Integrated Water Management Plan

2019 – 2024

Developed on behalf of:

The Baw Baw Shire Integrated Water Management Plan was endorsed at the 14 December 2019 Council Meeting.

Prepared by:

TRADITIONAL OWNER ACKNOWLEDGEMENT

Baw Baw Shire Council and E2Designlab acknowledge the Traditional Owners of the region of Baw Baw Shire. We pay our respect to the Elders of these communities past, present and emerging, acknowledging that they have been custodians of land and water for many centuries and that their continuing culture and contribution is important to the life of the region.

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Plan Summary

The following chart summarises the processes used to develop the Integrated Water Management Plan for Baw Baw Shire Council, as well as the main outcomes of the plan.

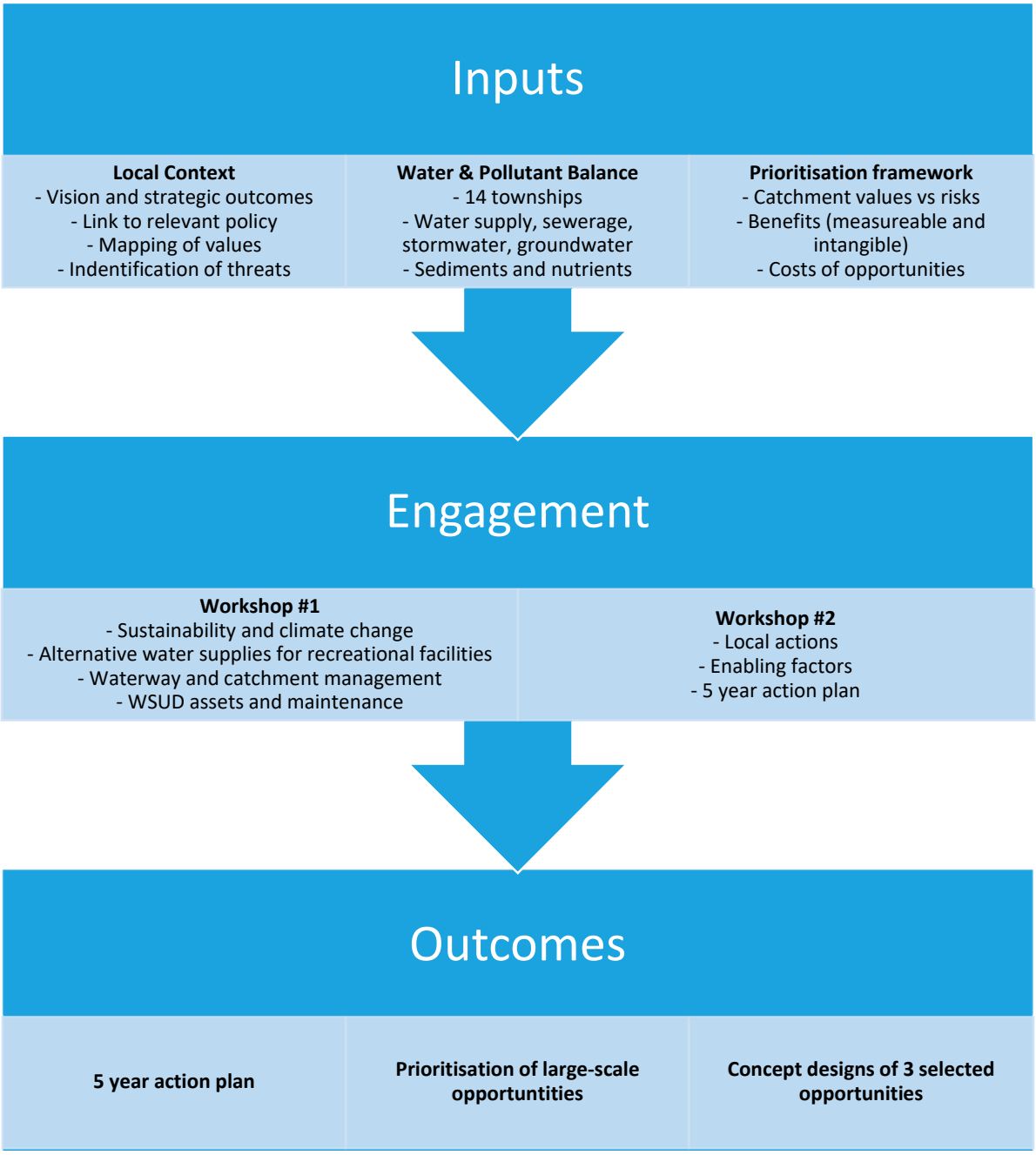


Figure 1 Summary of Baw Baw IWM Plan

1. An integrated water management approach for Baw Baw Shire

1.1 What is Integrated Water Management?

Integrated water management (IWM) recognises the interconnected nature of the water cycle, seeking to manage water across the whole water cycle in a coordinated manner and improve its interactions with the built and natural environment. Traditionally, three 'areas' of the water cycle have been managed separately; water supply, wastewater and stormwater. Roles and responsibilities have similarly focused on the different areas of water management. Integrated water management recognises the relationships between different sources of water, and views water cycle management within a specific environmental, social, cultural and economic context – recognising the needs of local catchments and waterways, communities and industries.

Figure 2 Integrated water management diagram showing the interaction of the three 'areas' of water management within a context of urban form and landscapes.

