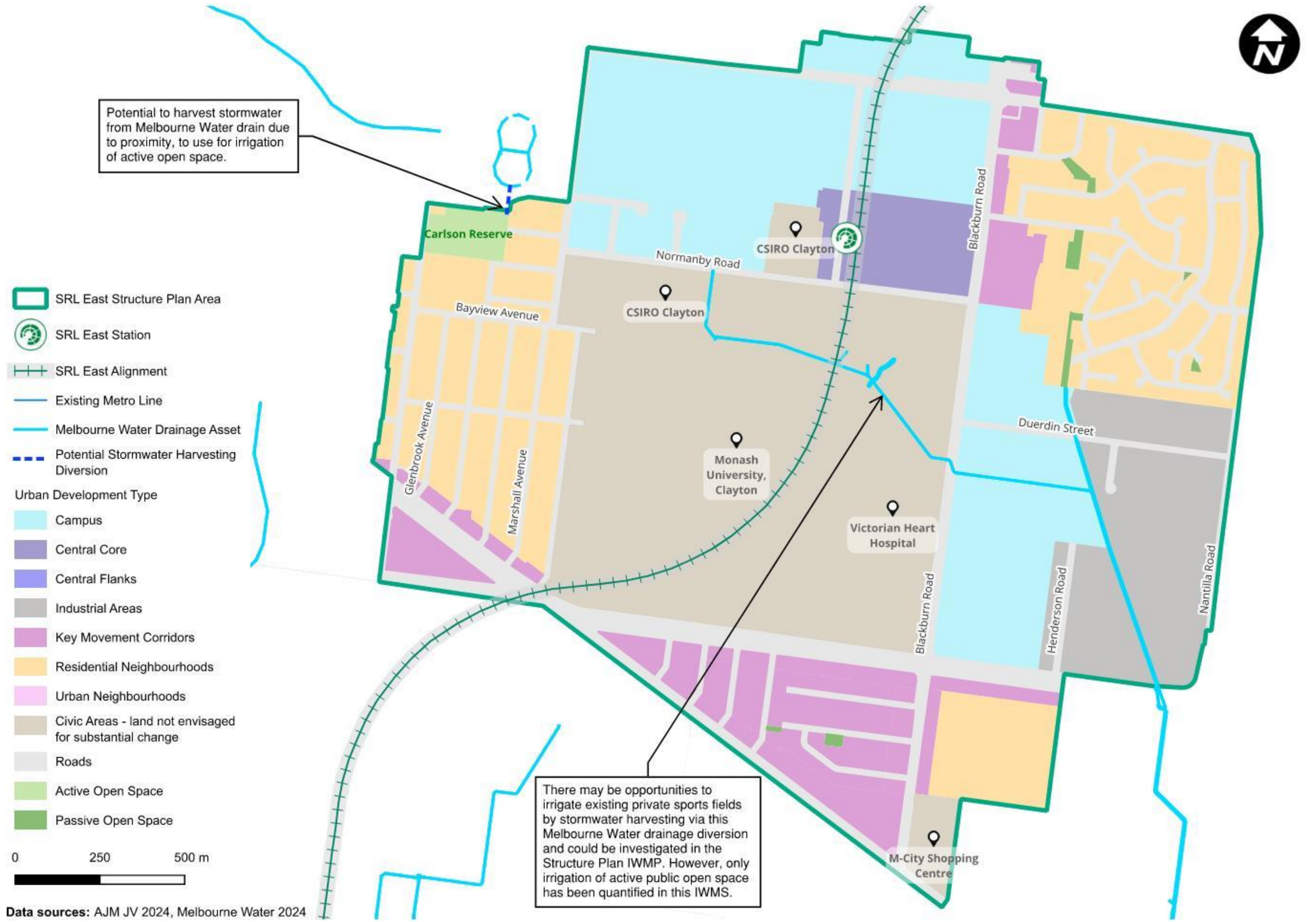


FIGURE 5.9 URBAN DEVELOPMENT TYPES AND OPEN SPACE IRRIGATION OPPORTUNITIES IN THE MONASH STRUCTURE PLAN AREA

FIGURE 5.10 ROADS WHERE PASSIVE IRRIGATION OF STREET TREES IS FEASIBLE IN THE MONASH STRUCTURE PLAN AREA

5.3.2 WATER BALANCE

5.3.2.1 Water supply assessment

Table 5.10 and Figure 5.11 show the water supply balance in the Monash Structure Plan Area for the existing scenario and the ultimate development scenario, with and without IWM.

The following conclusions can be summarised from the water supply assessment:

- Potable water demand is expected to increase by 95% due to resident and worker population growth
- Alternative water supplies could reduce reliance on potable water by 31%:
  - Rainwater tanks could reduce reliance on potable water by 25%
  - Recycled water to top up rainwater tank supplies could reduce reliance on potable water by 5%
  - For projected growth in the Central Core urban development type, the modelled rainwater tanks will not meet 90% of the demand due to the significant demand in this area for recycled water as a non-potable water source
  - Using alternative water (stormwater harvesting or recycled water) for irrigating active open space (Carlston Avenue Reserve) could reduce reliance on potable water by 1%
- There is opportunity to harvest stormwater from a Melbourne Water drain to irrigate passive open spaces in Monash University campus. The water balance has not made assumptions on the water use of Monash University as a 'Civic Areas', so the opportunity to reduce the amount of potable water to irrigate is not quantified.
- Additional passive open space areas exist in the in the Structure Plan Area that could be activated with stormwater from Council drains or recycled water if available.

TABLE 5.10 WATER SUPPLY BALANCE PER DEVELOPMENT SCENARIO – MONASH STRUCTURE PLAN AREA

WATER SUPPLY BALANCE	EXISTING (2021)		DEVELOPED (2041 – WITHOUT IWM)		DEVELOPED (2041 – WITH IWM)	
	(ML/YEAR)		(ML/YEAR)	(% CHANGE FROM EXISTING)	(ML/YEAR)	(% CHANGE FROM DEV CASE WITHOUT IWM)
Total water demand	1226		2298	87%	2298	**0%**
Potable water demand	1177		2298	95%	1587	**-31%**
	NON-POTABLE SOURCES	**(% OF TOTAL SUPPLY)**	**NON-POTABLE SOURCES**	**(% OF TOTAL SUPPLY)**	**NON-POTABLE SOURCES**	**(% OF TOTAL SUPPLY)**
Non-potable water demand	On-lot rainwater tanks	4%	On-lot rainwater tanks	0%	On-lot rainwater tanks	**25%**
					On-lot recycled water (top-up)	**5%**
					Stormwater harvesting for irrigation	**1%**
					Recycled water for irrigation	**0%**

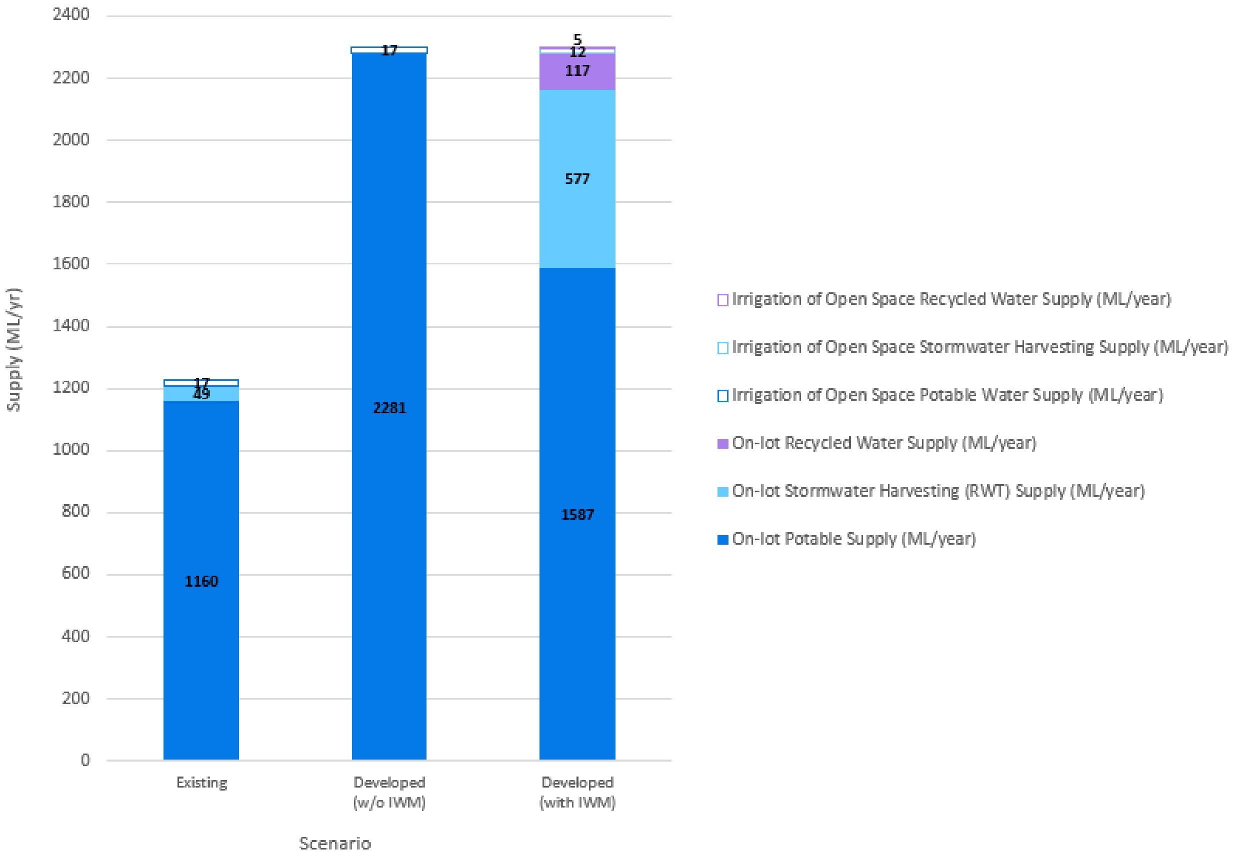


FIGURE 5.11 WATER SUPPLY BALANCE PER DEVELOPMENT SCENARIO – MONASH STRUCTURE PLAN AREA

5.3.2.2 Stormwater assessment

Table 5.11 and Figure 5.12 show the water balance for stormwater presented as mean annual runoff volume (MARV) for each scenario in the Monash Structure Plan Area.

The following conclusions can be summarised from the stormwater assessment:

- MARV could increase by 11% under the ultimate development scenario without IWM initiatives
- IWM opportunities modelled could reduce the MARV by 27% under the ultimate development scenario:
  - » Rainwater tanks will harvest 589 ML/year (26%)
  - » Passively irrigated street trees will evapotranspire 15 ML/year (1%)
  - » Stormwater harvesting to irrigate active open space will harvest 12 ML/year (1%).

TABLE 5.11 MONASH CATCHMENT WATER BALANCE PER DEVELOPMENT SCENARIO

WATER BALANCE COMPONENTS	EXISTING (2021)	DEVELOPED (2041 – WITHOUT IWM)		DEVELOPED (2041 – WITH IWM)	
	ML/YEAR	ML/YEAR	% CHANGE FROM EXISTING (2021) SCENARIO	ML/YEAR	% CHANGE FROM DEVELOPED (2041 - WITHOUT IWM) SCENARIO
Mean annual runoff volume (MARV)	2052	2286	11%	1671	-27%
IWM OPPORTUNITIES				**ML/YEAR**	**% OF DEVELOPED (2041 – WITHOUT IWM) SCENARIO MARV***
On-lot rainwater tanks				-589	-26%
Street trees				-15	-1%
Stormwater harvesting to irrigate public open space (POS)				-12	-1%

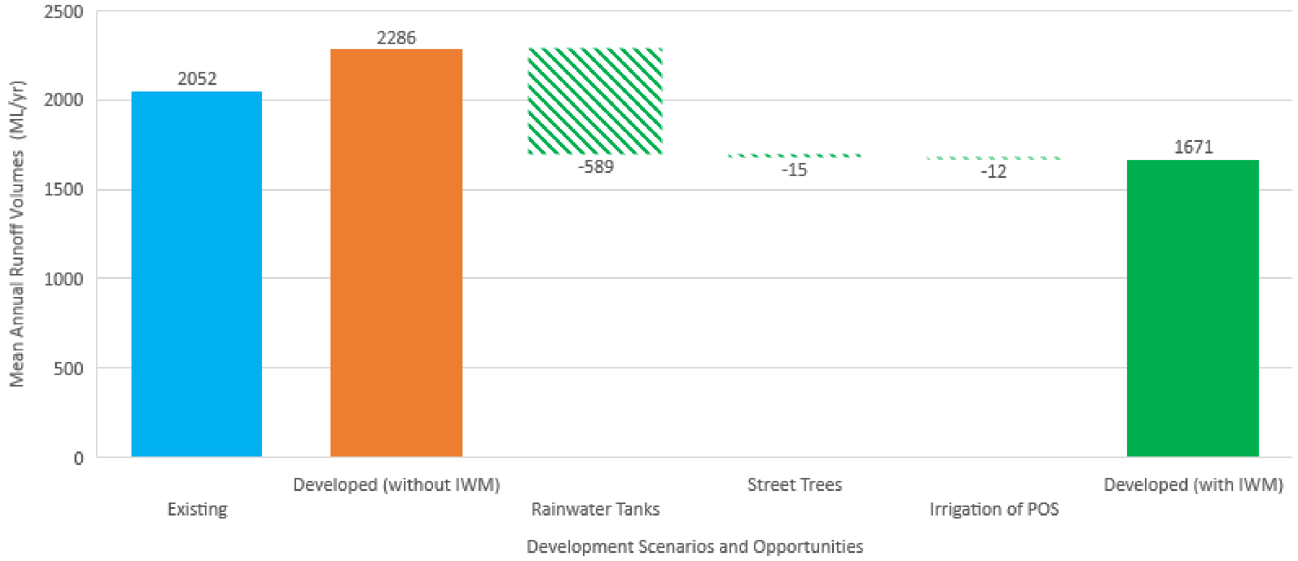


FIGURE 5.12 MEAN ANNUAL RUNOFF VOLUMES PER DEVELOPMENT SCENARIO AND THE IMPACTS OF IWM OPPORTUNITIES – MONASH STRUCTURE PLAN AREA

5.3.3 STORMWATER PERFORMANCE OBJECTIVES

The assessment of achieving the quantitative performance objectives for urban stormwater set in EPA Victoria Publication 1739.1 – *Urban stormwater management guidance* in the Monash Structure Plan Area is provided in Table 5.12.

The following conclusions can be made from the stormwater assessment:

- Rainwater tanks will reduce mean annual pollutant loads by intercepting the runoff, and street trees will improve water quality through infiltration
- Rainwater tanks, with a minor contribution from street trees, will meet the volume harvesting / evapotranspiration quantitative performance objective for urban stormwater, with a 26% reduction in mean annual impervious runoff
- The combination of rainwater tanks and street trees could reduce total suspended solids (TSS) by 21%, total nitrogen (TN) by 22%, total phosphorus (TP) by 27% and gross pollutants by 60%. These potential reductions will not meet the current quantitative performance objective for urban stormwater for TSS, TP and TN. More interventions will be required on-lot and across the Structure Plan Area.

TABLE 5.12 QUANTITATIVE PERFORMANCE OBJECTIVES FOR URBAN STORMWATER – MONASH STRUCTURE PLAN AREA

WATER QUALITY	TARGET	DEVELOPED (2041 – WITHOUT IWM)	DEVELOPED (2041 – WITH IWM)	
	(% REDUCTION IN MEAN ANNUAL LOAD)	(KG/YEAR)	(KG/YEAR)	(% REDUCTION IN MEAN ANNUAL LOAD)
Total suspended solids (TSS)	80%	334,839	263,127	21%
Total phosphorus (TP)	45%	743	576	22%
Total nitrogen (TN)	45%	5889	4312	27%
Gross pollutants (GP)	70%	90,352	35,957	60%
FLOW VOLUME	**TARGET**	**DEVELOPED (2041 – WITHOUT IWM)**	**DEVELOPED (2041 – WITH IWM)**	
	(% MEAN ANNUAL IMPERVIOUS RUNOFF)			
Harvest / evapotranspire	26 to 27%	0%	26%	
Infiltrate / filter	9 to 11%	0%	0%	

5.3.4 DISCUSSION

The modelled scenario for the Monash Structure Plan Area forecasts that resident and worker population growth could increase demand for potable water by 95% to 2298 ML/year in 2041.

Introducing alternative water supply options such as rainwater tanks and recycled water could reduce this to 1587 ML/year (a 35% increase in potable demand). This is based on the sizing of the rainwater tanks modelled for each development type to meet 90% of the non-potable water demand.

After maximising the use of rainwater tanks and stormwater harvesting to provide non-potable water, the demand for recycled water could be reduced to 122 ML/year. The majority (96%) would be for on-lot use with the remainder (4%) used to irrigate active open space.

The optimum reliance on rainwater or recycled water for non-potable demands would need to be considered when preparing the Monash Structure Plan IWM Plan.

Opportunities for stormwater harvesting were identified at Carlston Reserve and Monash University due to their proximity to a Melbourne Water drain. All other open spaces (and recommended new open spaces) could be supported by recycled water to further reduce the demand for potable water supply and deliver on the urban greening and climate resilient vision for the Monash Structure Plan Area and surrounds.

At ultimate development of the Monash Structure Plan Area, MARV could increase marginally (11% to 2286 ML/year) but this could also be reduced by almost a third (to 1671 ML/year) mostly from the sizing of rainwater tanks with minor contributions from the passive irrigation of street trees and stormwater harvesting. Reducing the MARV could contribute to alleviating local flooding conditions and minimise the pressure on local drainage infrastructure during storm events.

Rainwater tanks and passive irrigation of street trees will contribute to pollutants load reductions but do not achieve the quantitative performance objectives for urban stormwater for all water quality indicators. Gross pollutant traps could be investigated to reduce gross pollutant loads (litter) but other treatment options (such as stormwater wetlands at a regional scale or raingarden at an individual lot scale) may need to be considered to achieve the water quality objectives for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN).

The stormwater harvesting target of 27% (see Table 5.12) could be achieved by implementing the identified IWM opportunities but other options (such as permeable paving) will need to be considered to achieve the 11% infiltration target.

5.4 Glen Waverley Structure Plan Area

5.4.1 SPATIAL CONTEXT

A breakdown of land types in the Glen Waverley Structure Plan Area that informed the IWM assessment is provided in Table 5.13. A detailed breakdown of land use for the existing and ultimate development scenarios in the Structure Plan Area is provided in **Error! Reference source not found.**– Table A.3 and Table A.7.

The Glen Waverley Structure Plan Area urban development types (ultimate development) that form the basis of the IWM scenario assessment are shown in Figure 5.13. Rainwater tanks were modelled as an on-lot IWM opportunity for each urban development type (excluding Civic Areas).

The roads where passively irrigated street trees are feasible are shown in Figure 5.14.

How these IWM opportunities impact quantifiable metrics in the Glen Waverley Structure Plan Area are described below.

TABLE 5.13 LAND TYPE BREAKDOWN – GLEN WAVERLEY STRUCTURE PLAN AREA

LAND TYPE	AREA (HA)	PORTION OF STRUCTURE PLAN AREA
Lot – developable	175	72%
Lot – non-developable (Civic Areas)	16	6%
Roads	48	20%
Open space	5	2%

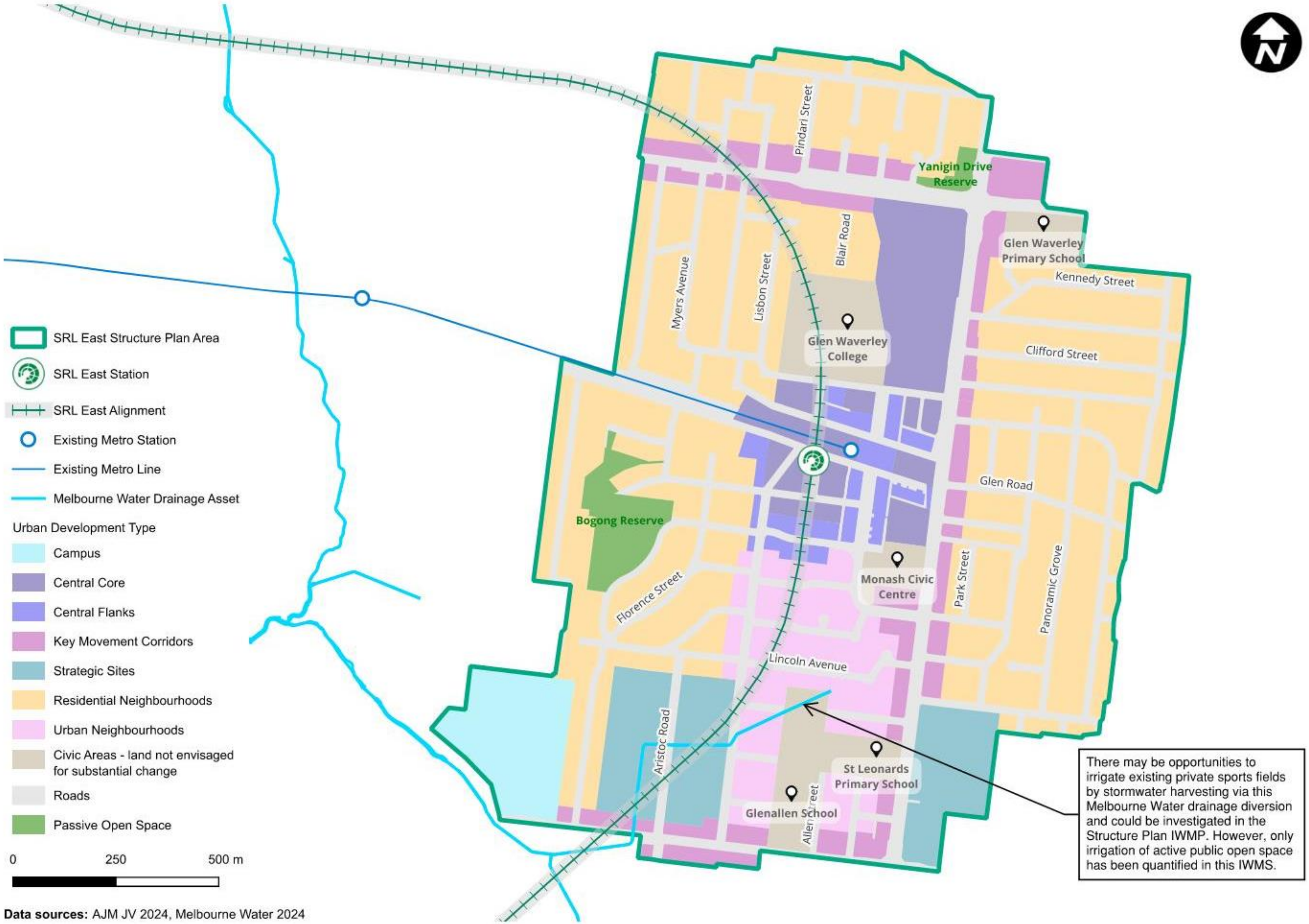


FIGURE 5.13 URBAN DEVELOPMENT TYPES AND OPEN SPACE IRRIGATION OPPORTUNITIES IN THE GLEN WAVERLEY STRUCTURE PLAN AREA

FIGURE 5.14 ROADS WHERE THE PASSIVE IRRIGATION OF STREET TREES IS FEASIBLE IN THE GLEN WAVERLEY STRUCTURE PLAN AREA

5.4.2 WATER BALANCE

5.4.2.1 Water supply assessment

Table 5.14 and Figure 5.15 show the water supply balance in the Glen Waverley Structure Plan Area for the existing scenario and the ultimate development scenario, with and without IWM.