In a built-up environment, such as the urban townships of Baw Baw Shire, it is important to recognise how the water cycle is affected by urban areas. Urban development and formalised water supply and management systems have fundamentally altered the natural water cycle over time, creating an 'urban water cycle'. The urban water cycle encompasses water supplies extracted from or imported to a local catchment, wastewater and stormwater generated locally, and the catchments and receiving environments affected by those water cycle interactions. As urban settlements change and grow, additional water demands and changes in generation of wastewater and stormwater will have knock-on effects on the urban water cycle, requiring forethought and understanding of environmental, economic and social influences and sensitivities in the system.

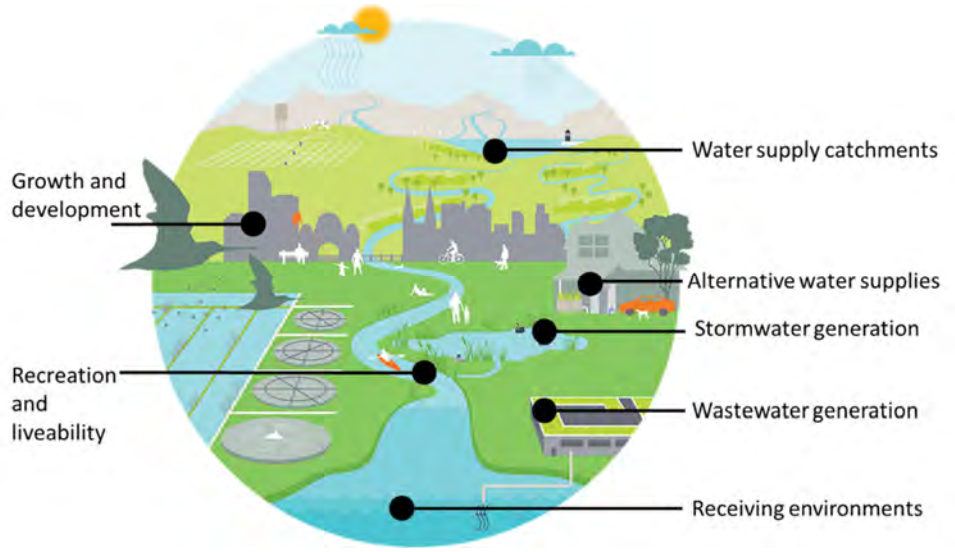


Figure 3 Key elements of the urban water cycle

1.2 State and regional IWM policy frameworks

Water for Victoria (Victorian State Government, 2016) is "a framework to guide smarter water management, bolster the water grid and support more liveable Victorian communities". Water for Victoria identified eight themes and associated actions to implement the policy. One of those themes is 'resilient and liveable towns and cities' and Government provided a commitment to:

- "Adopt integrated water planning across Victoria, with place-based planning supporting community values and local opportunities", and
- "Put integrated water management into practice, working with water corporations to develop a common economic evaluation framework, promoting exemplar projects, building the capacity of the water sector and local government to participate, and continuing research to improve urban water management".