The following conclusions can be summarised from the water supply assessment:

- Potable water demand is expected to increase by 68% due to resident and worker population growth
- Alternative water supplies could reduce reliance on potable water by 36% through the following opportunities:
  - » Rainwater tanks could reduce reliance on potable water by 33%
  - » Recycled water to top up rainwater tank supplies could reduce reliance on potable water by 3%
- There are no active space opportunities in the Glen Waverley Structure Plan Area to use alternative water (stormwater harvesting or recycled water).
- There are passive open space areas that could be activated with stormwater from Council drains or recycled water if available in the Structure Plan Area.

TABLE 5.14 WATER SUPPLY BALANCE PER DEVELOPMENT SCENARIO – GLEN WAVERLEY STRUCTURE PLAN AREA

<table>
<tr><th rowspan="2">WATER SUPPLY BALANCE</th><th colspan="2">EXISTING (2021)</th><th colspan="2">DEVELOPED (2041 – WITHOUT IWM)</th><th colspan="2">DEVELOPED (2041 – WITH IWM)</th></tr>
<tr><th colspan="2">(ML/YEAR)</th><th>(ML/YEAR)</th><th>(% CHANGE FROM EXISTING)</th><th>(ML/YEAR)</th><th>(% CHANGE FROM DEV CASE WITHOUT IWM)</th></tr>
<tr><td>Total water demand</td><td colspan="2">676</td><td>1076</td><td>59%</td><td>1076</td><td>0%</td></tr>
<tr><td>Potable water demand</td><td colspan="2">641</td><td>1076</td><td>68%</td><td>684</td><td>-36%</td></tr>
<tr><th></th><th>NON-POTABLE SOURCES</th><th>(% OF TOTAL SUPPLY)</th><th>NON-POTABLE SOURCES</th><th>(% OF TOTAL SUPPLY)</th><th>NON-POTABLE SOURCES</th><th>(% OF TOTAL SUPPLY)</th></tr>
<tr><td rowspan="4">Non-potable water demand</td><td rowspan="4">On-lot rainwater tanks</td><td rowspan="4">5%</td><td rowspan="4">On-lot rainwater tanks</td><td rowspan="4">0%</td><td>On-lot rainwater tanks</td><td>33%</td></tr>
<tr><td>On-lot recycled water (top-up)</td><td>3%</td></tr>
<tr><td>Stormwater harvesting for irrigation</td><td>0%</td></tr>
<tr><td>Recycled water for irrigation</td><td>0%</td></tr>
</table>

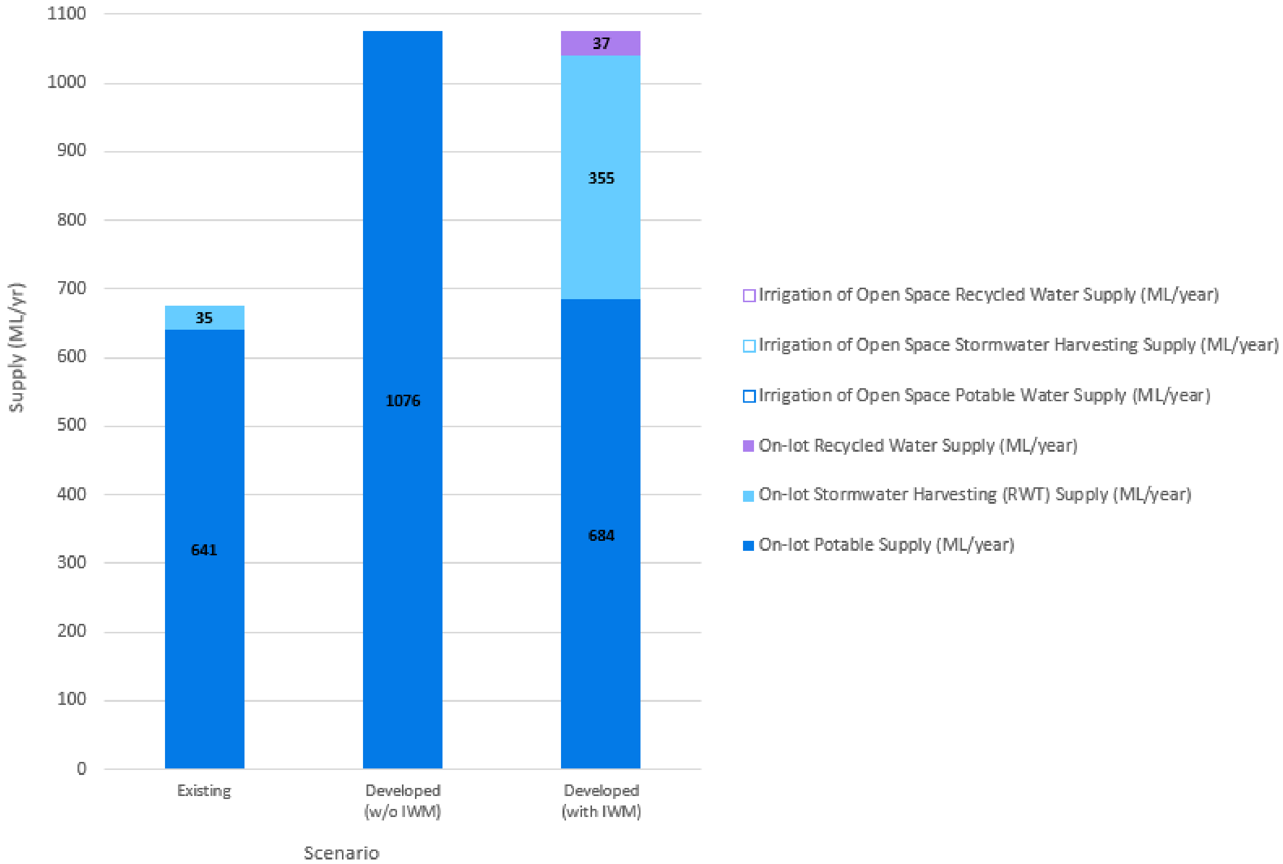


FIGURE 5.15 WATER SUPPLY BALANCE PER DEVELOPMENT SCENARIO – GLEN WAVERLEY STRUCTURE PLAN AREA

5.4.2.2 Stormwater assessment

Table 5.15 and Figure 5.16 show the water balance for stormwater presented as mean annual runoff volume (MARV) for each scenario in the Glen Waverley Structure Plan Area.

The following conclusions can be summarised from the stormwater assessment:

- MARV could increase by 10% under the ultimate development scenario without IWM initiatives
- IWM opportunities modelled could reduce the MARV by 29% under the ultimate development scenario:
  - Rainwater tanks will harvest 355 ML/year (28%)
  - Passively irrigated street trees will evapotranspire 17 ML/year (1%)
  - There are no opportunities in the Glen Waverley Structure Plan Area for stormwater harvesting to irrigate active open space.

TABLE 5.15 CATCHMENT WATER BALANCE PER DEVELOPMENT SCENARIO – GLEN WAVERLEY STRUCTURE PLAN AREA

WATER BALANCE COMPONENTS	EXISTING (2021)	DEVELOPED (2041 – WITHOUT IWM)		DEVELOPED (2041 – WITH IWM)	
	ML/YEAR	ML/YEAR	% CHANGE FROM EXISTING (2021) SCENARIO	ML/YEAR	% CHANGE FROM DEVELOPED (2041 – WITHOUT IWM) SCENARIO
Mean annual runoff volume (MARV)	1,152	1,271	10%	899	-29%
IWM OPPORTUNITIES				**ML/YEAR**	**% OF DEVELOPED (2041 - WITHOUT IWM) SCENARIO MARV**
On-lot rainwater tanks				-355	-28%
Street trees				-17	-1%
Stormwater harvesting to irrigate public open space (POS)				0	0%

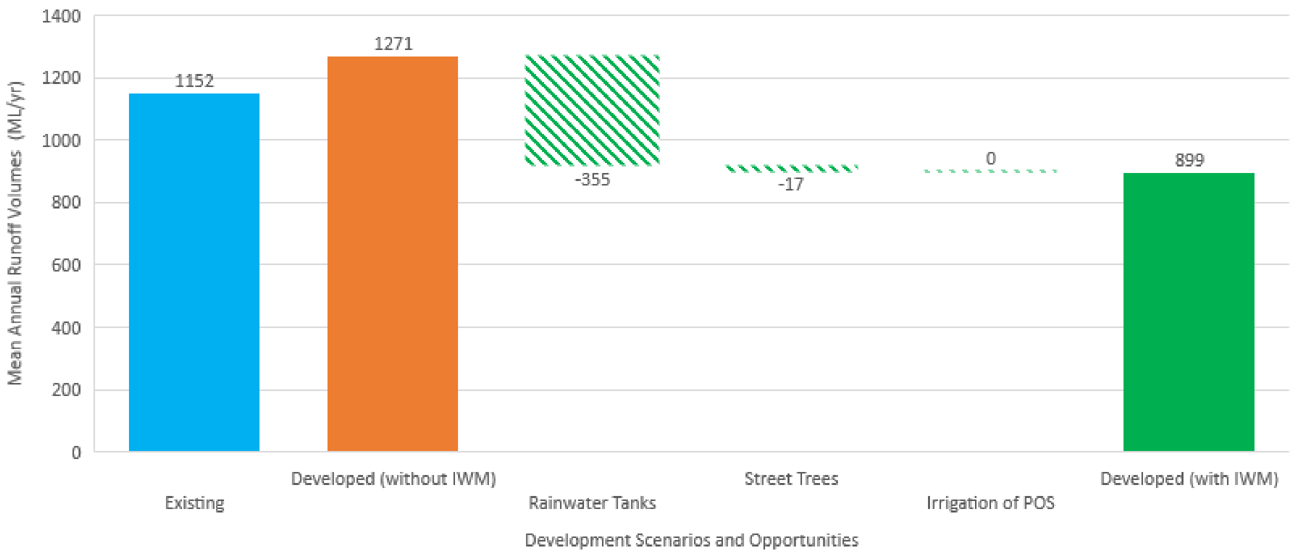


FIGURE 5.16 MEAN ANNUAL RUNOFF VOLUMES PER DEVELOPMENT SCENARIO AND THE IMPACTS OF IWM OPPORTUNITIES – GLEN WAVERLEY STRUCTURE PLAN AREA

5.4.3 STORMWATER PERFORMANCE OBJECTIVES

The assessment of achieving the quantitative performance objectives for urban stormwater set in EPA Victoria Publication 1739.1 – *Urban stormwater management guidance* in the Glen Waverley Structure Plan Area is provided in Table 5.16.

The following conclusions can be made from the assessment:

- Rainwater tanks will reduce mean annual pollutant loads by intercepting the runoff, and street trees will improve water quality through infiltration

- Rainwater tanks, with a minor contribution from street trees, will meet the volume harvesting / evapotranspiration quantitative performance objective for urban stormwater, with a 29% reduction in mean annual impervious runoff
- The combination of rainwater tanks and street trees could reduce total suspended solids (TSS) by 41%, total nitrogen (TN) by 36%, total phosphorus (TP) by 34% and gross pollutants by 77%. These potential reductions will not meet the current quantitative performance objectives for urban stormwater for TSS, TP and TN. More interventions will be required on-lot and across the Structure Plan Area.

TABLE 5.16 QUANTITATIVE PERFORMANCE OBJECTIVES FOR URBAN STORMWATER – GLEN WAVERLEY STRUCTURE PLAN AREA

WATER QUALITY	TARGET	DEVELOPED (2041 – WITHOUT IWM)	DEVELOPED (2041 – WITH IWM)	
	(% REDUCTION IN MEAN ANNUAL LOAD)	(KG/YEAR)	(KG/YEAR)	(% REDUCTION IN MEAN ANNUAL LOAD)
Total suspended solids (TSS)	80%	178,099	105,875	**41%**
Total phosphorus (TP)	45%	398	255	**36%**
Total nitrogen (TN)	45%	3194	2113	**34%**
Gross pollutants (GP)	70%	50,562	11,610	**77%**
FLOW VOLUME	**TARGET**	**DEVELOPED (2041 - WITHOUT IWM)**	**DEVELOPED (2041 - WITH IWM)**	
	(% MEAN ANNUAL IMPERVIOUS RUNOFF)			
Harvest / evapotranspire	26 to 27%	0%	**29%**	
Infiltrate / filter	9 to 11%	0%	**0%**	

5.4.4 DISCUSSION

The modelled scenario for the Glen Waverley Structure Plan Area forecasts that resident and worker population growth could increase demand for potable water by 68% to 1076 ML/year in 2041.

Introducing alternative water supply options such as rainwater tanks and recycled water could reduce this to 684 ML/year (a 7% increase in potable demand). This is based on the sizing of the rainwater tanks modelled for each development type to meet 90% of the non-potable water demand.

After maximising the use of rainwater tanks and stormwater harvesting to provide non-potable water, the demand for recycled water could be reduced to 37 ML/year.

The optimum reliance on rainwater or recycled water for non-potable demands would need to be considered when preparing the Glen Waverley Structure Plan IWM Plan.

All open spaces (and recommended new open spaces) could be supported by recycled water to further reduce the demand for potable water supply and deliver on the urban greening and climate resilient vision for the Glen Waverley Structure Plan Area.

At ultimate development of the Structure Plan Area, MARV could increase by 10% to 1271 ML/year, but this could be reduced by almost a third (to 899 ML/year) with rainwater tanks and minor contributions from the passive irrigation of street trees. Reducing the MARV could contribute to alleviating local flooding conditions and minimise the pressure on local drainage infrastructure during storm events.

Rainwater tanks and the passive irrigation of street trees will contribute to pollutants load reductions but do not achieve the quantitative performance objectives for urban stormwater for all water quality indicators. Gross pollutant traps could be investigated to reduce gross pollutant loads (litter) but other treatment options (such as stormwater wetlands at a regional scale or rain gardens at an individual lot scale) may need to be considered to achieve the water quality objectives for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN).

The stormwater harvesting target of 27% (see Table 5.16) could be achieved by implementing the identified IWM opportunities but other options (such as permeable paving and rain gardens) will need to be considered to achieve the 11% infiltration target.

5.5 Burwood Structure Plan Area

5.5.1 SPATIAL CONTEXT

A breakdown of land types in the Burwood Structure Plan Area that informed the IWM assessment is provided in Table 5.17. A detailed breakdown of land use for the existing and ultimate development scenarios in the Structure Plan Area is provided in **Error! Reference source not found.**– Table A.3 and Table A.7.

The Burwood Structure Plan Area urban development types (ultimate development) that form the basis of the IWM scenario assessment are shown in Figure 5.17. Rainwater tanks were modelled as an on-lot IWM opportunity for each urban development type (excluding Civic Areas). Opportunities to irrigate active open space via recycled water are identified.

The roads where passively irrigated street trees are feasible are shown in Figure 5.18.

How these IWM opportunities impact quantifiable metrics in the Burwood Structure Plan Area are described below.

TABLE 5.17 LAND TYPE BREAKDOWN – BURWOOD STRUCTURE PLAN AREA

LAND TYPE	AREA (HA)	PORTION OF STRUCTURE PLAN AREA
Lot – developable	172	65%
Lot – non-developable (Civic Areas)	15	6%
Roads	45	17%
Open space	31	12%

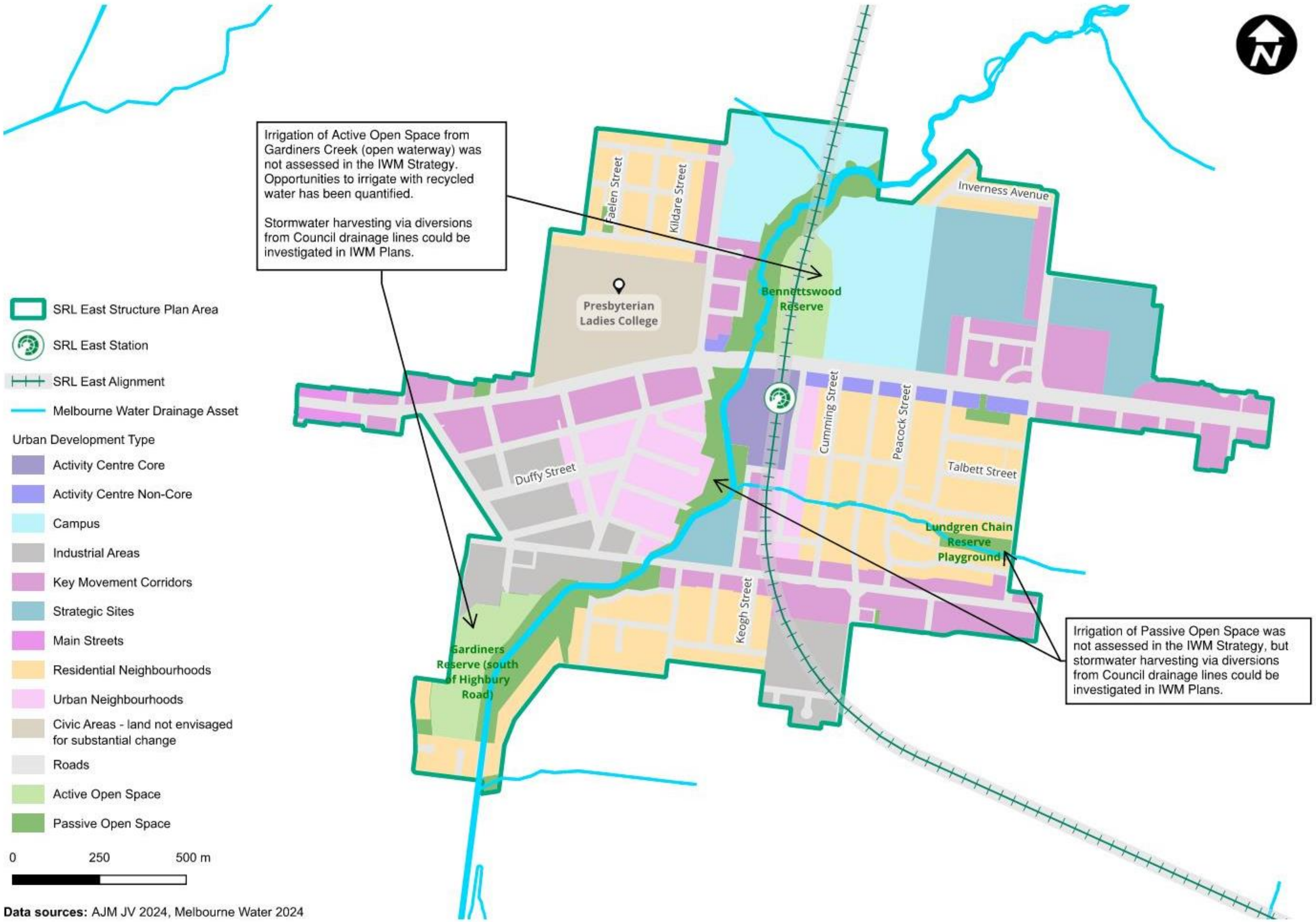


FIGURE 5.17 URBAN DEVELOPMENT TYPES AND OPEN SPACE IRRIGATION OPPORTUNITIES IN THE BURWOOD STRUCTURE PLAN AREA

FIGURE 5.18 ROADS WHERE PASSIVELY IRRIGATED STREET TREES ARE FEASIBLE IN THE BURWOOD STRUCTURE PLAN AREA

5.5.2 WATER BALANCE

5.5.2.1 Water supply assessment

Table 5.18 and Figure 5.19 show the water supply balance for each scenario in the Burwood Structure Plan Area.

The following conclusions can be summarised from the assessment:

- Potable water demand is expected to increase by 94% due to resident and worker population growth
- Alternative water supplies could reduce the reliance on potable water by 41%:
  - » Rainwater tanks could reduce reliance on potable water by 32%
  - » Recycled water to top up rainwater tank supplies could further reduce reliance on potable water by 3%
  - » There are no opportunities in the Burwood Structure Plan Area for stormwater harvesting (via diverting water from Melbourne Water drainage lines) to irrigate active open space. Active open spaces at Bennettswood Reserve and Gardiners Reserve (south of Highbury Road) could be met using recycled water, which could further reduce reliance on potable water by 5%. The estimated demand to irrigate these spaces with a recycled water supply is 62 ML/year.
- There are additional passive open space areas that could be activated with stormwater from Council drains or recycled water if available in the Structure Plan Area.

TABLE 5.18 BURWOOD WATER SUPPLY BALANCE PER DEVELOPMENT SCENARIO

WATER SUPPLY BALANCE	EXISTING (2021)		DEVELOPED (2041 - WITHOUT IWM)		DEVELOPED (2041 - WITH IWM)	
	(ML/YEAR)		(ML/YEAR)	(% CHANGE FROM EXISTING)	(ML/YEAR)	(% CHANGE FROM DEV CASE WITHOUT IWM)
Total water demand	652		1212	86%	1212	**0%**
Potable water demand	626		1212	94%	719	**-41%**
	NON-POTABLE SOURCES	(% OF TOTAL SUPPLY)	NON-POTABLE SOURCES	(% OF TOTAL SUPPLY)	NON-POTABLE SOURCES	(% OF TOTAL SUPPLY)*
Non-potable water demand	On-lot rainwater tanks	5%	On-lot rainwater tanks	0%	On-lot rainwater tanks	32%
					On-lot recycled water (top-up)	3%
					Stormwater harvesting for irrigation	0%
					Recycled water for irrigation	5%

*Percentages are presented to the nearest whole number

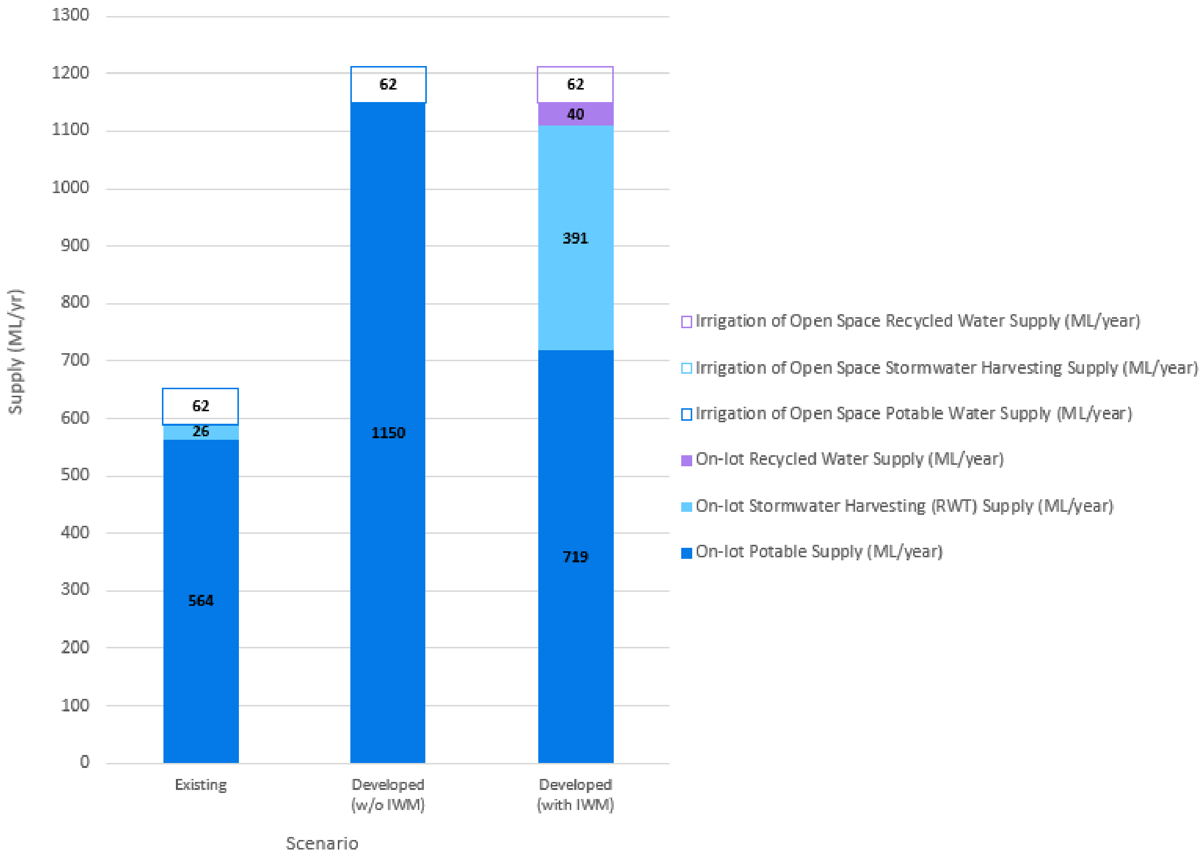


FIGURE 5.19 WATER SUPPLY BALANCE PER DEVELOPMENT SCENARIO – BURWOOD STRUCTURE PLAN AREA

5.5.2.2 Stormwater assessment

Table 5.19 and Figure 5.20 shows the water balance for stormwater presented as MARV for each scenario in the Burwood Structure Plan Area.

The following conclusions can be summarised from the assessment:

- MARV could increase by 10% with ultimate development in the Burwood Structure Plan Area without IWM initiatives.
- IWM opportunities modelled could reduce the MARV by 33% under the ultimate development scenario with the following contributions:
  - » Rainwater tanks could harvest 391 ML/year (32%)
  - » Passively irrigated street trees could evapotranspire 13 ML/year (1%)
  - » There are no opportunities in the Burwood Structure Plan Area for stormwater harvesting (via diverting water from Melbourne Water drainage lines) to irrigate active open space.

TABLE 5.19 CATCHMENT WATER BALANCE PER DEVELOPMENT SCENARIO – BURWOOD STRUCTURE PLAN AREA

WATER BALANCE COMPONENTS	EXISTING (2021)	DEVELOPED (2041 - WITHOUT IWM)		DEVELOPED (2041 - WITH IWM)	
	ML/YEAR	ML/YEAR	% CHANGE FROM EXISTING (2021) SCENARIO	ML/YEAR	% CHANGE FROM DEVELOPED (2041 - WITHOUT IWM) SCENARIO
Mean annual runoff volume (MARV)	1,126	1,236	10%	832	-33%
IWM OPPORTUNITIES				**ML/YEAR**	**% OF DEVELOPED (2041 - WITHOUT IWM) SCENARIO MARV**
On-lot rainwater tanks				-391	-32%
Street trees				-13	-1%
Stormwater harvesting for irrigation of public open space (POS)				0	0%

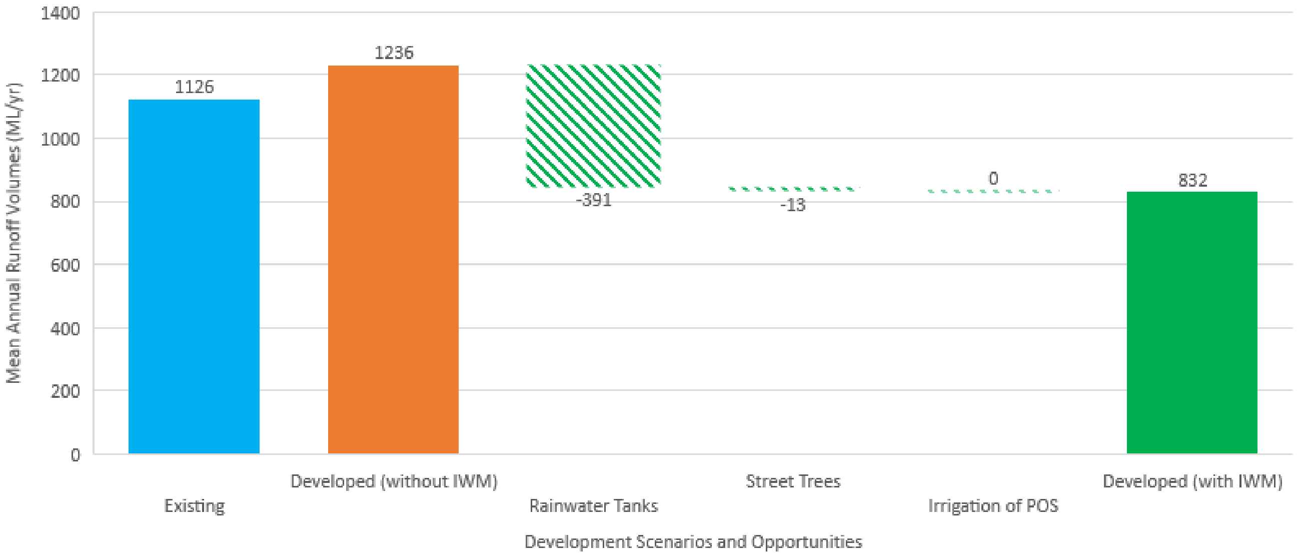


FIGURE 5.20 MEAN ANNUAL RUNOFF VOLUMES PER DEVELOPMENT SCENARIO, AND THE IMPACTS OF IWM OPPORTUNITIES- BURWOOD STRUCTURE PLAN AREA

5.5.3 STORMWATER PERFORMANCE OBJECTIVES

The assessment of achieving the quantitative performance objectives for urban stormwater set in EPA Victoria Publication 1739.1 – *Urban stormwater management guidance* in the Burwood Structure Plan Area is provided in Table 5.20.

The following conclusions can be made from the assessment:

- Rainwater tanks will reduce mean annual pollutant loads by intercepting runoff, and street trees will improve water quality through infiltration
- Rainwater tanks, with a minor contribution from street trees, will meet the volume harvesting / evapotranspiration quantitative performance objective for urban stormwater, with a 33% reduction in mean annual impervious runoff

- The combination of rainwater tanks and street trees could potentially reduce total suspended solids (TSS) by 35%, total nitrogen (TN) by 33%, total phosphorus (TP) by 34% and gross pollutants by 76%. These potential reductions will not meet the current quantitative performance objectives for urban stormwater for TSS, TP and TN. More interventions will be required on-lot and across the Structure Plan Area.

TABLE 5.20 QUANTITATIVE PERFORMANCE OBJECTIVES FOR URBAN STORMWATER – BURWOOD STRUCTURE PLAN AREA

WATER QUALITY	TARGET	DEVELOPED (2041 – WITHOUT IWM)	DEVELOPED (2041 – WITH IWM)	
	(% REDUCTION IN MEAN ANNUAL LOAD)	(KG/YEAR)	(KG/YEAR)	(% REDUCTION IN MEAN ANNUAL LOAD)
Total suspended solids (TSS)	80%	166,556	108,227	35%
Total phosphorus (TP)	45%	389	262	33%
Total nitrogen (TN)	45%	3278	2170	34%
Gross pollutants (GP)	70%	49,108	11,990	76%
FLOW VOLUME	TARGET	DEVELOPED (2041 – WITHOUT IWM)	DEVELOPED (2041 – WITH IWM)	
	(% MEAN ANNUAL IMPERVIOUS RUNOFF)			
Harvest / evapotranspire	26 to 27%	0%	33%	
Infiltrate / filter	9 to 11%	0%	0%	

5.5.4 DISCUSSION

The modelled scenario for the Burwood Structure Plan Area forecasts that resident and worker population growth could increase demand for potable water by 94% to 1212 ML/year in 2041.

Introducing alternative water supply options such as rainwater tanks and recycled water could reduce this to 719 ML/year (a 15% increase in potable demand). This is based on the sizing of the rainwater tanks modelled for each development type to meet 90% of the non-potable water demand.

After maximising the use of rainwater tanks and stormwater harvesting to provide non-potable water, the demand for recycled water could be 102 ML/year. The majority (60%) could support the irrigation of active open space with the remainder (40%) for on-lot use.

The optimum reliance on rainwater or recycled water for non-potable demands would need to be considered when preparing the Burwood Structure Plan Area IWM Plan.

No opportunities to irrigate active open spaces with stormwater (via diverting water from Melbourne Water drains) exist in the Burwood Structure Plan Area, but recycled water could be used to irrigate open spaces. The demand for recycled water to irrigate open space is 62 ML/year.

The Lungren Chain Reserve and recommended new open spaces should explore alternative water supplies being Council stormwater or recycled water to deliver on the urban greening and climate resilient vision for the Burwood Structure Plan Area.

At ultimate development of the Structure Plan Area, MARV could increase marginally by 10% (to 1236 ML/year), although this could be reduced by a third (to 832 ML/year) with rainwater tanks and minor contributions from the passive irrigation of street trees.

Burwood has a significant portion of the ‘Campus’ development type which presents the greatest opportunity in the Structure Plan Area to maximise stormwater harvesting though large rainwater tank sizing. Reducing the MARV could contribute to alleviating local flooding conditions and minimise the pressure on local drainage infrastructure during storm events.

Rainwater tanks and the passive irrigation of street trees will contribute to quantitative performance objectives for urban stormwater for gross pollutants (litter), but other treatment options (stormwater wetlands at a regional scale or raingardens at an individual lot scale) need to be considered to achieve the objectives for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN).

The stormwater harvesting target of 27% (see Table 5.20) could be achieved by implementing the identified IWM opportunities considered, but other options (such as permeable paving and rain gardens) will need to be considered to achieve the 11% infiltration target.

5.6 Box Hill Structure Plan Area

5.6.1 SPATIAL CONTEXT

A breakdown of land types in the Box Hill Structure Plan Area that informed the IWM assessment is provided in Table 5.21. A detailed breakdown of land use for the existing and ultimate development scenarios in the Structure Plan Area is provided in **Error! Reference source not found.**– Table A.3 and Table A.7.

The Box Hill Structure Plan Area urban development types (ultimate development) that form the basis of the IWM scenario assessment are shown in Figure 5.21. Rainwater tanks were modelled as an on-lot IWM opportunity for each urban development type (excluding Civic Areas). Modelled opportunities to irrigate active open space via stormwater harvesting or recycled water are identified.

The roads where passive irrigation of street trees is feasible are shown in Figure 5.22.

How these IWM opportunities impact quantifiable metrics in the Box Hill Structure Plan Area are described below.

TABLE 5.21 LAND TYPE BREAKDOWN – BOX HILL STRUCTURE PLAN AREA

LAND TYPE	AREA (HA)	PORTION OF STRUCTURE PLAN AREA
Lot – developable	186	64%
Lot – non-developable (Civic Areas)	7	2%
Roads	66	23%
Open space	32	11%

FIGURE 5.21 URBAN DEVELOPMENT TYPES AND OPEN SPACE IRRIGATION OPPORTUNITIES IN THE BOX HILL STRUCTURE PLAN AREA

FIGURE 5.22 ROADS WHERE PASSIVE IRRIGATION OF STREET TREES IS FEASIBLE IN THE BOX HILL STRUCTURE PLAN AREA

5.6.2 WATER BALANCE

5.6.2.1 Water supply assessment

Table 5.22 and Figure 5.23 show the water balance for each scenario in the Box Hill Structure Plan Area.

The following conclusions can be summarised from the water supply assessment:

- Potable water demand is expected to increase by 96% due to resident and worker population growth
- Alternative water supplies could reduce reliance on potable water by 35%:
  - » Rainwater tanks could reduce reliance on potable water by 21%
  - » Recycled water to top up rainwater tank supplies could reduce reliance on potable water by 12%
  - » For projected growth in the Central Core and Central Flanks urban development types, the modelled rainwater tanks will not meet 90% of water demand – these area provides a greater demand for recycled water.
  - » Using alternative water (stormwater harvesting and/or recycled water) to irrigate active open space could reduce reliance on potable water by 3%. The opportunities are:
    - – Stormwater harvesting from a Melbourne Water drain at Box Hill City Oval and Whitehorse Reserve/Howard Wilson Oval
    - – Providing recycled water provide to Surrey Park with an estimated demand 52 ML/year.
- Passive open spaces at Kinglsey Garden and Box Hill City Oval are located in proximity to a Melbourne Water drain present an opportunity to harvest stormwater to introduce irrigation to these passive open spaces. It is assumed that potable water is not currently used to irrigate these open spaces, so the water balance assessment has not quantified the opportunity.

TABLE 5.22 WATER SUPPLY BALANCE PER DEVELOPMENT SCENARIO – BOX HILL STRUCTURE PLAN AREA

WATER SUPPLY SOURCE	EXISTING (2021)		DEVELOPED (2041 – WITHOUT IWM)		DEVELOPED (2041 – WITH IWM)	
	(ML/YEAR)		(ML/YEAR)	(% CHANGE FROM EXISTING)	(ML/YEAR)	(% CHANGE FROM DEV CASE WITHOUT IWM)
Total water demand	1459		2734	87%	2734	**0%**
Potable water demand	1394		2734	96%	1766	**-35%**
	NON-POTABLE SOURCES	**(% OF TOTAL SUPPLY)**	**NON-POTABLE SOURCES**	**(% OF TOTAL SUPPLY)**	**NON-POTABLE SOURCES**	**(% OF TOTAL SUPPLY)***
Non-potable water demand	On-lot rainwater tanks	-4%	On-lot rainwater tanks	0%	On-lot rainwater tanks	-21%
					On-lot recycled water (top-up)	-12%
					Stormwater harvesting for irrigation	-1%
					Recycled water for irrigation	-2%

*Percentages are presented to the nearest whole number

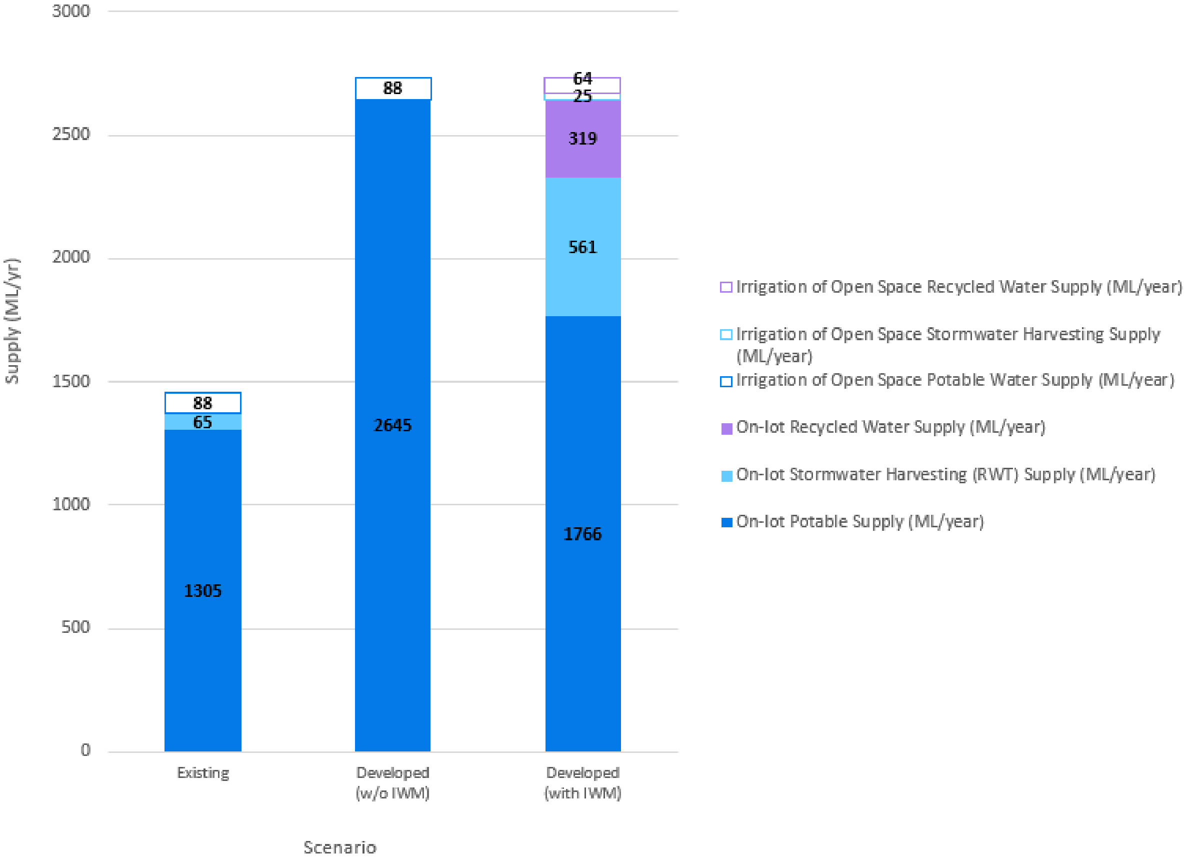


FIGURE 5.23 WATER SUPPLY BALANCE PER DEVELOPMENT SCENARIO – BOX HILL STRUCTURE PLAN AREA

5.6.2.2 Stormwater assessment

Table 5.23 and Figure 5.24 show the water balance for stormwater presented as MARV for each scenario in the Box Hill Structure Plan Area.

The following conclusions can be summarised from the assessment:

- MARV could increase by 16% with ultimate development in the Structure Plan Area without IWM initiatives
- IWM opportunities could reduce the MARV by 43% under the ultimate development scenario:
  - » Rainwater tanks harvesting 561 ML/year (40%)
  - » Passively irrigated street trees will evapotranspire 17 ML/year (1%)
  - » Stormwater harvesting to irrigate active open space will harvest 25 ML/year (2%).