On 8 September 2017, the Department of Environment, Land, Water and Planning (DELWP) released a document titled 'Integrated Water Management (IWM) Framework for Victoria'. The

IWM Framework provides guidance aimed at helping government, the water sector and the community work together to better plan and deliver solutions for water management across Victoria's towns and cities.

The IWM framework supports the establishment of IWM Forums in each region to drive and coordinated delivery of IWM. Baw Baw Shire participates in two regional IWM forums; Westernport and Gippsland. Refer to Attachment 6 for a detailed analysis of how this plan relates to other legislation and strategic documents.

1.3 A partnership approach to IWM in Baw Baw Shire

IWM involves a coordinated approach to water management, including deep collaboration between many stakeholders, extending to those who can affect and enable urban design, natural resource management, planning and economic development.

Covering a large area, Baw Baw Shire Council falls within the jurisdiction of many organisations that have different roles in the management of water within the Shire. Melbourne Water, Gippsland Water, South East Water, South Gippsland Water, Southern Rural Water, the West Gippsland Catchment Management Authority (CMA) and Port Phillip and Westernport CMA all assume varying roles across the Shire.

This IWM Plan focusses on the 14 identified township areas of Baw Baw Shire identified according to current characteristics and ability to achieve IWM outcomes shown in Figure 4. The townships include the following:

- Buln Buln
- Drouin
- Erica
- Jindivick
- Longwarry
- Neerim South
- Noojee
- Rawson
- Thorpdale
- Trafalgar
- Walhalla
- Warragul
- Willow Grove
- Yarragon

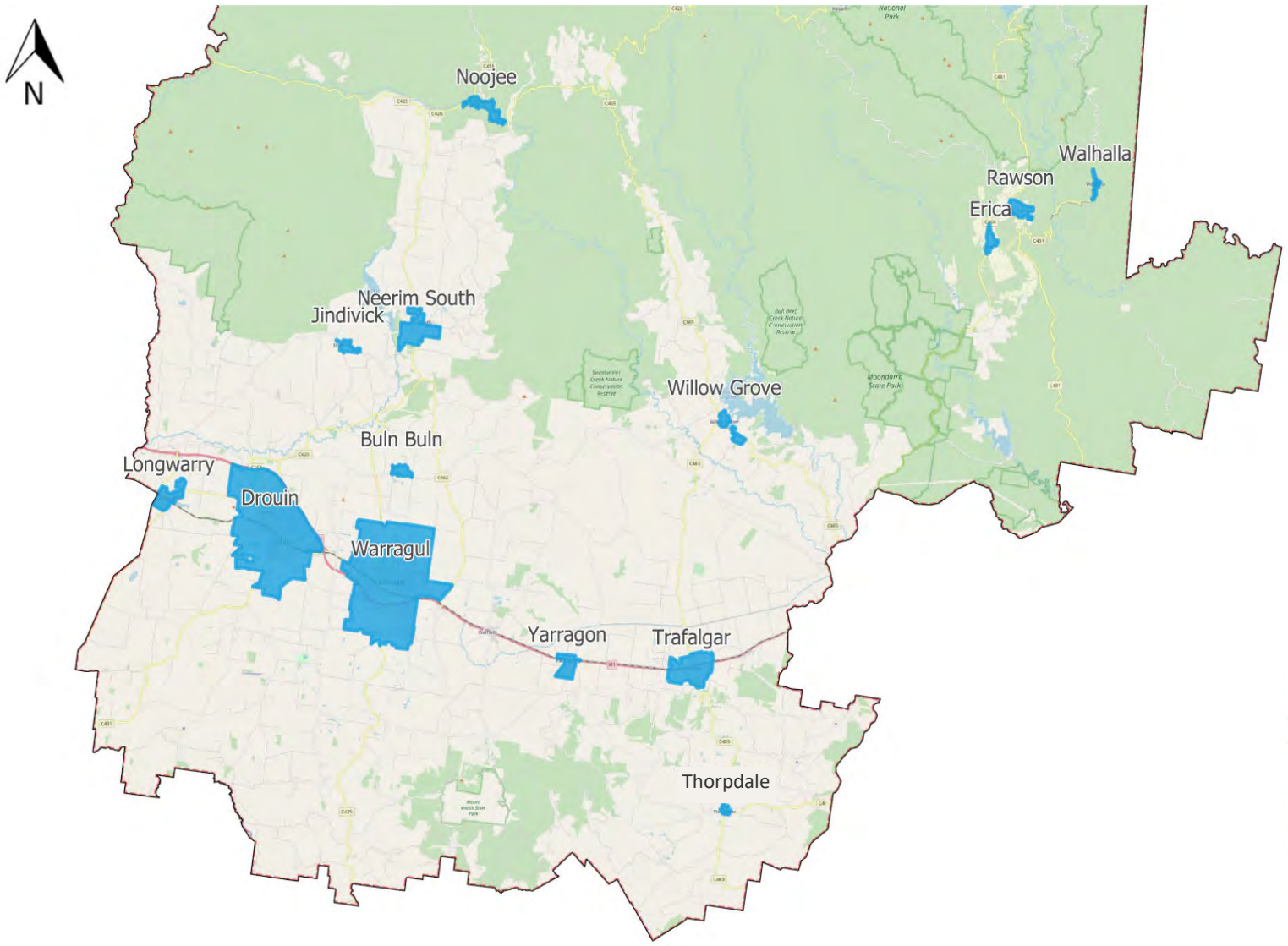


Figure 4 Focus area for the Baw Baw IWM Plan, encompassing 14 urban township areas

1.4 IWM plan's relationship to other strategy and policy

The Community Vision for Baw Baw Shire in 2050 is "happy, healthy people sharing prosperity and knowledge from living sustainably in harmony with our rural identity, thriving villages and productive and inspiring landscapes". This IWM plan supports this vision and Table 1 below sets out the alignment of strategic IWM outcomes with existing Council strategy. Figure 4 displays the positioning of this IWM in relation to local, state and commonwealth initiatives and legislation. Attachment 6 further describes how each strategic IWM outcome relates to Council's existing initiatives.

Table 1 Alignment of IWM strategic outcomes with existing Council plans

IWM strategic outcomes	**Council policy documents**										
Direct contribution to existing policy Potential contribution to existing policy	Council Plan 2017 - 2021	Environment Sustainability Strategy 2018 - 2022	Municipal Health and Well Being Plan 2017-2021	Flood Management Plan for Baw Baw Shire, 2018	Domestic Wastewater Management Plan, 2016	Council Recreational Strategy 2017 - 2022	Public Open Space Strategy 2014	Baw Baw Shire Council Road Management Plan, 2017	Waterway Management Plan Guidelines, 2017	Hazel Creek Waterway Management Plan, 2010	ESD Subdivision in Regional Victoria, 2018
Safe, secure and affordable supplies in an uncertain future	■		▫	▫		■					■
Effective and affordable wastewater systems	▫				■						
Opportunities are sought to manage existing and future flood risks and impacts	■			■		▫			▫	▫	
Healthy and valued waterways and marine environments	■	■			■		▫	■	■	■	■
Healthy and valued urban, rural, agricultural and green landscapes	■	■	■			■	■	▫	■	■	■
Community values are reflected in place-based planning	■	■	■	▫		■	■				■
Jobs, economic growth and innovation	▫		▫								