TABLE 5.23 CATCHMENT WATER BALANCE PER DEVELOPMENT SCENARIO – BOX HILL STRUCTURE PLAN AREA

WATER BALANCE COMPONENTS	EXISTING (2021)	DEVELOPED (2041 – WITHOUT IWM)		DEVELOPED (2041 – WITH IWM)	
	ML/YEAR	ML/YEAR	% CHANGE FROM EXISTING (2021) SCENARIO	ML/YEAR	% CHANGE FROM DEVELOPED (2041 – WITHOUT IWM) SCENARIO
Mean annual runoff volume (MARV)	1226	1418	16%	815	-43%
IWM OPPORTUNITIES				**ML/YEAR**	**% OF DEVELOPED (2041 – WITHOUT IWM) SCENARIO MARV**
On-lot rainwater tanks				-561	-40%
Street trees				-17	-1%
Stormwater harvesting to irrigate public open space (POS)				-25	-2%

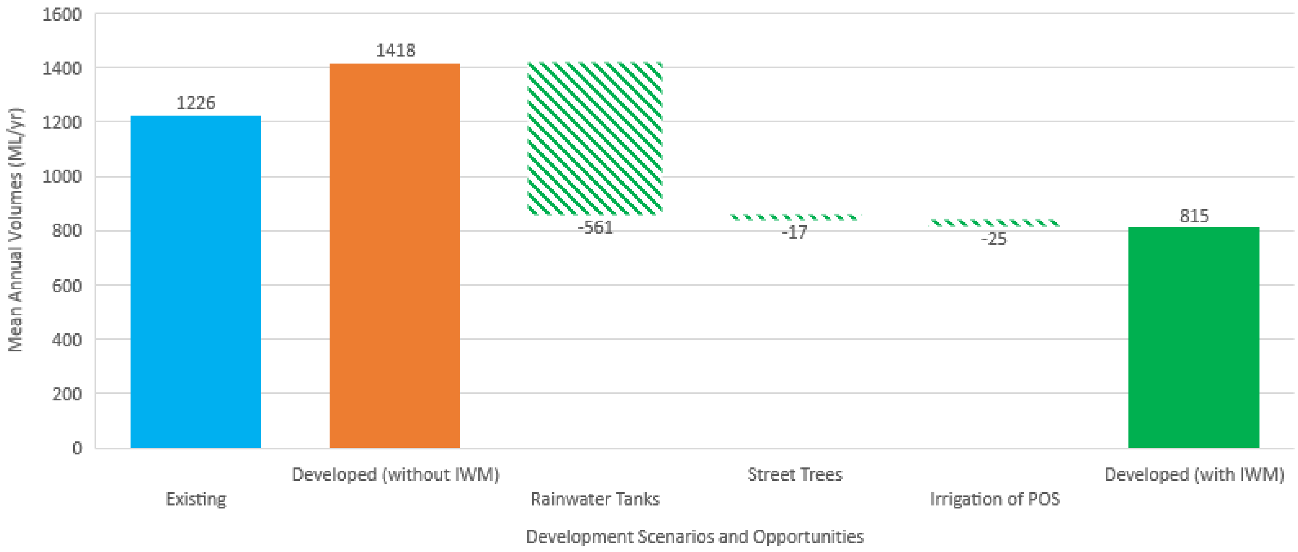


FIGURE 5.24 MEAN ANNUAL RUNOFF VOLUMES PER DEVELOPMENT SCENARIO AND THE IMPACTS OF IWM OPPORTUNITIES – BOX HILL STRUCTURE PLAN AREA

5.6.3 STORMWATER PERFORMANCE OBJECTIVES

The assessment of achieving the quantitative performance objectives for urban stormwater set EPA Victoria Publication 1739.1 – *Urban stormwater management guidance* in the Box Hill Structure Plan Area is provided in Table 5.24.

The following conclusions can be made from the assessment:

- Rainwater tanks will reduce mean annual pollutant loads by intercepting runoff, and street trees will improve water quality through infiltration
- Rainwater tanks, with a minor contribution from street trees, will meet the volume harvesting / evapotranspiration quantitative performance objective for urban stormwater, with a 41% mean annual impervious runoff reduction
- The combination of rainwater tanks and street trees could reduce total suspended solids (TSS) by 38%, total nitrogen (TN) by 38%, total phosphorus (TP) by 42% and gross pollutants by 76%. These potential reductions will not meet current quantitative performance objectives for urban stormwater for TSS, TP and TN. More interventions will be required on-lot and across the Structure Plan Area.

TABLE 5.24 QUANTITATIVE PERFORMANCE OBJECTIVES FOR URBAN STORMWATER – BOX HILL STRUCTURE PLAN AREA

WATER QUALITY	TARGET	DEVELOPED (2041 – WITHOUT IWM)	DEVELOPED (2041 – WITH IWM)	
	(% REDUCTION IN MEAN ANNUAL LOAD)	(KG/YEAR)	(KG/YEAR)	(% REDUCTION IN MEAN ANNUAL LOAD)
Total suspended solids (TSS)	80%	205,518	126,627	38%
Total phosphorus (TP)	45%	460	285	38%

WATER QUALITY	TARGET	DEVELOPED (2041 – WITHOUT IWM)	DEVELOPED (2041 – WITH IWM)	
	(% REDUCTION IN MEAN ANNUAL LOAD)	(KG/YEAR)	(KG/YEAR)	(% REDUCTION IN MEAN ANNUAL LOAD)
Total nitrogen (TN)	45%	3685	2144	42%
Gross pollutants (GP)	70%	56,688	13,854	76%
FLOW VOLUME	**TARGET**	**DEVELOPED (2041 – WITHOUT IWM)**	**DEVELOPED (2041 – WITH IWM)**	
	(% MEAN ANNUAL IMPERVIOUS RUNOFF)			
Harvest / evapotranspire	26 to 27%	0%	41%	
Infiltrate / filter	9 to 11%	0%	0%	

5.6.4 DISCUSSION

The modelled scenario for the Box Hill Structure Plan Area forecasts that resident and worker population growth could increase demand for portable water by 96% to 2734 ML/year in 2041.

Introducing alternative water supply options such as rainwater tanks and recycled water could reduce this to 1766 ML/year (a 27% increase in potable demand). This is based on the sizing of the rainwater tanks modelled for each development type to meet 90% of the non-potable water demand.

After maximising the use of rainwater tanks and stormwater harvesting to provide non-potable water, the demand for recycled water could be 382 ML/year, of which the majority (83%) is for on-lot use and the remainder (17%) could support the irrigation of active open space.

The optimum reliance on rainwater or recycled water for non-potable demands would need to be considered in the Box Hill Structure Plan Area IWM Plan.

Opportunities for stormwater harvesting were identified at Kinglsey Garden, Box Hill Gardens, Whitehorse Reserve / Howard Wilson Oval, and Box Hill City Oval due to their proximity to a Melbourne Water drain. All other open spaces including Surrey Park (and recommended new open spaces) could be supported by recycled water to further reduce the demand for potable water supply and deliver on the urban greening and climate resilient vision for the Box Hill Structure Plan Area.

At ultimate development of the Box Hill Structure Plan Area, MARV could increase marginally (16% to 1418 ML/year) unless measures are introduced to reduce this impact. The modelled scenario, MARV could be reduced by almost half (to 815 ML/year), mostly from the sizing of rainwater tanks and minor contributions from the passive irrigation of street trees. Reducing the MARV could contribute to alleviating local flooding conditions and minimise the pressure on local drainage infrastructure during storm events.

Rainwater tanks and the passive irrigation of street trees will contribute to achieving the quantitative performance objectives for urban stormwater for gross pollutants (litter), but other treatment options (such as stormwater wetlands at a regional scale or raingardens at an individual lot scale) need to be considered to achieve the objectives for total suspended solids (TS), total phosphorus (TP) and total nitrogen (TN).

The stormwater harvesting target of 27% (see Table 5.24) could be achieved by implemented the identified IWM opportunities, but other options (such as permeable paving and rain gardens) will need to be considered to achieve the 11% infiltration target.

5.7 IWM assessment summary

This section provides a summary of how development in each SRL East Structure Plan Area could deliver on the strategic performance objectives set by the policies, frameworks and guidelines relevant to IWM outlined in Section 4.

5.7.1 WATER SUPPLY

Reducing potable water demand by increasing the use of alternative water sources, such as rainwater and recycled water, can reduce pressure on existing water supply and sewerage systems, which reduces the need for costly infrastructure upgrades. Using rainwater for approved non-potable purposes (on-lot and to irrigate open spaces) conserves potable water and reduces the volume of stormwater runoff. Recycled water could also be used for approved non-potable purposes to reduce potable water demand and wastewater discharges to the environment.

These alternative water supply options highlight that it is feasible for urban infill to be delivered more sustainably, accommodating growth while minimising environmental impact, infrastructure strain and building community resilience.

In the ultimate development scenario for the Structure Plan Areas:

- Potable water demand is expected to double in most areas without implementation of IWM
- Alternative water supplies using a combination of rainwater tanks and recycled water could reduce reliance on potable water significantly (up to 41%)
- The performance and efficiency of rainwater tanks is driven by how much water can be collected (the size of the roof and size of the tank) and the magnitude of demand it is servicing. Rainwater tanks were modelled to provide the maximum non-potable water supply for projected growth in the SRL East Structure Plan Areas. In high density core areas (Central Core in Monash and Clayton and Central Core and Central Flank in Box Hill) the demand exceeds how much water can be collected for reuse. In these locations, demand for recycled water is greater, further supporting the provision of another non-potable water source. The optimum reliance on rainwater or recycled water for non-potable demands would need to be considered with stakeholders when preparing the IWM Plans for the SRL East Structure Plan Areas.

5.7.2 MEAN ANNUAL RUNOFF VOLUME (MARV)

Reducing the MARV through the structure planning and development process can significantly alleviate local flooding conditions by minimising the amount of stormwater that flows into drainage systems and natural waterways.

Opportunities to capture and reuse rainwater will reduce stormwater and minimise pressure on local drainage infrastructure during storm events. This also facilitates infiltration and can reduce peak flow rates to mitigate flood risk, protect water quality and contribute to a more resilient urban environment.

Mean Annual Runoff Volume (MARV) in the Structure Plan Areas is expected to increase marginally (up to 16%) from the existing scenario to the ultimate development scenario due to increases in the impervious area. Introducing rainwater tanks with minor contributions from the passive irrigation of street trees and stormwater harvesting can reduce MARV significantly in the ultimate development scenario.

Rainwater tanks and recycled water networks are crucial components of IWM, with each offering distinct advantages and potential limitations when trying to implement. To balance decision-making on the optimal water servicing solution, factors such as cost, infrastructure requirements, environmental impact and scalability need careful consideration with stakeholders. For instance, rainwater tanks may be more feasible in lower density urban development types that can readily service the magnitude of alternative water demand with rainwater, while recycled water networks might be more suitable for densely populated areas. A detailed cost-benefit analysis when preparing the IWM Plans for the SRL East Structure Plan Areas would consider costs, benefits to the community and environment and sustainability goals to determine the most appropriate solution.

5.7.3 STORMWATER PERFORMANCE OBJECTIVES

Adopting the EPA Victoria guidance by requiring stormwater harvesting and infiltration requirements in addition to the BPEM performance objectives creates more resilient and sustainable urban environments by preserving and enhancing the health of surrounding waterways to benefit communities and the natural environment.

Water quality is improved by rainwater tanks intercepting runoff, and the passive irrigation of street trees with stormwater infiltration. The performance of these treatments in each SRL East Structure Plan Area varies based on:

- How efficient rainwater tanks are in each development type (how much flow is intercepted and used for internal demands)
- The fraction of impervious area in each development type (impervious area has a higher concentration of pollutants)
- The percentage of streets that could be lined with passively irrigated street trees.

In accordance with the quantitative performance objective for urban stormwater (EPA Victoria guidance), rainwater tanks, with a minor contribution from street trees, could meet the stormwater volume harvesting / evapotranspiration objective in all SRL East Structure Plan Areas.

No SRL East Structure Plan Area is achieving the 9 to 11% infiltration target for reducing stormwater under the EPA Victoria guidance. An action relevant to exploring how to achieve the infiltration target for urban development is listed in the IWM Action Plans (see Section 4.2) which EPA Victoria and Melbourne Water are working to provide guidance on. The infiltration target is important to allow stormwater to infiltrate into the soil, provide environmental benefit to surrounding vegetation and mimic the natural hydrologic cycle. This work should feed into the preparation of IWM Plans for the SRL East Structure Plan Areas where relevant. Permeable paving and other streetscape treatment devices such as rain gardens and bioretention swales will be essential to investigate during preparation of the IWM Plans to contribute to meeting this objective. As the SRL East Structure Plans are developed, any new internal roads, outdoor carparks or otherwise impervious surfaces such as new non-grassed active open space should investigate the use of these treatments.

The combination of rainwater tanks and street trees could potentially reduce total suspended solids (TSS), total nitrogen (TN) and total phosphorus (TP). However, these potential reductions do not meet the objectives for these water quality measures. Additional interventions such as wetlands or bioretention swales will be required on-lot and across each Structure Plan Area to meet the water quality quantitative performance objectives for urban stormwater. New development is required to meet the best *Urban Stormwater Best Practice Environmental Guidelines* (BPEM Guidelines) as an existing requirement of the planning scheme (see Section 4.4.2) so will be required to meet the water quality targets.

While the modelling does indicate that IWM opportunities will meet the gross pollutant (litter) reduction objective for all SRL East Structure Plan Areas, excluding the Monash Structure Plan Area, this is driven by how street trees have been modelled and will likely need complementary Water Sensitive Urban Design devices such as gross pollutant traps to meet this target. This would be confirmed when preparing the IWM Plans.

Investigations into other and complementary Water Sensitive Urban Design opportunities are recommended to be completed when preparing the IWM Plans:

- Options assessments would be needed to determine where in the catchment Water Sensitive Urban Design opportunities could feasibly be placed, depending on where and with what other treatment devices they would be most effective
- Water Sensitive Urban Design devices would need to be sized specific to their catchment.

This is a level of detail that could not be achieved at strategic level but can reasonably be undertaken when preparing the IWM Plans, following approval of the SRL East Structure Plans. Other Water Sensitive Urban Design opportunities should be considered when preparing the IWM Plans as detailed in Appendix A.4.

5.7.4 OPEN SPACE

Providing a non-potable water supply to open spaces can significantly contribute to achieving healthier, more inclusive and equitable communities by ensuring that open space is adequately maintained and accessible throughout varying climatic conditions. The use of alternative water for irrigation contributes to environmental protection by facilitating the growth of native vegetation and increasing canopy cover, which is essential for promoting biodiversity and creating effective green corridors. This mitigates urban heat island effects and strengthens climate resilience with enhanced landscaping that can withstand extreme weather events.

The IWM assessment explored opportunities to irrigate active open spaces located within 250 metres of the Melbourne Water stormwater drainage network. The open spaces identified for potential stormwater harvesting were:

- Cheltenham Structure Plan Area – Wangara Road Golf Driving Range
- Clayton Structure Plan Area – Fregon Reserve, Jack Meade Reserve
- Monash Structure Plan Area – Carlson Avenue Reserve
- Box Hill Structure Plan Area – Box Hill City Oval and Whitehorse Reserve/Howard Wilson Oval.

Active open spaces that are not located near the Melbourne Water stormwater drainage network could be supplied by a recycled water are identified as:

- Burwood Structure Plan Area - Bennettswood Reserve and Gardiners Reserve (south of Highbury Road)
- Box Hill Structure Plan Area - Surrey Park

Most of the open space in the Glen Waverley and Burwood Structure Plan Areas is passive open space, so was not quantified in the IWM assessment. The opportunities for stormwater harvesting via collection of roof water (such as to irrigate adjacent sports fields), diversions from council-owned drainage systems or recycled water may be feasible in select locations. An assessment would be needed on a case-by-case basis to confirm demands and available supplies.

Where existing or new open space intersects with existing flooding issues in the SRL East Structure Plan Areas, stormwater harvesting may be a viable option to mitigate localised flooding. These areas present an opportunity to provide community and environmental benefit.

5.7.5 ALIGNMENT TO IWM CATCHMENT-SCALE TARGETS

The results of the IWM assessments in Sections 5.1 to 5.6 are summarised to present catchment-scale insights for the Yarra and Dandenong catchments below. The location of the SRL East Structure Plan Areas with respect to these catchments is shown in Figure 4.2. For simplicity, it was assumed the Glen Waverley Structure Plan Area drains solely to the Yarra receiving waters (along with the Box Hill and Burwood Structure Plan Areas), and the Monash Structure Plan Area drains solely to Dandenong receiving waters (along with the Clayton and Cheltenham Structure Plan Areas).

The predicted increase in total water demand in the SRL East Structure Plan Areas, and the breakdown of water sources (potable, stormwater harvesting and recycled water) for the Yarra catchment and Dandenong catchment are shown in Figure 5.25 and Figure 5.26 respectively. These figures show that while on-lot demands are expected to increase significantly, finding alternative water sources will reduce pressure on the potable water network. These figures also show that while irrigation of public open space only comprises a small percentage of total demands, these could be completely converted to non-potable water sources through stormwater harvesting opportunities and connection to recycled water.

In summary:

- In the Yarra catchment, water demand is expected to increase from 2637 to 4872 ML/year, of which approximately 35% could be met with alternative water supplies. This equates to 1854 ML/year, which is 13% contribution from the SRL East Structure Plan Areas to the catchment-scale alternative water supply target.
- In the Dandenong catchment, water demand is expected to increase from 3401 to 6616 ML/year, of which approximately 35% could be met with alternative water supplies. This equates to 2285 ML/year, which is 20% contribution from the SRL East Structure Plan Areas to the catchment-scale alternative water supply target.
- Where rainwater tanks are adopted, this would contribute to the catchment-scale MARV targets, although this depends on uptake and would need to be quantified when preparing the IWM Plans for each SRL East Structure Plan Area.
- Similarly, the irrigation of passive and active open spaces and the irrigation of street trees would contribute to the healthy and valued landscapes catchment targets and would need to be quantified when preparing the IWM Plans.

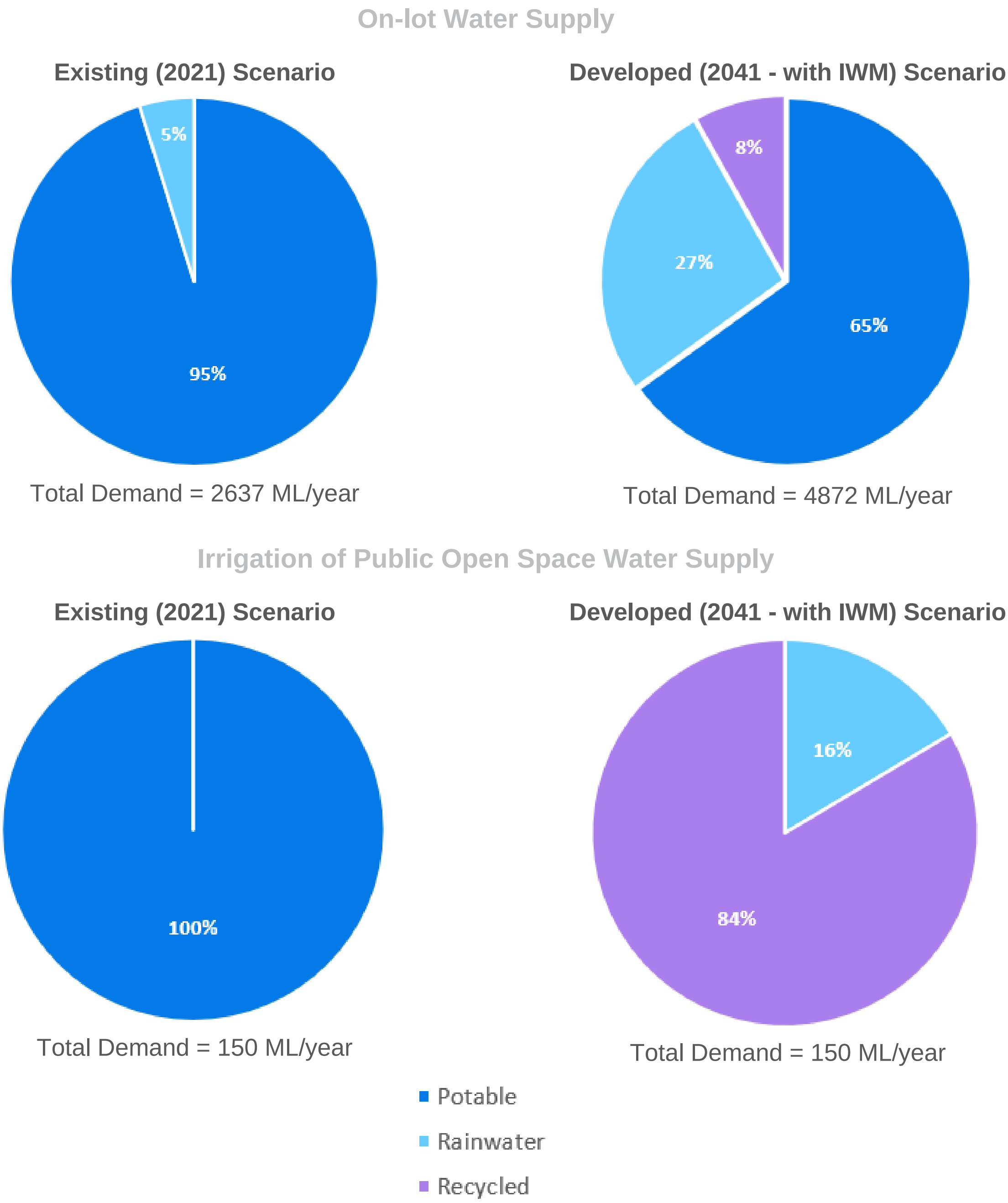


FIGURE 5.25 ON-LOT AND IRRIGATION OF PUBLIC OPEN SPACE WATER SUPPLY BREAKDOWN FOR THE YARRA CATCHMENT*

*Currently assumes 100% of the Glen Waverley Structure Plan Area drains to the Yarra receiving waters.

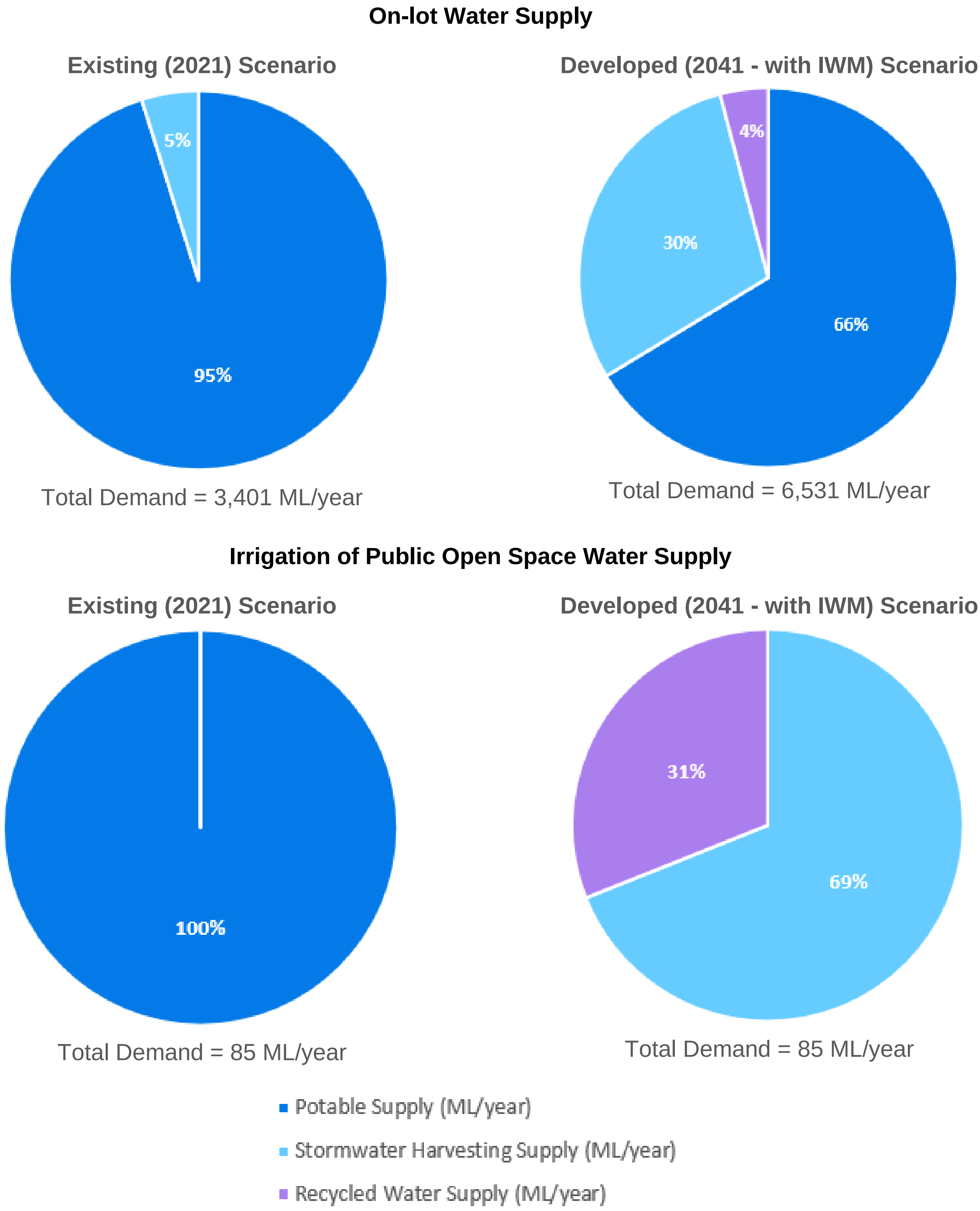


FIGURE 5.26 ON-LOT AND IRRIGATION OF PUBLIC OPEN SPACE WATER SUPPLY BREAKDOWN FOR THE DANDENONG CATCHMENT^

^Currently assumes 100% of the Monash Structure Plan Area drains to the Dandenong receiving waters

6 Recommendations

This section provides IWM recommendations to inform the development of the SRL East Structure Plans. It identifies recommendations that can be considered in the short term for structure planning, and other opportunities that should be addressed in the medium to longer term when preparing the IWM Plan for each SRL East Structure Plan Area.

6.1 Structure planning

6.1.1 RECOMMENDATIONS

1. Prepare an IWM Plan for each SRL East Structure Plan Area. The IWM Plans should be developed in collaboration with stakeholders once each SRL East Structure Plan is developed. The IWM Plans should determine localised, contextual and implementable IWM interventions, including the consideration of the opportunities outlined below.

6.1.2 OPPORTUNITIES

1. The provision of alternative water reticulation (such as third pipe plumbing) to all new developments where alternative water supply networks exist or are planned by the relevant water retailer.
2. The use of rainwater tanks as part of place-based IWM interventions for harvesting stormwater and supply of non-potable water use (such as toilets, laundry and irrigation systems) as part of a development.
3. The incorporation of place-based IWM interventions that balance the objectives of reducing potable water use, manages the risk of flooding, and improves stormwater quality for all new development, including public realm works.

6.2 Next steps

It is recommended an IWM Plan is prepared for each SRL East Structure Plan Area to confirm the IWM opportunities identified in this IWM Strategy (see Section 2.4). By establishing a working group of IWM Forum members, the IWM base case and options assessment could commence when the SRL East Structure Plans are exhibited for stakeholder and public comment.

Steps involved in preparing a IWM Plan for each SRL East Structure Plan Area include:

- Establish a collaborative working group for each Structure Plan Area to develop a common understanding of issues and priorities, facilitate the value capture of broader benefits, apportion costs, and explore alternative funding models or cost recovery mechanisms
- Establish an appropriate base case for each Structure Plan Area to compare alternative pathways and solutions
- Understand the risks and opportunities in the medium term and identify options that mitigate risks
- Define a fit-for-purpose economic and financial analysis to assess IWM options – this includes lifecycle costing and quantifying benefits across the whole water cycle, including:
    - » Broader social, environmental and economic benefits
    - » Avoided, offset and/or deferred costs and opportunities identified

» Quantifying opportunity cost (monetising opportunity / lost opportunity)

- Select the preferred servicing strategy based on a robust economic assessment
- Finalise the IWM Plan, including a staging plan to assist with delivery to achieve IWM benefits.

The steps for preparing IWM Plans for the SRL East Structure Plan Areas are shown in Figure 6.1.

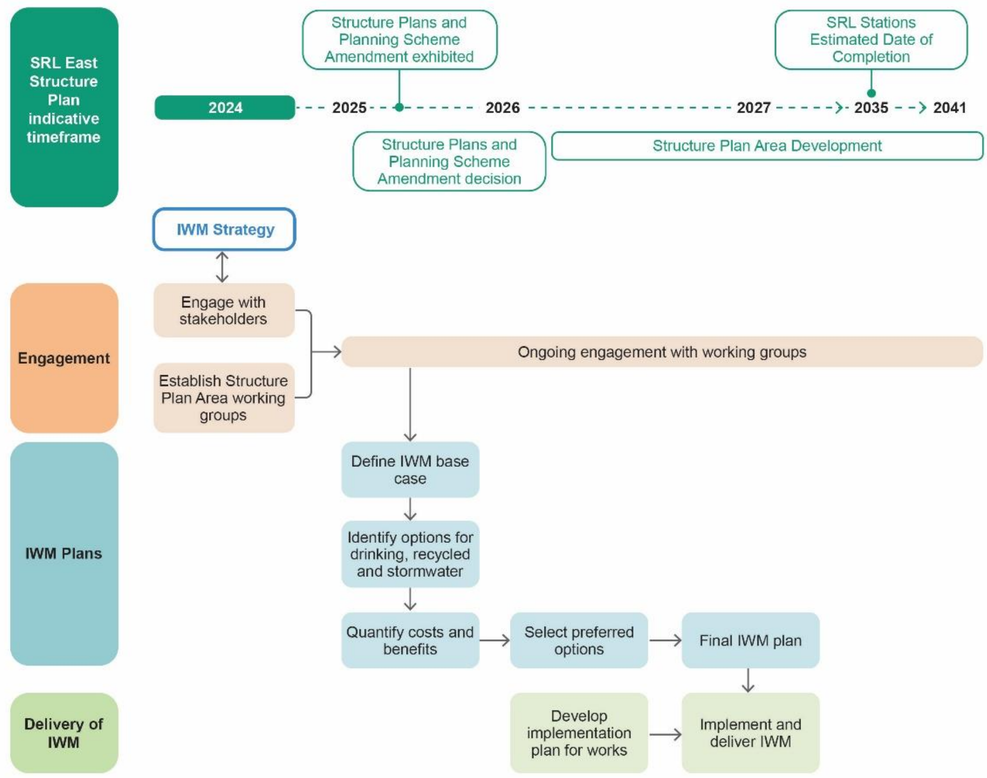


FIGURE 6.1 STEPS FOR PREPARING IWM PLANS

The following points should be considered when preparing the IWM Plans:

- An alternative water source (such as recycled water) is recommended to supplement non-potable water demand in the SRL East Structure Plan Areas.
- The optimum reliance on rainwater or recycled water for non-potable demands would need to be considered in collaboration with South East Water and Yarra Valley Water.
- Reducing demand for potable water to irrigate existing (active and passive) and new open spaces should be explored. Providing an alternative water source for irrigation assists with delivering on the urban greening and climate resilient vision for each SRL East Structure Plan Area.
- Passively irrigated street trees should be prioritised along green streets in all SRL East Structure Plan Areas where possible to maximise stormwater runoff reduction and improve stormwater quality with

stormwater infiltration. Early integration of the street tree pit and inlet design into the road design and space proofing is important.

- Where existing or new open space intersects with flooding issues in the SRL East Structure Plan Areas, stormwater harvesting may be a viable option to mitigate localised flooding. These areas present an opportunity to provide community and environmental benefit.
- Rainwater tanks and the passive irrigation of street trees will contribute to quantitative performance objectives for urban stormwater for gross pollutants (litter), but other treatment options (stormwater wetlands and / or bioretention at a regional scale or raingardens at an individual lot scale) need to be considered to achieve the water quality objectives.
- Consultation is key to implementing the identified IWM opportunities and should occur at the start of IWM Plan preparation. The IWM Plans should be prepared in consultation with Melbourne Water, DEECA, South East Water, Yarra Valley Water and relevant local governments.

References

AJM JV, 2025 Cheltenham Draft Climate Response Plan (SRL-301-AJM-P100-REP-PSP-CTM-005169).

City of Stonnington (2012), Como Park Stormwater Harvesting Project, available at Clearwater Vic Resource Library: Como Park Stormwater Harvesting Project | Clearwater - training and events on sustainable urban water management (clearwatervic.com.au) Library, accessed on: 28/03/2024.

CSIRO (1999), Urban Stormwater Best Practice Environmental Management Guidelines, prepared for the Stormwater Committee, CSIRO Publishing, Victoria.

DEECA (2024) Dandenong Catchment Scale Integrated Water Management Plan: Actions for Delivery, Department of Energy, Environment and Climate Action.

DEECA (2024b) Yarra Catchment Scale Integrated Water Management Plan: Actions for Delivery, Department of Energy, Environment and Climate Action.

DELWP (2017), Integrated Water Management Framework for Victoria, Department of Environment, Land, Water and Planning, Melbourne.

DELWP (2017b), Plan Melbourne 2017–2050. Department of Environment, Land, Water and Planning, Melbourne.

DELWP (2018) Dandenong Catchment Scale Integrated Water Management Plan, Department of Environment, Land, Water and Planning.

DELWP (2018b) Yarra Catchment Scale Integrated Water Management Plan, Department of Environment, Land, Water and Planning.

DELWP (2022) Central and Gippsland Region Sustainable Water Strategy, Department of Environment, Land, Water and Planning.

EPA Victoria (2021), Publication 1739.1 – *Urban stormwater management guidance*.

EPA Victoria (2021b), Publication 1911.2 – *Technical information for the Victorian guideline for water recycling Approved recycled water use*.

Jamali, B, Bach, P M, Deletic, A (2019), Rainwater harvesting for urban flood management – An integrated modelling framework, available at https://doi.org/10.1016/j.watres.2019.115372, accessed on 26/02/2024.

Knox City Council (2014), Fairpark Reserve Stormwater Harvesting Scheme, available at Clearwater Vic Resource Library: Fairpark Reserve Stormwater Harvesting Scheme (clearwatervic.com.au), accessed on 28/03/2024.

Manningham City Council (2014), Templestowe Reserve Stormwater Harvesting Project, available at Clearwater Vic Resource Library Templestowe Reserve Stormwater Harvesting Project (clearwatervic.com.au), accessed on 28/03/2024.

Melbourne Water (2018), Healthy Waterways Strategy, State Government of Victoria.

Melbourne Water (2022b), Greater Melbourne Urban Water & System Strategy: Water for Life, Melbourne Water, Greater Western Water, South East Water and Yarra Valley Water.

Planning and Environment Act 1987 (Vic).

AJM
Joint Venture

Appe

Basis of model

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A.1 Methodology

Three scenarios were assessed for the IWM assessment:

1. Existing (2021)
2. Developed (2041 without IWM)
3. Developed (2041 with IWM).

Both ultimate development scenarios use the same urban development types. The key difference between them is the introduction of IWM opportunities to quantify the effect on water supply, mean annual runoff volumes (MARV) and the contribution toward quantitative performance objectives for urban stormwater (EPA Victoria guidance).

On-lot land was first defined by the current cadastral data. The model has not accounted for any proposed change to the existing road and transport corridor footprints that may occur under ultimate development.[1] Lots were broken into urban development types for the existing and ultimate development scenarios in the SRL East Structure Plan Areas. The urban development types were grouped by planning zones for the existing scenario and were taken directly from the SRL East Structure Plan - Urban Design Reports for the ultimate development scenarios. Each urban development type was characterised by:

- The breakdown of % roof, % hardstand and % pervious per 1-hectare of lot. The potable and non-potable demands per 1 hectares of roof (per capita and per job demand water use assumptions were applied to the population and employment projections, consistent with the Business and Investment Case (BIC) prepared for the Suburban Rail Loop (August 2021), for the Structure Plan Areas as presented in the SRL East Draft Structure Plan - Urban Design Reports (AJM JV 2025).

Water demands were assumed using professional judgement and data provided by stakeholders through previous engagement. The input assumptions for each urban development type are detailed in Appendix A.2.

The water balance calculations are based on 1-hectare source nodes[2] (that is, roof, hardstand, grass) in terms of runoff, pollutant generation and water demand to allow the water balance assessment to be conducted on a consistent scale across all SRL East Structure Plan Areas (see note 1 below).

IWM opportunities (or treatments) were also modelled on a per hectare basis: rainwater tanks per hectare of roof, street trees per hectare of road. Irrigation of open space was considered as a place-based opportunity and for each parcel of active open space, the area likely to be irrigated was assessed. The input assumptions used in the modelling of the opportunities is detailed in Appendix A.3.

The results could then be multiplied out by the amount of each source node for each urban development type in each SRL East Structure Plan Area.

NOTE:

1. The water balance model does not account for potential lot consolidation and the introduction of internal roads. Internal roads are those within a cadastral parcel and count towards 'on-lot' calculations. It is assumed that any new internal roads in the ultimate development scenarios will have already been factored into the impervious assumptions associated with each urban development type in the SRL East Structure Plan – Urban Design Reports.
2. The development of the 1-hectare MUSIC models was based on the Dandenong (750 to 850 millimetres) rainfall data from the Melbourne Water MUSIC 2023 Guidelines. All SRL East Structure Plan Areas except for Cheltenham fall within this rainfall band, which falls within the Melbourne Regional (650 to 750 millimetres) band. This assumption may overestimate the stormflow generated for the Cheltenham Structure Plan Area but is not expected to affect the strategic insights.

A.2 Urban development type assumptions

EXISTING SCENARIO

TABLE A.1 EXISTING (2021) SCENARIO URBAN DEVELOPMENT TYPES

URBAN DEVELOPMENT TYPES	RESIDENTIAL – LOW DENSITY	RESIDENTIAL – HIGH DENSITY	COMMERCIAL / INDUSTRIAL / HOSPITAL	MIXED USE / EDUCATION	ACTIVE OPEN SPACE	PASSIVE OPEN SPACE	CEMETERY
PLANNING ZONES	GRZ1 GRZ12 GRZ13 GRZ14 GRZ15 GRZ16 GRZ17 GRZ18 GRZ2 GRZ3 GRZ4 GRZ5 GRZ6 Manually split into Low Density and High Density, differs per Structure Plan Area	GRZ7 GRZ8 GRZ9 MUZ NRZ1 NRZ2 NRZ3 NRZ4 NRZ5 RGZ2 RGZ3 RGZ4	C1Z C2Z IN1Z IN3Z PUZ1 PUZ3	CA CDZ2 PUZ2 PUZ6 PUZ7 SUZ1 SUZ3 SUZ5 SUZ6	PPRZ UFZ Manually split into Passive and Active Open Space		Manually defined – Cheltenham only
LOT % ROOF (IMPERVIOUS)	40%		60%	30%	3%	0%	0%
LOT % HARDSTAND (IMPERVIOUS)	35%		30%	40%	10%	5%	50%
LOT % GRASS (PERVIOUS)	25%		10%	30%	87%	95%	50%
PORTION OF DWELLINGS THAT HAVE RAINWATER TANKS	30%	30%	N/A	N/A	N/A	N/A	N/A
RAINWATER TANK (KL / HA)	40	120	N/A	N/A	N/A	N/A	N/A

URBAN DEVELOPMENT TYPES	RESIDENTIAL – LOW DENSITY	RESIDENTIAL – HIGH DENSITY	COMMERCIAL / INDUSTRIAL / HOSPITAL	MIXED USE / EDUCATION	ACTIVE OPEN SPACE	PASSIVE OPEN SPACE	CEMETERY
AVERAGE OCCUPANCY RATE	2.4	1.9	N/A	N/A	N/A	N/A	N/A
DWELLINGS/HA	20	60	N/A	N/A	N/A	N/A	N/A

*split later into low-density and high-density, differs per Structure Plan Area

TABLE A.2 BREAKDOWN OF POPULATION AND JOBS FOR URBAN DEVLOPMENT TYPE PER STRUCTURE PLAN AREA

POPULATION (CAPITA) – 2021						
URBAN DEVELOPMENT TYPES	**BOX HILL**	**BURWOOD**	**CHELTENHAM**	**CLAYTON**	**GLEN WAVERLEY**	**MONASH**
Residential - Low Density	1909	4396	6327	9293	5647	2587
Residential - High Density	11391	904	3073	4907	1453	7413
Population total	**13300**	**5300**	**9400**	**14200**	**7100**	**10000**
JOBS (CAPITA) – 2021						
URBAN DEVELOPMENT TYPES	**BOX HILL**	**BURWOOD**	**CHELTENHAM**	**CLAYTON**	**GLEN WAVERLEY**	**MONASH**
Commercial / Industrial / Hospital	11300	3900	8000	11500	4800	8300
Mixed Use / Education	7200	5200	2687	1200	2900	12600
Jobs Total	**18500**	**9100**	**10700**	**12700**	**7700**	**20900**

TABLE A.3 EXISTING (2021) SCENARIO AREA BREAKDOWN

URBAN DEVELOPMENT TYPE AREAS (HA)	BOX HILL	BURWOOD	CHELTENHAM	CLAYTON	GLEN WAVERLEY	MONASH
LOT – DEVELOPABLE AREA						
Residential - Low Density	40	92	132	194	118	54
Residential - High Density	100	8	27	43	13	65
Commercial / Industrial / Hospital	30	37	109	20	37	5
Mixed Use / Education	14	34	1	11	7	140
LOT – NON-DEVELOPABLE AREA (CIVIC AREAS)						
Cemetery	0	0	17	0	0	0
Commercial / Industrial / Hospital	0	0	0	15	2	0
Mixed Use / Education	7	15	0	4	14	123
ROADS						
All roads	66	45	66	83	48	62
OPEN SPACE						
Active Open Space	23	11	7	6	0	3
Passive Open Space	11	22	12	2	6	2
TOTAL	**292**	**263**	**371**	**378**	**244**	**455**

TABLE A.4 EXISTING (2021) SCENARIO WATER DEMAND BREAKDOWN PER URBAN DEVELOPMENT TYPE

RESIDENTIAL USAGE SPLIT OF WATER CONSUMPTION (L/CAPITA/DAY)		RESIDENTIAL – LOW DENSITY	RESIDENTIAL – HIGH DENSITY
Indoor non-potable*	Toilet	6.0	6.0
	Washing machine	7.5	7.5
Indoor potable	Toilet	14.0	14.0
	Washing machine	17.5	17.5
	Drinking water / shower	100.0	100.0
Outdoor potable	Outdoor / irrigation	40.0	40.0
Total non-potable demand		**13.5**	**13.5**
Total potable demand		**171.5**	**171.5**
Total demand		**185.0**	**185.0**

*Assumes 30% of residences currently have rainwater tanks for indoor uses
Current approved uses of non-potable water in a residential building are toilets, laundry and outdoor irrigation. Under the existing scenario, it is only assumed rainwater tanks are connected to indoor non-potable uses (toilet and laundry).

TABLE A.5 EXISTING (2021) SCENARIO WATER DEMAND BREAKDOWN PER JOBS URBAN DEVELOPMENT TYPE

JOBS USAGE SPLIT OF WATER CONSUMPTION (L/CAPITA/DAY)		CEMETERY	COM/IND/HOSP	MIXED/EDUCATION
Indoor non-potable	Toilet	0	0	0
Outdoor non-potable	Outdoor / irrigation (recycled water)	0	0	0
Indoor potable	Toilet	20	20	20
	Drinking water / shower	50	50	50
Outdoor potable	Outdoor / irrigation	0	0	0
Total non-potable demand		**0**	**0**	**0**
Total potable demand		**70**	**70**	**70**
Total demand		**70**	**70**	**70**

A.3 Ultimate development scenario: interpretation of the Structure Plan urban design

The SRL East Draft Structure Plan - Urban Design Reports (AJM JV 2025) was adopted for the ultimate development scenario and informed the use of urban development types presented in this IWM assessment. The urban design place types were directly translated into urban development types for the ultimate development scenario for the purpose of water balance modelling. The exception is the ‘Activity Centre Non-Core’ urban development type (Burwood Structure Plan Area only) has been classified as the ‘Central Flanks’ urban development type as it was identified as being the ‘T-shape’ urban development type.