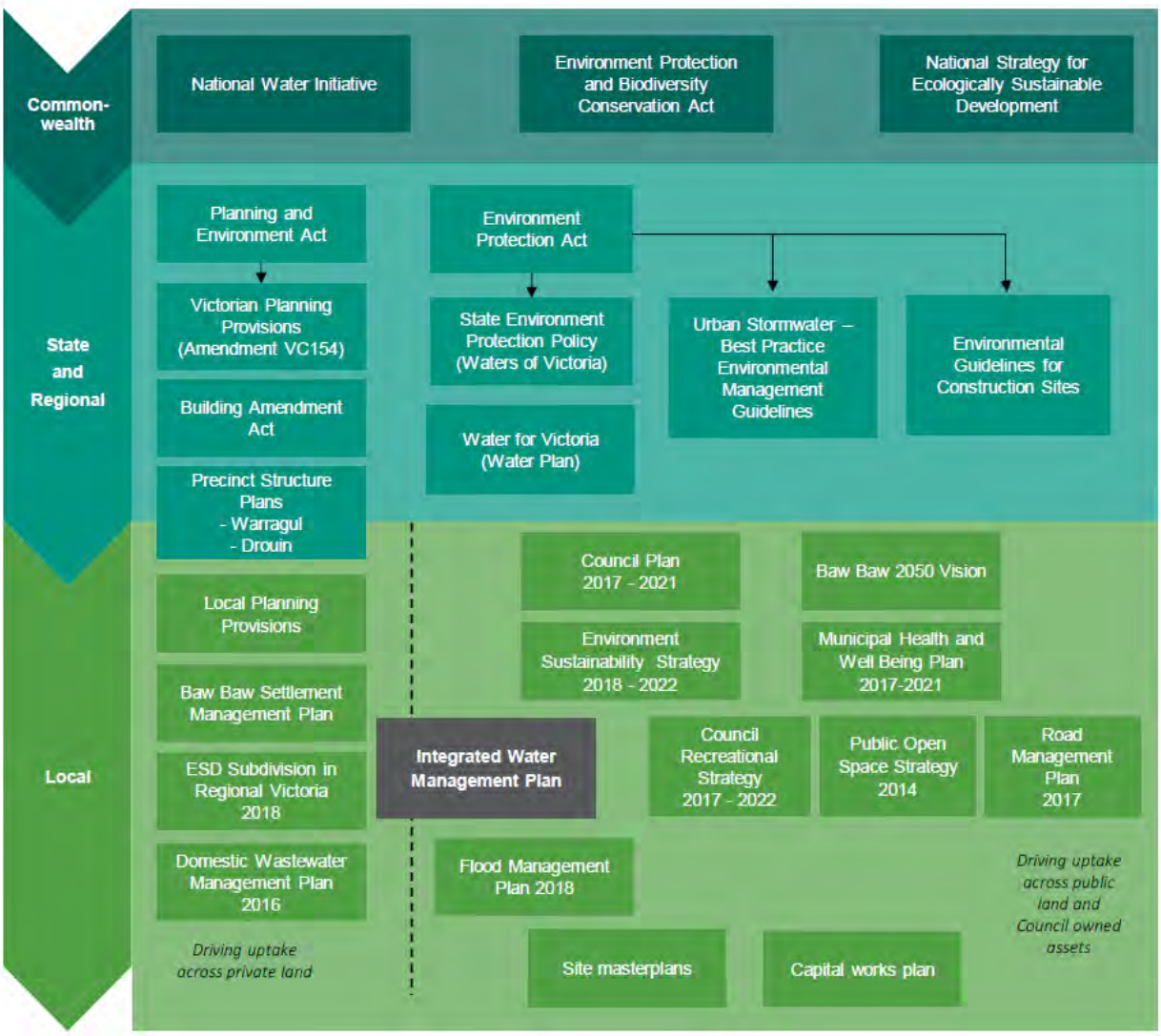


Figure 5 Diagram of legislation and policy as it relates to this IWM plan

2. The case for IWM: Drivers, vision and objectives

2.1 Snapshot of the urban water cycle in Baw Baw Shire

2.1.1 Urban development and growth

Baw Baw Shire has an estimated combined current population of 52,015 people[1], with most of that population (~31,000 people) concentrated in Warragul and Drouin. Baw Baw's population is projected to grow to 67,743 by 2031. Growth areas within the municipality are also concentrated within the two largest townships, with 12,500 and 7,500 new homes planned for Warragul and Drouin respectively. Other growth townships within Baw Baw Shire, such as Yarragon, Trafalgar and Longwarry, are generally located along the main rail and road corridor. Growth brings new water demands, as well as new wastewater and stormwater volumes, but development also brings opportunities to shape the urban landscape. Through greening and regional scale IWM responses, new suburbs can improve the resilience to increasingly extreme weather.

Major industries in Baw Baw Shire include manufacturing, construction and agriculture, with the largest employers being healthcare, agriculture and education.

Figure 6 Example of recent residential development in north-east Warragul

[1] (.id - the population experts, 2019)

2.1.2 Potable water supplies

Management of the water supply system varies across the different townships within Baw Baw Shire. Gippsland Water manages the reticulated supply for the majority of townships in the municipality (Warragul, Drouin, Trafalgar, Yarragon, Buln Buln, Neerim South, Noojee, Rawson, Erica, Willow Grove and Thorpdale). South East Water is responsible for the supply of the township of Longwarry. The towns of Walhalla and Jindivick are not connected to a reticulated water supply system. Figure 6 shows the water supply status of townships across the Shire.

Potable demands are projected to increase with the planned urban growth in the region. This increase in demand is centred around Drouin and Warragul, as the two townships with the largest areas of urban growth. Drouin and Warragul are part of the Tarago water supply system that has been identified as requiring immediate action to address supply security[2] and will be shortly connected to the Moe water supply system. Therefore, developing feasible alternative water schemes to reduce stress on the potable system is a priority within the Tarago system. Gippsland Water has acknowledged that community feedback has emphasised a preference for investigating fit-for-purpose recycled water options[3].

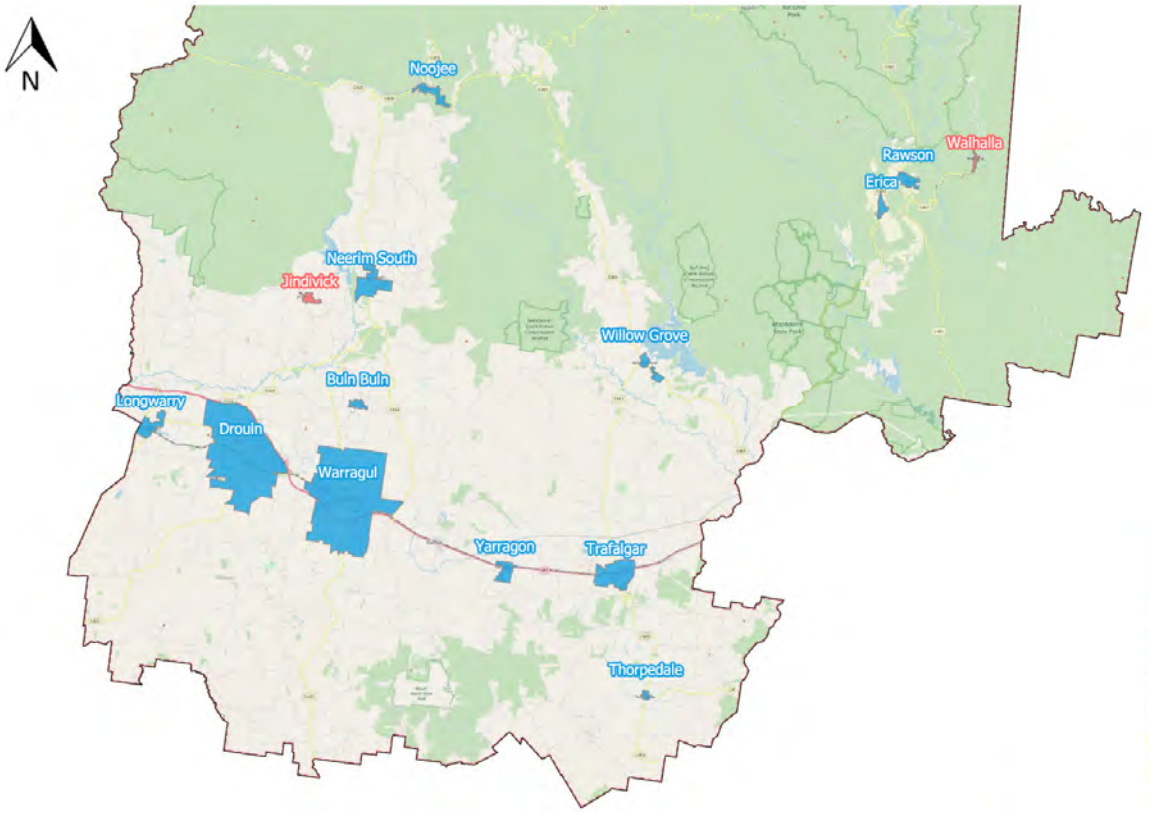


Figure 7 Status of potable water supplies to study townships. Blue townships are connected to a reticulated supply.