TABLE A.6 BREAKDOWN OF POPULATION AND JOBS FOR DEVELOPED (2041) SCENARIO URBAN DEVELOPMENT TYPE PER SRL EAST STRUCTURE PLAN AREA

POPULATION (CAPITA) – 2041						
URBAN DEVELOPMENT TYPE	BOX HILL	BURWOOD	CHELTENHAM	CLAYTON	GLEN WAVERLEY	MONASH
Activity Centre Core	0	114	0	0	0	0
Campus	0	391	0	0	22	0
Central Core	9303	0	1135	612	1633	3488
Central Flanks	5561	155	0	1290	251	0
Industrial Areas	0	0	559	52	0	0
Key Movement Corridors	4098	5117	6379	2589	1942	6660
Main Streets	0	43	762	117	0	0
Residential Neighborhoods	7046	3133	8774	12884	5664	5501
Transport Corridor	0	0	0	0	0	0
Urban Neighborhoods	2972	1913	2068	8467	2190	0
Strategic Sites	1	234	1123	891	0	0
Passive Open Space	0	0	0	0	0	0
Active Open Space	0	0	0	0	0	0
Cemetery	0	0	0	0	0	0
Commercial / Industrial / Hospital	0	0	0	0	0	0
Mixed / Education	121	0	0	0	0	2251
Population total	**29,100**	**11,100**	**20,800**	**26,900**	**11,700**	**17,900**
JOBS (CAPITA) – 2041						
Typologies	**BOX HILL**	**BURWOOD**	**CHELTENHAM**	**CLAYTON**	**GLEN WAVERLEY**	**MONASH**
Activity Centre Core	0	86	0	0	0	0
Campus	0	5523	0	0	2804	23232
Central Core	15069	0	7530	1472	5392	8504
Central Flanks	20312	515	0	1590	982	0
Industrial Areas	0	2023	9911	3062	0	2753
Key Movement Corridors	974	4336	4132	1681	1615	1179
Main Streets	0	232	461	1859	0	0
Residential Neighborhoods	531	16	15	2	24	132
Transport Corridor	0	0	0	0	0	0
Urban Neighborhoods	16	342	345	12113	0	0
Strategic Sites	157	3027	194	922	2251	0
Passive Open Space	402	128	0	0	0	0
Active Open Space	0	0	0	0	0	0
Cemetery	0	0	13	0	0	0

POPULATION (CAPITA) – 2041						
Commercial / Industrial / Hospital	0	0	0	6312	90	0
Mixed / Education	1231	669	0	588	643	14201
Jobs total	**38,693**	**16,900**	**22,600**	**29,600**	**13,800**	**50,000**

TABLE A.7 DEVELOPED (2041) SCENARIO(S) AREA BREAKDOWN

URBAN DEVELOPMENT TYPE AREAS (HA)	BOX HILL	BURWOOD	CHELTENHAM	CLAYTON	GLEN WAVERLEY	MONASH
LOT – DEVELOPABLE AREA						
Activity Centre Core	0	5	0	0	0	0
Campus	0	24	0	0	8	91
Central Core	15	0	16	2	16	12
Central Flanks	36	3	0	7	6	0
Industrial Areas	0	17	70	14	0	35
Key Movement Corridors	21	40	42	18	17	39
Main Streets	0	1	5	4	0	0
Residential Neighbourhoods	89	49	106	137	96	87
Urban Neighbourhoods	17	13	14	74	15	0
Large Opportunities Sites	8	20	19	11	16	0
Lot – Non-Developable Area (Civic Areas)						
Cemetery	0	0	17	0	0	0
Commercial / Industrial / Hospital	0	0	0	15	2	0
Mixed Use / Education	7	15	0	4	14	123
Roads						
Major Transport Corridor	25	17	29	23	12	31
Minor Road - no street tree potential	4	1	0	1	1	0
Minor Road - street tree potential	37	27	37	59	36	31
Open Space						
Active Open Space	23	11	7	6	0	3
Passive Open Space	9	20	9	2	5	2
TOTAL	**292**	**263**	**371**	**378**	**244**	**454**

TABLE A.8 DEVELOPED (2041) SCENARIO URBAN DEVELOPMENT TYPE ASSUMPTIONS

URBAN DEVELOPMENT TYPE	LOT % ROOF (IMPERVIOUS)#	LOT % HARDSTAND (IMPERVIOUS)	LOT % GRASS (PERVIOUS)^
Activity Centre Core	89%	11%	0%
Campus	67%	8%	25%
Central Core	89%	11%	0%
Central Flanks	88%	2%	10%
Industrial Areas	83%	13%	5%
Key Movement Corridors	80%	5%	15%
Main Streets	95%	5%	0%
Residential Neighborhoods	68%	17%	15%
Transport Corridor	0%	75%	25%
Urban Neighborhoods	70%	15%	15%
Strategic Sites	65%	11%	25%
Commercial / Industrial / Hospital *	60%	30%	10%
Mixed / Education*	30%	40%	30%
Active Open Space*	3%	10%	87%
Passive Open Space*	0%	5%	95%
Cemetery*	0%	50%	50%

*These Urban Development Types are present in the existing (2021) and developed (2041) scenarios. The Urban Design identifies 'Civic Areas' as land not envisaged for substantial change; these areas have been given a consistent typology between existing (2021) and developed (2041) scenarios for the purpose of the water balance modelling, but do experience a change in water demand driven by population and jobs.

#The ultimate development scenario % roof (/lot) for each urban development type was taken from the 'average site coverage' as provided by the case studies in the SRL East Draft Structure Plan –Urban Design Report (AJM JV 2025).

^The % perviousness for each urban development type was taken as the % deep soil coverage as provided in the SRL East Draft Structure Plan – Urban Design Report (AJM JV 2025).

TABLE A.9 DEVELOPED (2041) SCENARIO WATER DEMAND BREAKDOWN PER RESIDENTIAL TYPOLOGY

RESIDENTIAL USAGE SPLIT OF WATER CONSUMPTION (L/CAPITA/DAY)		ACTIVITY CENTRE CORE	CAMPUS	CENTRAL CORE	CENTRAL FLANKS	INDUSTRIAL AREAS	KEY MOVEMENT CORRIDORS	MAIN STREETS	RESIDENTIAL NEIGHBOURHOODS	URBAN NEIGHBOURHOODS	STRATEGIC SITES
Indoor non-potable	Toilet	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
	Washing machine	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Outdoor non-potable	Outdoor/ irrigation	0.0	10.3	0.0	1.8	4.0	7.0	0.0	20.8	7.1	22.6
Indoor potable	Drinking water/ shower	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total non-potable demand		45.0	55.3	45.0	46.8	49.0	52.0	45.0	65.8	52.1	67.6
Total potable demand		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total demand		145.0	155.3	145.0	146.8	149.0	152.0	145.0	165.8	152.1	167.6

TABLE A.10 DEVELOPED (2041) SCENARIO WATER DEMAND BREAKDOWN PER JOBS TYPOLOGY

JOBS USAGE SPLIT OF WATER CONSUMPTION (L/CAPITA/DAY)		ACTIVITY CENTRE CORE	CAMPUS	CENTRAL CORE	CENTRAL FLANKS	INDUSTRIAL AREAS	KEY MOVEMENT CORRIDORS	MAIN STREETS	RESIDENTIAL NEIGHBOURHOODS	URBAN NEIGHBOURHOODS	STRATEGIC SITES
Indoor non-potable	Toilet	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0
Outdoor non-potable	Outdoor / Irrigation	0.0	10.3	0.0	1.8	4.0	7.0	0.0	20.8	7.1	22.6
Indoor potable	Drinking water / shower	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Total non-potable demand		20.0	31.3	22.0	24.8	28.0	32.0	26.0	47.8	35.1	51.6
Total potable demand		50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Total demand		70.0	81.3	72.0	74.8	78.0	82.0	76.0	97.8	85.1	101.6

A.4 Modelling of IWM opportunities

ON-LOT RAINWATER TANKS

The methodology and assumptions for assessing rainwater tanks was:

- Rainwater tanks were sized per 1-hectare of roof area (the ‘catchment’) with the aim of capturing 90% of the demand. The relationship between daily demand and tank size per hectare of roof was determined using a MUSIC model (example treatment train shown in Figure A.1), assuming 100% of water is captured from the roof (Figure A-2). It was found the maximum daily demand that can feasibly meet 90% of demands was 18.5kL/day. Once the daily demands exceeded this point, the demand was higher than the amount of rainwater able to be captured, and in these cases a secondary target of 90% volume (flow) reduction of stormflow generated on the roof was adopted.
- The typical lot size and % roof coverage estimated from the SRL East Structure Plan - Urban Design Reports was used to calculate the typical building footprint. This enabled the results to be converted to approximate rainwater tank size per typical lot (to check feasibility of resulting tank sizes. It is assumed at this point that all tank sizes predicted can be achieved by development.
- The demand not able to be met by rainwater tanks was reported as a deficit requiring top-up by recycled water.
- The intention of this process was to determine which urban development types, rainwater tanks show a noticeable benefit to reduction in stormflow, and if these urban development types are concentrated in particular areas.
- The Mixed / Education urban development type is considered to only have jobs and no resident population in the existing case. As such, while this urban development type registers as having population and jobs in the future based on the transport zone data, only job demands are integrated in the assessment for this urban development type.

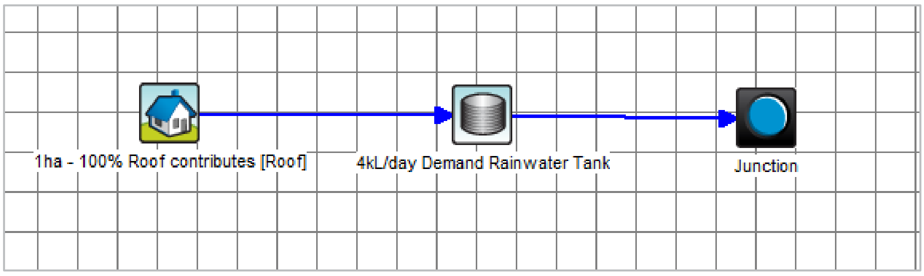

FIGURE A.1 MUSIC RAINWATER TANK TREATMENT TRAIN

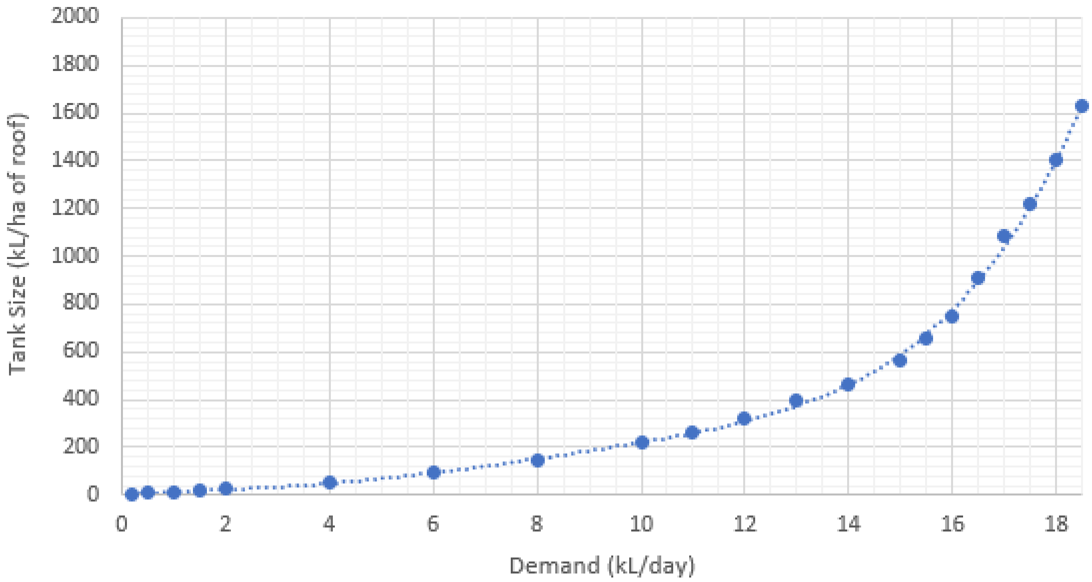

FIGURE A.2 RELATIONSHIP BETWEEN DEMAND AND TANK SIZE PER HECTARE OF ROOF TO ACHIEVE 90% OF DEMAND

TABLE A.11 RAINWATER TANK MUSIC INPUTS

MUSIC INPUTS	ADOPTED VALUE
Volume below overflow pipe (kL)	Iterative per urban development type per SRL East Structure Plan Area. Set to achieve a minimum 90% demand met, OR if not possible to meet demand, 90% volume (flow) reduction.
Depth above overflow (m)	0.2
Surface area (m^2)	Volume ÷ 1.5 (assumes all tanks 1.5m deep below overflow)
Initial volume (kL)	0
Overflow pipe diameter (mm)	50 (default)
Daily demand	Calculated per urban development types per SRL East Structure Plan Area. Set based on per person and per job demand assumptions, multiplied out by the provided population and employment numbers per urban development types per SRL East Structure Plan Area.

TABLE A.12 APPROXIMATE RWT SIZE PER TYPICAL LOT SIZE

CALCULATES INDICATIVE SIZE (THE STORY)	TYPICAL LOT SIZE (M2)	APPROX. RWT SIZE KL/LOT					
TYPOLOGIES		BOX HILL	BURWOOD	CHELTENHAM	CLAYTON	GLEN WAVERLEY	MONASH
Activity Centre Core	1884		4				
Campus	3752		125			290	117
Central Core	1884	44		117	59	75	61
Central Flanks	1115	57	18		92	14	
Industrial Areas	914		4	7	12		3
Key Movement Corridors	1190	63	42	55	50	33	39
Main Streets	650		8	13	47		
Residential Neighbourhoods	612	10	6	9	12	5	6
Urban Neighbourhoods	957	38	30	31	92	24	
Large Opportunities Sites	3096	6	135	38	181	83	

STREET TREES

The methodology for assessing street trees was:

- Roads with potential for passively irrigated street trees were assumed to be 25% pervious and 75% impervious. For an average 16-metre wide street, this nominally allows 2 metres either side of the street for street tree pits and to allow an offset between the road pavement and the tree.
- Per 1-hectare of road, this equates to a length of 1250 metres that can be planted when considering both sides of the road, assuming an average road width of 16 metres. This length was discounted by 20% to allow for driveways and intersections, reducing the assumed total planted length to 1000 metres.
- Trees have assumed to be planted at 8-metre centres, equating to 125 trees per hectare of road.
- Using the treatment train setup shown in Figure A.3 and inputs from Table A.13, a reasonable range of tree pit sizes were tested – from 1 x 0.6 metres up to 3 x 3 metres – to determine if there was a point of diminishing returns in flow and pollutant load reduction.
- The performance curves with respect to flow (MARV) and each pollutant type (TSS, TP and TN) are shown in Figure A.4 to Figure A.7 respectively. These curves show that while the reduction in MARV steadily increases with more tree surface area (due to increased evapotranspiration) within this range of pit sizes, there is a point of diminishing returns for the reduction in pollutant loads at a street tree pit of approximately 2 m^2. This street tree pit size was ultimately adopted for the presentation of results.

FIGURE A.3 MUSIC STREET TREE TREATMENT TRAIN

TABLE A.13 STREET TREE MUSIC INPUTS

MUSIC INPUTS	ADOPTED VALUE	ACCEPTABLE RANGE
High-flow bypass (m^3/s)	0.00042/tree	N/A - Represents TreeNet inlet
EDD (m)	0.01 m	In-house guidance
Surface area (m^2)	Varied during testing. Adopted: 2/tree	These parameters varied for the tested range of tree pit sizes. The $2m^2$ pit size was ultimately adopted for the presentation of results.
Filter area (m^2)	Varied during testing. Adopted: 2/tree	
Unlined filter media perimeter (m)	0.01	Represents lined
Ksat	50	50-100 (page 57). Loamy sand or Sandy Loam – imported material not in situ material.
Filter depth (m)	0.6 m	Can be <1m (in-house guidance)
TN content (mg/kg)	800	Low nutrient content TN<1000mg/kg (page 57). Setting this based on Blacktown Guidelines.
Orthophosphate content (mg/kg)	40	Available phosphate < 80 (page 57). Setting this based on Blacktown Guidelines
Exfiltration rate (mm/hr)	0	
Base lined	Yes	
Vegetation properties	Effective Nutrient Removal Plants	
Overflow weir width (m)	Varied during testing. Adopted: 6	Based on the adopted pit size of $2m^2$, this varied during testing. Has been set so that the pit can overflow from all four sides (should not be a point of restriction for the model).
Underdrain present	Yes	
Submerged zone with carbon present	No	

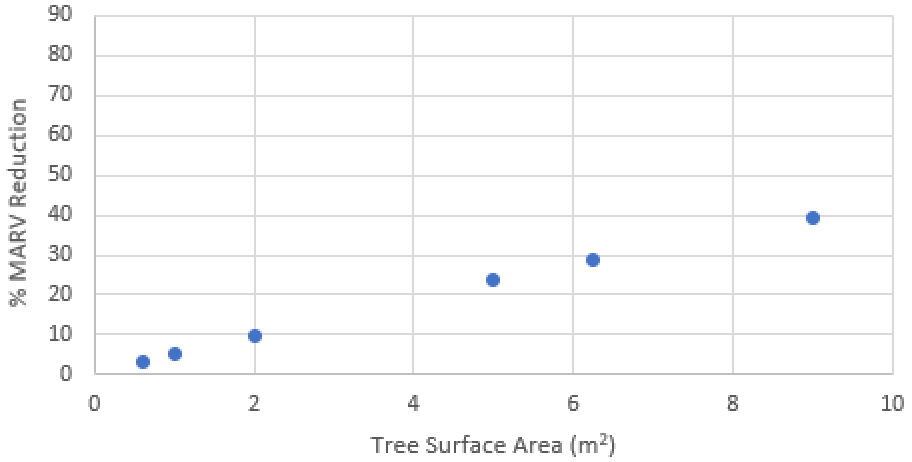

FIGURE A.4 RELATIONSHIP BETWEEN TREE SURFACE AREA AND MARV REDUCTION

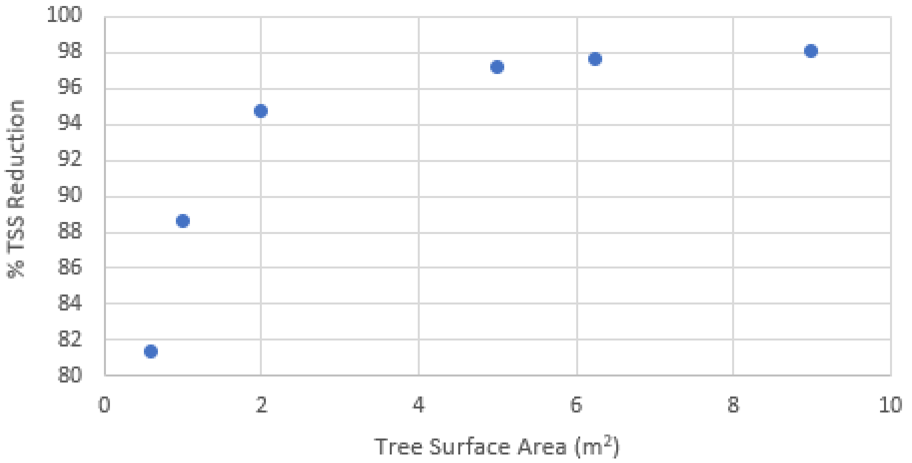

FIGURE A.5 RELATIONSHIP BETWEEN TREE SURFACE AREA AND TSS REDUCTION

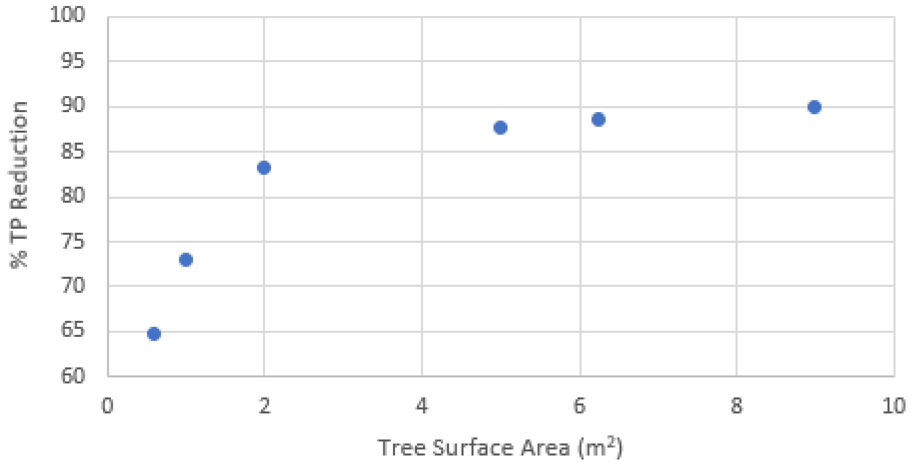

FIGURE A.6 RELATIONSHIP BETWEEN TREE SURFACE AREA AND TP REDUCTION

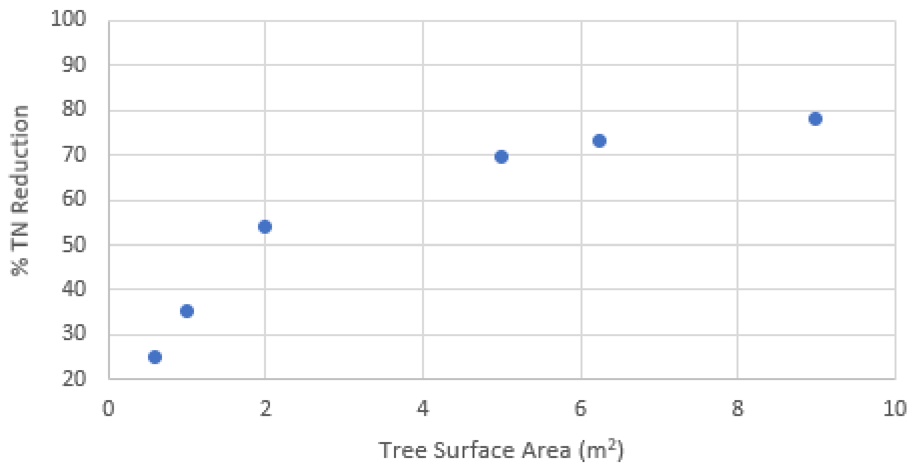

FIGURE A.7 RELATIONSHIP BETWEEN TREE SURFACE AREA AND TN REDUCTION

Note on Section 5 results where they relate to street tree performance:

- Street trees are modelled to show maximum possible removal of gross pollutants but effective gross pollutant removal will be dependent on the street tree pit inlet that Council approves. If a TreeNet inlet is used, most gross pollutants will continue along the road passage.
- Street trees could be shown to remove more total suspended solids (TSS), total nitrogen (TN) and total phosphorus (TP) (than results presented in Section 5) if a larger filter area per tree is adopted. A filter area of 2 m^2 (as discussed in **Error! Reference source not found.**was adopted for quantifying the effects of street trees on the water balance.
- Street trees contribute to the harvest / evapotranspire objective as they are assumed to be lined, and so the loss in flow volume is through evapotranspiration and not through infiltration.