[2] (Gippsland Water, 2017)

2.1.3 Wastewater management

Wastewater within Baw Baw Shire is managed on a township basis, with larger townships serviced by reticulated sewers and wastewater treatment plants. Smaller townships rely on domestic wastewater treatment systems that operate on a lot scale. South East Water services the township of Longwarry, with Gippsland Water servicing all other reticulated townships within the Shire. Baw Baw Shire Council is responsible for the regulation and approval of domestic systems within the Shire. Figure 7 shows the wastewater status of townships across the Shire.

Wastewater is projected to increase with population across the Shire and township wastewater treatment systems need to accommodate this extra volume. Increased effluent discharge rates can have adverse impact on receiving waterways. Baw Baw Shire Council has developed the *2016 Domestic Wastewater Management Plan* (DWMP) to identify issues and recommend actions to manage risks associated with decentralised wastewater management. The ongoing implementation of this plan is an important IWM outcome and should be prioritised across the municipality. Townships in this study identified as a priority within the DWMP include; Walhalla, Noojee, Erica, Buln Buln and Thorpdale.

Gippsland Water has identified Drouin Wastewater Treatment Plant[3]. and action to address compliance and capacity issues is underway.

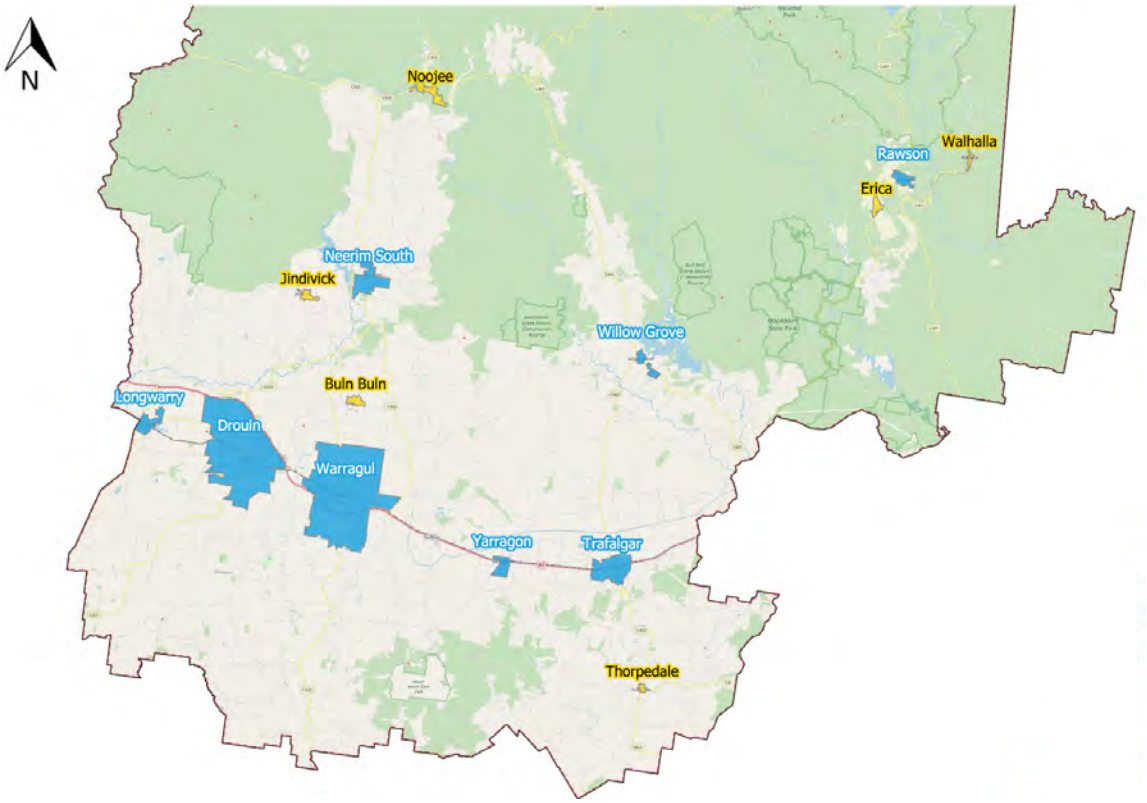


Figure 8 Sewered townships across Baw Baw are shown in blue, townships relying on domestic wastewater systems are shown in yellow

[3] (Gippsland Water, 2017)

2.1.4 Stormwater management

The increase coverage in hard surfaces across catchments increases the volume and intensity of stormwater runoff discharged to local waterways. Stormwater runoff generated by urban areas contain higher levels of pollution than runoff generated across naturalised catchments and pose a risk to receiving waters. Figure 7 displays the differences between natural and urbanised catchments.