A.5 Irrigation of public open space via stormwater harvesting

The methodology for assessing public open space was:

- Parcels of active open space were identified in each SRL East Structure Plan Area, and the portion of each parcel that was likely to be irrigated was approximated using an aerial image in GIS on a case-by-case basis as shown in Table A.15.
- Only active open space where there was a nearby Melbourne Water drain were considered for stormwater harvesting supply in this assessment, as it was assumed to provide sufficient flow. For the purpose of this assessment it was assumed connections requiring a pipe diversion of less than 250 metres would be acceptable. Parcels of passive open space where there is potential for connection to Melbourne Water drains was also identified but not included in the assessment.
- Where active open space was not close to a Melbourne Water drain as described above, it was assumed for the ultimate development scenario that these potable irrigation demands could be replaced with recycled water.
- An irrigation demand of 10ML/year/ha of irrigatable area was assumed.
- Three case studies for stormwater harvesting from stormwater drainage networks were compared: catchment area, irrigated area, tank size and performance for each study is summarised in Table A.14.

TABLE A.14 STREET TREE MUSIC INPUTS

STRUCTURE PLAN AREA	PARK NAME	MW DRAIN CONNECTION POTENTIAL	NON-POTABLE OPTION FOR DEVELOPED (2041 – WITH IWM) SCENARIO	AREA (M2)	PORTION IRRIGATED	IRRIGATED AREA (M2)	IRRIGATION DEMAND (ML/YEAR)
Cheltenham	Wangara Road Golf Driving Range	Y	Stormwater harvesting with recycled top-up as needed	66595	50%	33298	33.30
Clayton	Fregon Reserve	Y	Stormwater harvesting with recycled top-up as needed	35177	63%	22161	22.16
Clayton	Jack Meade Reserve	Y	Stormwater harvesting with recycled top-up as needed	23678	56%	13260	13.26
Monash	Carlson Avenue Reserve	Y	Stormwater harvesting with recycled top-up as needed	33337	50%	16669	16.67
Burwood	Gardiners Reserve (south of Highbury Road)	N	Recycled water	56665	53%	30032	30.03
Burwood	Bennettswood Reserve	N	Recycled water	48898	65%	31784	31.78
Box Hill	Box Hill City Oval and Whitehorse Reserve/Howard Wilson Oval	Y	Stormwater harvesting with recycled top-up as needed	73678	50%	36839	36.84
Box Hill	Surrey Park	N	Recycled water	156134	33%	51524	51.52

- . The three case studies are:
    - » Como Park Stormwater Harvesting Project, City of Stonnington (2012)
    - » Templestowe Reserve Stormwater Harvesting Project, Manningham City Council (2014)
    - » Fairpark Reserve Stormwater Harvesting Scheme Knox City Council (2014).
- A tank volume of 150 kL per hectare of irrigated land was adopted as a consistent assumption based on the median value from the Como Park case study.
- The stormwater harvesting tanks were sized and the demand calculated for each land parcel individually. The % demand met was then calculated using a water balance spreadsheet, which integrates seasonality in the demands as per Table A.17. The % demand met for each land parcel only varied between 68 to 70% for the assumed tank sizes.
- The public open space irrigation demand that was not met was assumed to be topped up by a recycled water source, and so there is no potable irrigation demand assumed for the ultimate development scenario.

TABLE A.15 IRRIGATION OF PUBLIC OPEN SPACE DEMAND ASSUMPTIONS

STRUCTURE PLAN AREA	PARK NAME	MW DRAIN CONNECTION POTENTIAL	NON-POTABLE OPTION FOR DEVELOPED (2041 – WITH IWM) SCENARIO	AREA (M2)	PORTION IRRIGATED	IRRIGATED AREA (M2)	IRRIGATION DEMAND (ML/YEAR)
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Box Hill	Surrey Park	N	Recycled water	156134	33%	51524	51.52

TABLE A.16 STORMWATER HARVESTING CASE STUDIES

CASE STUDY	COMO PARK	TEMPLESTOWE RESERVE	FAIRPARK RESERVE
Tank capacity (kL)	300	240	510
Catchment (ha)	365	8	20
Demand (ML/year)	15-20	3.4	
Amount harvested (ML/year)	15-20	2.4	4
Approx. irrigated area (ha) - measured in GIS	2	3	1.3
Tank vol / Irrigated Area (ML/ha)	0.15	0.08	0.39
Notes	"enough to supply 100% of irrigation requirements"	"70% reliability"	"10.8ML can be captured and treated with 4ML being used for irrigation"

TABLE A.17 DEMAND SEASONALITY

MONTH	MONTHLY PORTION OF ANNUAL DEMAND
Jan	15%
Feb	14%
Mar	12%
Apr	8%
May	5%
Jun	3%
Jul	2%
Aug	3%
Sep	5%
Oct	8%
Nov	12%
Dec	14%

A.6 Other opportunities

As mentioned in Section 2.4, the quantified IWM opportunities are not the only opportunities that may be implemented in the SRL East Structure Plan Areas. Other opportunities that should be investigated during preparation of the IWM Plans are detailed below. These opportunities may complement or replace the quantified opportunities in this IWM Strategy as appropriate.

LEAKY OR SMART RAINWATER TANKS

Rainwater tanks (non-leaky) were modelled for the IWM assessment to determine their effects on the water supply and the stormflow water balances. Leaky rainwater tanks (LRWTs) are a type of rainwater tank that allows the tank to slowly release a portion of its volume over a period of time, so that additional storage may be made available before storm events. As opposed to non-leaky rainwater tanks, there may be a benefit to considering LRWTs in areas that are known for flooding, so the tank may be able to capture a portion of the peak rainfall and contribute to flood reduction. Research on the cumulative benefits of Water Sensitive Urban Design for flood risk mitigation and using LWRTs for flood reduction is relatively new but is seen in studies such as 'Rainwater harvesting for urban flood management – An integrated modelling framework' (Jamali et al. 2019). The study shows the efficacy of using rainwater tanks including LRWTs for flood reduction is dependent on the rainfall characteristics and would be best supported by the use of real-time (smart) tanks that can automatically release water according to rainfall predictions, so the maximum volume is available to capture rainfall peaks. Leaky or smart rainwater tanks would contribute to the infiltration targets.

GROSS POLLUTANT TRAPS (GPTS)

Gross pollutant traps (GPTs) are a primary treatment device for gross pollutants such as rubbish, leaf litter and sediment. These should be placed at the upstream end of a treatment train such as before bioretention or wetlands.

As previously mentioned in Section 5.7, while the modelling does indicate the assessed IWM opportunities will achieve the gross pollutant (litter) reduction target for all SRL East Structure Plan Areas excluding the Monash Structure Plan Area, the efficiency of street trees for removing gross pollutants depends on the inlet design (as noted in Section 2.5) and will likely need complementary Water Sensitive Urban Design devices such as gross pollutant traps to achieve this target. GPTs were not modelled as they should be sized specific to their upstream catchment and must be located on drainage lines where there is sufficient access for maintenance and sufficient grade on the drainage lines. It is recommended that an options assessment for GPT locations is assessed for each SRL East Structure Plan Area during preparation of the IWM Plans. Consideration should also be given to the stormwater harvesting to irrigate public open space opportunities, as GPTs will be needed at any diversions from the Melbourne Water drains before the stormwater is collected in storage tanks for use.

PERMEABLE PAVING

Permeable paving will be an essential IWM opportunity to investigate during preparation of the IWM Plans to contribute to meeting the infiltration / filter quantitative performance objective for urban stormwater (EPA Victoria Publication 1939.1). The IWM opportunities assessed in this IWM Strategy currently meet 0% of this guideline. As the SRL East Structure Plan Areas develop, any new internal roads, outdoor carparks or otherwise impervious surfaces such as any new non-grassed active open space should investigate the use of permeable paving. Using permeable pavers instead of traditional hardstand pavement allows rainfall to infiltrate into the sub-surface, recharging the local groundwater table and reducing MARV that may degrade local waterways. While a reduction in MARV is achieved with the assessed IWM opportunities, groundwater recharge is not addressed in this IWM Strategy. Permeable paving would contribute to the infiltration targets.

STREETSCAPE TREATMENT DEVICES: RAIN GARDENS, BIORETENTION SWALES

Passive irrigation of street trees is the only streetscape treatment opportunity assessed for this IWM Strategy as it addresses water quality improvement and also supports urban greening and cooling as well as enhanced environmental and biodiversity outcomes. The SRL East Structure Plan – Urban Design reports also recommend green street improvements, so passively irrigated street trees as an IWM opportunity supports this.

However, it is important to note there are other opportunities that can and should be investigated on a case-by-case basis for the IWM Plans where:

- Additional infiltration and/or water quality improvement is needed to meet targets and/or guidelines
- Where passively irrigated street trees are not feasible to implement
- Where other treatment devices may be considered more appropriate.

The design of rain gardens and bioretention swales are different, but both treatments capture stormwater and slow overland flows, allowing for stormwater infiltration and treatment. Slowing of flows and infiltration may have added benefits on localised flood mitigation. In terms of the quantitative performance objectives for urban stormwater (EPA Victoria Publication 1739.1), it has been assumed that street trees will be lined and so only contribute to the evapotranspiration objective, while rain gardens and bioretention swales would assist in contributing to the infiltration objective.

END OF PIPE OPPORTUNITIES: BIORETENTION, WETLANDS, PONDS

The introduction of end of pipe (EOP) opportunities (tertiary treatment) such as bioretention, wetlands and ponds are place-based opportunities that occur at the downstream end of a treatment train and would either outlet into receiving waterways or be collected in stormwater harvesting ponds for reuse. The limitation to this type of opportunity in an urban-fill setting is available space, connection to existing drainage assets, engineering constraints and acceptance from the community (as while these assets may provide amenity value, they may take up valuable open space).

Bioretention and wetlands in particular provide credible water quality improvement potential and may also contribute to achieving a combination of other IWM-related targets such as greening and cooling of the catchment and support local ecology and bird life. EOP opportunities may also have flood mitigation benefits in slowing down peak flows, but flood mitigation potential depends on the catchment characteristics (such as time of concentration of the upstream catchment with respect to the total catchment) and is subject to flood modelling of the solution.

Pairing EOP opportunities such as wetlands with stormwater harvesting ponds will have combined benefits in improving water quality while also providing a non-potable water source for stormwater harvesting. This could be further investigated to replace the proposed underground storage tanks for the irrigation of public open space opportunity discussed in this IWM Strategy. However, as mentioned, space will likely be the biggest constraint and there will unlikely be opportunities for above-ground EOP where there is also active open space. Alternatively, passive open space could be investigated as possible land for EOP opportunities, and stormwater harvesting could contribute to surrounding on-lot demands if investigated and found feasible.

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B.1 Victoria Planning Provisions

Clause 53.18-5 – Stormwater management objectives for buildings and works (Standard W2) include:

- To encourage stormwater management that maximises the retention and reuse of stormwater
- To encourage development that reduces the impact of stormwater on the drainage system and filters sediment and waste from stormwater prior to discharge from the site
- To encourage stormwater management that contributes to cooling, local habitat improvements and provision of attractive and enjoyable spaces
- To ensure that industrial and commercial chemical pollutants and other toxicants do not enter the stormwater system.

Standard W2 also requires the design of a stormwater management system to meet the Urban Stormwater–-Best Practice Environmental Management Guidelines (Victorian Stormwater Committee 1999).

Clause 53.18-6 – Site management objectives (Standard W3) include:

- To protect drainage infrastructure and receiving waters from sedimentation and contamination
- To protect the site and surrounding area from environmental degradation prior to and during construction of subdivision works.

Standard W3 requires an application to describe how the site will be managed prior to and during the construction period.

The decision guidelines at Clause 53.18-7 guide the assessment of applications against the objectives.

CLAUSE 55 – TWO OR MORE DWELLINGS ON A LOT

Clause 55 applies to the construction or extension of two or more dwellings on a lot and residential buildings (of less than five storeys) within the Neighbourhood Residential Zone, General Residential Zone, Residential Growth Zone, Mixed Use Zone or Township Zone. The Clause includes objectives, standards and decision guidelines applying to the above-mentioned developments. A standard includes requirements to meet the objective and should be met, but if a responsible authority is satisfied that an application for an alternative design solution meets the objective, the alternative design solution may be considered.

Clause 55.03-4 – *Permeability and stormwater management objectives* seeks to:

- Reduce the impact of increased stormwater run-off on the drainage system
- Facilitate on-site stormwater infiltration
- Encourage stormwater management that maximises the retention and reuse of stormwater.

Standard B9 identifies that the site area covered by pervious services should be at least the minimum area specified in the schedule to the zone or 20 per cent of the site (if no minimum area is specified in the schedule to the applicable zone). The Clause states the stormwater management system should:

- Meet the current best practice performance objectives for stormwater quality as set in the Urban Stormwater – Best Practice Environmental Management Guidelines (Victorian Stormwater Committee 1999)
- Contribute to cooling, improving local habitat and providing attractive and enjoyable spaces.

Clause 55.07-5 – *Integrated water and stormwater management* applies to apartment developments of four storeys or less (excluding a basement). Standard B39 identifies that buildings should be designed to collect rainwater for non-potable purposes and that buildings should be connected to a non-potable dual pipe reticulated water supply (where available from the water authority). Further, the stormwater management system should be:

- Designed to meet the current best practice performance objectives for stormwater quality as set in the Urban Stormwater – Best Practice Environmental Management Guidelines (Victorian Stormwater Committee 1999)
- Designed to maximise the infiltration of stormwater, water and drainage of residual flows into permeable surfaces, tree pits and treatment areas.

CLAUSE 58 – APARTMENT DEVELOPMENTS

The provisions of Clause 58 apply to a planning application to construct or extend an apartment development, or construct or extend a dwelling that forms part of an apartment building if:

- The apartment development is five or more storeys (excluding basement) and is within the General Residential Zone, Residential Growth Zone, Mixed Use Zone or Township Zone, or
- The apartment development is within the Commercial 1 Zone, Commercial 3 Zone, Special Use Zone, Comprehensive Development Zone, Capital City Zone, Docklands Zone, Priority Development Zone or Activity Centre Zone.

Clause 58.03-8 – *Integrated water and stormwater management* seeks to:

- Encourage the use of alternative water sources such as rainwater, stormwater and recycled water
- Facilitate stormwater collection, use and infiltration within the development
- Encourage development that reduces the impact of stormwater run-off on the drainage system and filters sediment and waste from stormwater prior to discharge from the site.

Standard D13 outlines discretionary requirements, including:

- Buildings should be designed to collect rainwater for non-drinking purposes such as flushing toilets, laundry appliances and garden use
- Buildings should be connected to a non-potable dual pipe reticulated water supply, where available from the water authority.

Standard D13 also states that any stormwater management system should be designed to meet the current best practice performance objectives for stormwater quality in accordance with the Urban Stormwater – Best Practice Environmental Management Guidelines and designed to maximise infiltration of stormwater, water and drainage of residual flows into permeable surfaces, tree pits and treatment areas.

MONASH PLANNING SCHEME

Monash Planning Scheme policies and provisions relevant to flooding and water management are summarised below.

CLAUSE 19.03.3L – STORMWATER MANAGEMENT

This Clause seeks to encourage the provision of on-site retention systems so that stormwater discharge is maintained at pre-development levels.

Strategies to achieve this are:

- Manage stormwater flows generated from increased impervious areas by providing on-site retention systems

- Encourage the design, construction and operation of drainage systems to reduce impacts on surface waters and groundwater
- Promote the use of Water Sensitive Urban Design techniques that use non-structural devices to reduce the amount of pollutants entering the stormwater system, and structural devices to intercept pollutants that have already entered the system
- Where on-site detention is not provided, or the impervious area of the site is greater than 35 per cent of the site area a levy is to be charged by a local council.

This policy expires 23 May 2027.

WHITEHORSE PLANNING SCHEME

Whitehorse Planning Scheme policies and provisions relevant to flooding and water management are summarised below.

CLAUSE 21.05 – ENVIRONMENT

This Clause includes a number of strategies at Clause 21.05-4 to achieve environmental objectives, including:

- Implementing ecological sustainability principles and the Council's Sustainability Strategy
- Encouraging water and energy efficient practices through the Council's Energy and Water Action Plans
- Implementing best practice in environmentally sustainable development.

CLAUSE 22.10 – ENVIRONMENTALLY SUSTAINABLE DEVELOPMENT

This Clause includes a framework for early consideration of environmental sustainability at the building design stage to achieve IWM.

The overarching objective is that development should achieve best practice in environmentally sustainable development from the design stage through to construction and operation. Objectives relevant to stormwater management provisions for urban development require meeting best practice stormwater quality.

Clause 22.10-4 includes application requirements to use the STORM and/or MUSIC tools for development to determine if the design of stormwater treatments and size and meets minimum planning requirements.

Other planning provisions

Given the environmental significance of Gardiners Creek to the SRL East Structure Plan Areas, there are various clauses within the Whitehorse Planning Scheme of relevance:

- Gardiners Creek forms part of important open space linkages and is viewed as a significant environmental, landscape and recreation location (Clause 21.01 – *Municipal profile*).
- Properties abutting or situated close to Gardiners Creek will contain substantial vegetation and development will be sited so the overall visibility of buildings is minimised when viewed from the open space corridors (Clause 22.03-5 – *Preferred character statements [Bush suburban 3]).*
- The maintenance of an adequate buffer strip along Gardiners Creek (Decision Guidelines to Schedule 1 to Clause 43.02 Design and Development Overlay – Jeffery Street Area).
- The justification for any building within 60 metres of the banks of Gardiners Creek, which is higher than 6 metres above ground level (Decision Guidelines to Schedule 2 to Clause 43.02 – Design and Development Overlay – Gardiners Creek Environs).

- The maintenance of an adequate buffer strip along watercourses, roads, rail lines and other property boundaries (Decision Guidelines to Schedule 1 to Clause 42.03 – Significant Landscape Overlay – Blackburn Area 1).

While these are design controls, they also serve the purpose of managing flood storage and flow. These should be maintained and protected through the structure planning process.

WHITEHORSE INTEGRATED WATER MANAGEMENT STRATEGY 2022–2042

The Whitehorse Integrated Water Management Strategy 2022–2042 supports delivery of IWM through Council initiatives. The policy acknowledges that IWM should be delivered on private land but acknowledge significant investment will be required to facilitate this. The Integrated Water Strategy adopts 10-year targets to be achieved by 2030, including that 15 per cent of the Council's water use will be sourced from alternative sources, and that 100 per cent of projects should consider IWM and flood mitigation as part of their design.

KINGSTON PLANNING SCHEME

Kingston Planning Scheme policies and provisions relevant to flooding and water management are summarised below.

CLAUSE 19.03-3L-01 – INTEGRATED WATER MANAGEMENT

This Clause includes strategies to:

- Promote the use of Water Sensitive Urban Design, including stormwater re-use
- Ensure new residential development contributes to the upgrading of local drainage infrastructure, where the development will impact on the capacity of such infrastructure
- Design drainage systems to minimise potential for transportation of silt and debris, and provide for their collection and removal at accessible locations
- Ensure that buildings and works do not increase or divert overland flows, causing increased flooding on adjacent properties.

CLAUSE 19.03-3L-02 – STORMWATER MANAGEMENT

This Clause provides guidance for stormwater management and refers to the civil design requirements for further detail. It includes strategies to:

- Incorporate the use of Water Sensitive Urban Design measures in development including stormwater reuse
- Design development to meet the best practice performance objectives for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN) as set out in the Urban Stormwater – Best Practice Environmental Management Guidelines (Victoria Stormwater Committee 1999)
- Maintain or improve the quality of stormwater within or exiting the site
- Minimise stormwater discharge and limit adverse effects on the water quality entering the drainage system
- Provide opportunities for water conservation and reuse.

Policy guidelines and documents considered relevant include:

- Using stormwater protection measures such as silt traps during construction
- Kingston Civil Design Requirements for Developers Part A: Integrated Stormwater Management (May 2016).

BAYSIDE PLANNING SCHEME

Bayside Planning Scheme policies and provisions relevant to flooding and water management are summarised below.

CLAUSE 19.03-3L-01 – INTEGRATED WATER MANAGEMENT

This Clause includes strategies to:

- Restrict site coverage and hard surface area where the drainage capacity is limited and the area is subject to flooding
- Encourage recycling of stormwater for use on gardens and nature strips
- Manage the impact of increased development on the quantity and quality of stormwater drainage into the environment.

CLAUSE 19.03-3L-02 – WATER SENSITIVE URBAN DESIGN

This Clause includes a strategy that seeks to design stormwater quality treatment measures to prevent litter being carried to receiving waters. This includes appropriate design of waste enclosures and use of gross pollutant traps for development with potential to generate significant amounts of litter.

The policy refers to the *Water Sensitive Urban Design Compliance Guidelines for New Development* (Bayside City Council 2009). The objectives of these guidelines are to:

- Promote the use of water sensitive urban design, including stormwater re-use
- Protect the surface water and ground waters in the Port Phillip Bay catchment from stormwater pollutants
- Reduce the effects of peak stormwater flows
- Integrate stormwater treatment measures into the landscape
- Reduce the entry of pollutants into stormwater run-off.

The guidelines provide direction and guidance to Bayside City Council as the responsible authority in decision-making on the management of stormwater as part of new development. Given the age of the guidelines, planning policy and industry guidance has been updated since and may be more relevant than Clause 190.03–SL–02. However, it remains relevant and supports the implementation of IWM and Water Sensitive Urban Design.

STRATEGIC POLICY

PLAN MELBOURNE 2017 – 2050

Plan Melbourne (DELWP 2017b) is the Victorian Government's long-term metropolitan planning strategy. Of particular relevance is Outcome 6 that seeks to make Melbourne a more sustainable and resilient city.

Direction 6.3 and related policies on water management have been strengthened to reduce pressure on water supplies and improve IWM approaches.

Policy 6.3.2 seeks to improve alignment between urban water management and planning by adopting an IWM approach.

Plan Melbourne supports the implementation of Victoria's water plan, Water for Victoria, by protecting water assets and influencing how development occurs across new and established urban areas.

Plan Melbourne is being updated to Plan for Victoria and is currently under consultation.

WATER FOR VICTORIA

Water for Victoria (Victorian Government 2016) is the strategic plan for managing water resources now and into the future. The vision of Water for Victoria is *'we will ensure we manage water to support a healthy environment, a prosperous economy and thriving communities'.*

Water for Victoria identifies 10 key areas to implement the strategic plan. One theme is 'resilient and liveable towns and cities' with the objective to transform Victorian cities and towns into the most resilient and liveable in the world. It seeks to include all elements of the urban water cycle in the way water is planned and managed so that Victorian communities can continue to thrive in all climates.

Actions relevant to delivering on the resilient and liveable towns and cities within the SRL East Structure Plan Areas are:

- Action 5.1 – Use diverse water sources to protect public spaces
- Action 5.3 – Reinvigorate water efficiency programs such as by helping to facilitate Target 155 for households
- Action 5.4 – Make the most of investment in wastewater, such as the potential for recycled water networks
- Action 5.5 – Improve stormwater management for greener environments and healthier waterways.

CENTRAL AND GIPPSLAND REGION SUSTAINABLE WATER STRATEGY, 2022

The Central and Gippsland Region Sustainable Water Strategy (DELWP 2022) seeks to secure the region's water future in the face of drier climate conditions and a growing population. The strategy supports investment in water efficiencies for homes, business and transitioning the region to greater reliance on manufactured water. Manufactured water includes fit-for-purpose recycled water, treated stormwater and desalination.

Melbourne average per capita water use target is 150 litres per person per day. This can be achieved with water efficient building and rainwater tanks, building and plumbing controls. Small water savings can accumulate to make a big impact on the region's long-term water supplies and is of relevance to the strategic planning of SRL East Structure Plan Areas.

GREATER MELBOURNE URBAN WATER & SYSTEM STRATEGY: WATER FOR LIFE, 2022

The Greater Melbourne Urban Water & System Strategy builds on the work of the Central and Gippsland Region Sustainable Water Strategy (DELWP 2022) to focus on the metropolitan Melbourne area. Melbourne's population is expected to double by 2070 and the draft strategy sets out a 50-year plan to manage urban water security, balancing the broad range of water values and needs of the region now and into the future.

Relevant to the SRL East Structure Plan Areas is IWM as a key component of achieving the state's water security objectives. By expanding the portfolio of water resources to include rainwater tanks, stormwater harvesting, fit-for-purpose recycled water, and exploring aquifer storage and recovery opportunities to increase their resilience and security.

ORDER FOR OBLIGATIONS OF MANAGERS OF LAND OR INFRASTRUCTURE (OMLI) (URBAN STORMWATER MANAGEMENT AND ON-SITE WASTEWATER MANAGEMENT) – ENVIRONMENT PROTECTION ACT 2017

This OMLI states that local councils must develop and publish a plan that so far as reasonably practicable identifies actions with implementation timeframes to minimise the generation and transport of pollutants in urban stormwater, and to minimise the generation, velocity and volume of urban stormwater flows. The plan must be prepared in consultation with relevant stakeholders and updated every 5 years.

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Appendix C

Peer review report

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

Peer Review of Hydrology, Flooding and Integrated Water Management Strategy

Suburban Rail Loop East Precinct Planning

Suburban Rail Loop Authority

Project Details

Project Name	Suburban Rail Loop East Precinct Planning
Client	Suburban Rail Loop Authority
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ACKNOWLEDGEMENT OF COUNTRY

The Board and employees of Water Technology acknowledge and respect the Aboriginal and Torres Strait Islander Peoples as the Traditional Custodians of Country throughout Australia. We specifically acknowledge the Traditional Custodians of the land on which our offices reside and where we undertake our work.

We respect the knowledge, skills and lived experiences of Aboriginal and Torres Strait Islander Peoples, who we continue to learn from and collaborate with. We also extend our respect to all First Nations Peoples, their cultures and to their Elders, past and present.

Artwork by Maurice Goolagong 2023. This piece was commissioned by Water Technology and visualises the important connections we have to water, and the cultural significance of journeys taken by traditional custodians of our land to meeting places, where communities connect with each other around waterways.

The symbolism in the artwork includes:

- *Seven circles representing each of the States and Territories in Australia where we do our work*
- *Blue dots between each circle representing the waterways that connect us*
- *The animals that rely on healthy waterways for their home*
- *Black and white dots representing all the different communities that we visit in our work*
- *Hands that are for the people we help on our journey*

CONTENTS

1 INTRODUCTION AND BACKGROUND

1.1 The Project

The Suburban Rail Loop Authority (SRLA) is a statutory authority within Victorian that is responsible for the planning and delivery of the Suburban Rail Loop (SRL) project. This is a large rail infrastructure project which will ultimately provide an orbital rail loop connecting the existing radial system of railway lines that extend outwards from the Melbourne CBD. The first stage of this project is SRL East, that runs from Cheltenham to Box Hill.

The SRL East project includes 6 underground stations that will provide access to the line. In addition to responsibility for the infrastructure delivery, SRLA is a planning authority under the Planning and Environment Act 1987. In this capacity the SRLA is overseeing the development of Structure Plans for precincts associated with each of the SRL East stations.

There are a range of investigations that have been undertaken to support the precinct planning process. Work that specifically relates to surface water management (including flooding) includes the following two studies:

- SRL East Structure Plan - Flooding Technical Report
- SRL East Structure Plan - Integrated Water Management Strategy

The final version of these reports are “SRL East Structure Plan - Flooding Technical Report” Revision 1 February 2025, AJM Joint Venture and “SRL East Draft Structure Plan – Integrated Water Management Strategy” Revision 1 February 2025, AJM Joint Venture.

1.2 Peer Review

In October 2023 I was engaged on behalf of the SRLA to undertake independent peer review of the flooding and water management technical reports for the SRL East precincts.

Through the course of the peer review I have been engaged in conferences with the technical project teams undertaking the investigations. This was primarily related to the scoping of the investigations and discussion of broad approaches, methods and assumptions. Subsequently I have incrementally provided review and comments on progressive drafts of the reports through their development phase.

2 SCOPE AND METHOD

The scope and nature of my review has been to assess the overall method and approach for each report, along with the assumptions and limitations. I have addressed each section and provided feedback during the document development phase.

While reviewing the material I have been conscious of the context of the technical reports that are intended to inform the overall planning process and constructively contribute to the consideration of each precinct.

Specifically, I have been asked to address the following matters:

- The scope of my role in reviewing the Flooding Technical Report and IWMS;
- The appropriateness of the methodology, assumptions and limitations in the Flooding Technical Report and IWMS; and
- Whether the findings, assessment outcomes and recommendations in the Flooding Technical Report and IWMS are appropriate in the context of the structure planning process for the SRL East Structure Plan Areas.

3 FLOODING TECHNICAL REPORT

3.1 Method

The method applied for the investigation consisted of:

- A desktop review of the legislative and policy framework around flood management in the urban context for Melbourne.
- Identification of existing flooding conditions in the Structure Plan Areas.
- Assessment of risks and opportunities relating to flooding and development in the Structure Plan Areas (based on existing flood models and data), which included:
  - A flood safety assessment for the Burwood and Box Hill Structure Plan Areas, and
  - A flood impact assessment of the Burwood Structure Plan Area
- Recommendations responding to the identified flood conditions

Section 2.7 of the report addresses assumptions and limitations that have been applied to the investigation. They principally recognise the reliance of the work on existing flood and other information available at present. I consider these assumptions to be reasonable and appropriate.

The use of current hazard classifications (based on Australian Rainfall and Runoff, 2019) and latest Melbourne Water Technical Specifications for Flood Mapping is appropriate for the assessment. I note that the older Melbourne Water street safety classification has also been applied; only to the flood study data sets that pre-date the more contemporary flood information. This is considered a reasonable approach as it makes best use of the available information to provide the maximum coverage of area potentially impacted by flooding.

The precincts are all within well established urban areas that have formal, defined surface water drainage systems and urban built form. This includes the various land uses and major infrastructure such as roads and water/power networks.

This means that the context and needs of precinct planning in these areas is very different to that for greenfield precincts in urban growth areas. In greenfield areas the drainage infrastructure is not established yet and a significant effort is required to define and optimise the proposed drainage services. For the precinct planning areas I understand there is not proposed to be any significant reconfiguration of the overall development footprint such as the location of major roads and drainage infrastructure (acknowledging there may be some consolidation of existing lots).

No new hydrologic or hydraulic models have been established for the purposes of this investigation and the analysis utilised existing model data. One existing model was re-run for the preliminary flood impact assessment at Burwood.

The time and resource investment to develop six, new and detailed hydrologic and hydraulic models for this project would be difficult to justify and may not add significant value to the precinct planning process. It is noted in the report that Melbourne Water (together with Councils) are currently developing new flood information across Melbourne. I expect this newly generated Melbourne Water data will inform future flood assessments of any proposed developments under the precinct plans. Hence this would be likely to supersede any project specific modelling undertaken for this investigation. It is also reasonable to expect that some aspects of the technical guidelines around flooding are likely to continue to evolve over time, particularly with respect to climate change.

Hence, I consider the overall method proposed for the flooding report is appropriate for the purposes of precinct planning in the context of the SRL East project.

3.2 Legislative and policy context

Section 4 of the report addresses the relevant planning and policy documents, along with a listing of the relevant regulatory authorities with respect to flooding. This section covers all the areas I would expect to see in such a review and that in my experience are pertinent to the flood risk assessment and planning area.

3.3 Flooding Assessment

Section 5 of the report details, based on available flood studies and data, the existing flood risk across each of the 6 precincts. The description of flood risk in terms of inundation extent, depth and hazard (where available) is clear and well described. Efforts have been made to identify what could be defined as “hot spots” or areas of specific local increased flood risk, which is useful from a planning perspective as this identifies both where areas of flood related constraint are located, along with the areas of potential opportunity to contribute to future mitigation of flood impacts.

The information is focussed on the 1% Annual Exceedence Probability (AEP) plus climate change (reflected through increased rainfall intensity scenarios). Whilst this provides a snapshot of the most severe flood profile within the available flood information, I consider this is appropriate for planning purposes. In a strategic planning sense this is the key piece of information and adding large amounts of additional information on more frequent flooding could overly complicate the report and take focus from the principal area of interest.

It is interesting to note that, apart from Burwood, the other precinct locations tend to be at the upper end of urban stormwater catchments or on a ridge between two or more catchments. This is a key finding and has significant implications for future consideration of flood risk as, apart from Burwood, there is little requirement for the consideration of external catchment flows for the precinct areas. The report figures demonstrate this clearly which will be an important input to the precinct planning process going forward.

It is also pointed out that there is only one recognised waterway (Gardiners Creek in Burwood) that is directly impacted by any of the precincts. This is useful to the consideration of flooding and waterway issues as it significantly reduces the range of issues that need to be addressed from a flooding perspective for most of the precinct areas.

3.4 Risks and Opportunities

Section 6 of the report addresses risks in the Burwood and Box Hill Structure Plan Areas. The additional analysis in these two areas has been driven by the availability of information to underpin the additional analysis. I consider the additional analysis undertaken for these two areas provides significant value to the overall report.

The way in which the properties have been classified (for example Figure 6-1) is instructive and informs the planning process with a clear visual guide to flood risk and access safety. The breakdown of percentage areas that are flood “safe” or “constrained” is particularly useful and the consistency between the two areas provides an insight into the likely results for other areas. It would be helpful as future flood information becomes available for this analysis to be extended to other Structure Plan areas.

The flood impact assessment for the Burwood Structure Plan area provides insight regarding what future flood impact studies may reveal in relation to the proposed level of redevelopment in the Structure Plan areas. Whilst it is recognised that these results are preliminary, the overall trends can be considered reasonable and can be used as to guide further development and implementation of the structure plans.

Section 6.2 notes states that “Melbourne Water will remain the floodplain management authority for the SRL East Structure Plan Areas”. Whilst this is true it is important to also recognise that Councils are also likely to have some responsibility for flood referrals in council controlled stormwater catchments with overland flow.

Current Melbourne Water flood mapping projects that are generally undertaken commonly produce overlays which trigger Council referrals within the planning framework. Future planning scheme amendments that implement flood-related controls may separate out SBO into Melbourne Water (SBO1) and Council (SBO2) drainage areas.

Under section 6.2.2 I note that, while it is true that the present state planning provisions strictly only require the consideration of the existing 1% AEP design flood, it is becoming more common for floodplain authorities to require the 1% AEP with climate change scenario to be applied as the planning standard for development assessment (for example see amendment C384 for City of Melbourne Planning Scheme). I note that the material presented in this report has, where data is available, taken climate change into consideration.

I note in the last paragraph of section 6.2.2 that mitigation options in open space or on public land associated with developments are flagged. It is important to recognise that such solutions are difficult to achieve in the context of a standard planning permit for development. Such mitigation options would more likely need to be driven by Melbourne Water and/or Councils, separate to the development application process. Potentially a re-development charge scheme or some other mechanism would be required to facilitate this (outside Melbourne Water's normal flood mitigation works program). The report does raise the Urban Renewal Cost Recovery Scheme (URCRS) scheme being investigated in the Arden-Macaulay Precinct. A similar scheme would involve a complex process and something that would require significant effort establish. Apart from Burwood (with Gardiners Creek) there is no single source of flooding that could be readily mitigated in most of the Structure Plan areas.

3.5 Recommendations

The study recommendations are considered reasonable and appropriate.

Under section 7.1.5 (11) a 30 m minimum setback is recommended. This is in line with the planning provisions, although it is important to recognise that in some existing areas this is not always achievable within historic lot boundaries. It may be that in some areas, as with flooding hazard, lot consolidation may be necessary to overcome these constraints. I consider that some level of flexibility is always desirable when dealing with planning matters related to natural systems such as waterways and floodplains.

It is recommended for most of the areas that lot consolidation can be a practical way of addressing safety access issues. I agree with this approach and it may be that at some point in the future, areas where optimal consolidation may be required could be identified. This would provide maximum transparency to potential developers and improve the potential for optimised outcomes from a flood risk management perspective.

Throughout Section 7 I support the recommendation of a risk-based design approach and consider this to be an appropriate response to infill development.

4 INTEGRATED WATER MANAGEMENT STRATEGY

4.1 Method

The approach to the IWMS is described as high level and is consistent with the current stage in the overall process of planning for the precincts. The IWMS includes a review of the current policy framework and then goes on to explore high-level IWM opportunities for the precinct areas using a standard hydrologic modelling approach (MUSIC). I consider the approach and level of detail provided in the report to be appropriate for the high-level planning requirements of the Structure Plans.

The modelling methodology is primarily based on hydrologic modelling (water balance analysis). I note the following:

- A water demand analysis has been undertaken to determine impacts on potable water supply:
  - This water balance modelling is based on the population projections provided by the Housing Needs Assessment for each Structure Plan Area. This is a reasonable basis for establishing demand. The study is clearly preliminary in nature and seeks to establish opportunities for IWM that can be pursued in later, more detailed investigations (individual precinct IWM plans).
  - There will be some discrepancies between the baseline assumptions and likely ultimate Precinct outcomes (e.g., adopted land use assumptions have not been reconciled with the transport zones used to provide the population and jobs data), the approach provides a fit-for-purpose overall assessment of current and future demands.
- A MUSIC analysis has been undertaken, to assess Mean Annual Runoff Volume (MARV), impact of Precinct development on the receiving environment and quantify possible benefits from WSUD assets and other IWM solutions (e.g., stormwater harvesting):
  - Results were compared against Best Environmental Practice Management (BPEM) quantitative performance objectives for urban stormwater and the EPA 1739.1: Urban Stormwater Management Guidance.

Details of the modelling methodology and process are outlined in Appendix A. This provides an appropriate level of detail regarding the parameters and assumptions used to inform the modelling process. It is acknowledged that a number of simplifying assumptions were made that are considered reasonable for this exercise. A standard 1-hectare MUSIC model catchment was utilised and then scaled up for different catchment areas. This is an acceptable approach.

Whilst custom rainfall templates for each locality could have been developed, which may lead to some small variations in model outputs, it is recognised that the improvement in reliability of the results would be minor and for the demonstrative purposes of modelling exercise was not warranted. The report at Appendix A1 states that “This assumption may overestimate the stormflow generated for the Cheltenham Structure Plan Area but is not expected to affect the strategic insights”. I agree with this assessment.

Overall, I consider the methods applied in the determination of IWM opportunities to be satisfactory and appropriate for this investigation.

4.2 Policy, frameworks and guidelines

Section 4 in the report (along with Appendix B) provides a detailed review of the over-arching policies, framework and guidelines that impact IWM in Melbourne and Victoria and are of relevance to the SRL East Precincts.

This section is effective in linking the key drivers from policy with the stakeholders that will are engaged in the process. IWM is a complex area with (compared to say the flood management area) a less well defined set of performance requirements and less clear accountabilities, along with a distributed regulatory framework.

The report is clear in highlighting the areas within the overall IWM framework that are of relevance to the SRL East Precincts (for example Table 4.3).

In section 4.7 the report states that "While the objectives of EPA Victoria Publication 1739.1 are not currently enforced by the planning schemes, this IWM Strategy adopts these performance objectives as the benchmark for IWM opportunities to achieve best practice stormwater management". I support this approach as I consider it is likely that over time these objectives will become more strongly embedded in planning policy.

The report identifies relevant potential/future IWM schemes within each Precinct and relevant catchment objectives from the IWM Framework for Victoria. It is appropriate to refer to the state IWM framework. As identified in the IWMS, the future IWM plans will benefit by aligning with works by other relevant stakeholders (e.g., South East Water regarding likely future opportunity for recycled water).

4.3 IWM Assessment

This section provides a high-level options assessment for each Precinct. Each precinct has been considered in a similar manner, including:

- Identifying roads where passively irrigated street trees could be incorporated;
- Assessing possible reductions to future water demand, based on IWM solutions including:
  - Rainwater tanks;
  - Recycled water re-use;
  - Alternative water (stormwater harvesting or recycled water) for irrigation of active and passive open space.
- Mitigation of Mean Annual Runoff Volume (MARV) and pollution using the above IWM solutions.
  - MARV and overall water quality treatment performance are reported and compared against Best Environmental Practice Management (BPEM) quantitative performance objectives for urban stormwater and the EPA 1739.1: Urban Stormwater Management Guidance.

Whilst the water balance modelling is based on generic assumptions for each overall precinct area, there are specific opportunities identified within each area (for example stormwater harvesting in a particular reserve). This gives a more tangible level of opportunity assessment and provides a starting point for future detailed IWM plans for each precinct.

I note that the assumed water tank sizes are large if considering standard residential lots, however it is recognised that the future scenarios will involve higher density developments that may accommodate more substantial IWM measures and that this is a conceptual analysis to demonstrate the potential level of system performance. As such I consider the assumptions around rainwater tanks and the water balance to be acceptable.

The proposed approach aligns with Melbourne Water's recommendations that an integrated water management process should be considered for the whole precinct. I consider this is an appropriate way to address IWM opportunities.

4.4 Recommendations

The recommendations are considered concise, targeted and appropriate for this type of strategic level investigation. There overall strategy is demonstrated to have the potential to significantly reduce potable water demand and work towards quality and quantity objectives.

5 CONCLUSIONS

The Flooding Technical Report and Integrated Water Management Report for the SRL East Structure Plan have been reviewed for their technical approach and the outputs that have been generated.

Through the course of this review I have considered the assumptions behind each report and the suitability of the approach and outputs for the intended purpose of informing the strategic planning process.

Overall, I consider that the methodology, assumptions and limitations in the Flooding Technical Report and IWMS are appropriate.

I am also of the view that the findings, assessment outcomes and recommendations in the Flooding Technical Report and IWMS are appropriate in the context of the structure planning process for the SRL East Structure Plan Areas.

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