Baw Baw Shire Council is responsible for the management of most urban stormwater within the Shire. This extends to roadside drains across the large number of Council-managed roads between urban township areas. Within the Melbourne Water (MW) Drainage Boundary, Melbourne Water is the relevant drainage authority where a Melbourne Water Development Services Scheme exists and generally takes ownership of assets with a catchment that exceeds 60 ha. For assets with smaller catchments, Baw Baw Shire Council has the responsibility for drainage assets. Baw Baw Shire Council is generally the relevant drainage authority for areas outside of the MW Drainage Boundary.

Opportunities such as water sensitive urban design (WSUD) and stormwater harvesting can help to reduce urban flow volumes and pollution reaching local creeks. Generally, the proportion of stormwater generated across urban catchments, in excess of the runoff generated in a pre-development state, is available to harvest.

Flood management within Baw Baw Shire Council is guided by the *Flood Management Plan for Baw Baw Shire, West Gippsland CMA and Melbourne Water.* The document specifies the goals and key management actions for each organisation to improve flood management within the Shire. Water Sensitive Design requirements within Baw Baw Shire are guided by the *Infrastructure Design Manual* and *Water Sensitive Urban Design Guidelines Addendum – Baw Baw Shire Council.* The pace of urban growth in areas of the Shire has increased the handover of WSUD assets to Council.

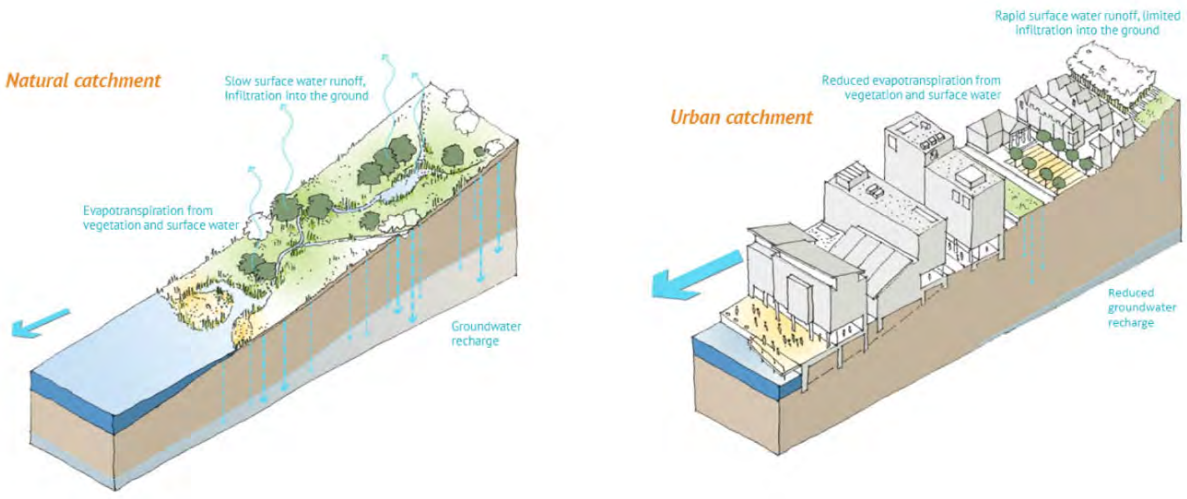


Figure 9 Comparison of stormwater runoff volumes from a natural catchment and an urbanised catchment

2.1.5 Local waterways and waterbodies

Baw Baw Shire contains several significant waterways as well as water supply catchments and reservoirs. Due to the extent within the Shire, historical land use practices, catchment clearing, and agricultural land practices present the dominant risk to waterway condition. However, urban areas within the Shire also present significant impacts on the condition of waterways. Management of urban areas is critical within areas draining to high-value waterways.

The *2010 Hazel Creek Management Plan* is a strategic plan developed by Baw Baw Shire Council to guide improvements to waterway health, floodplain protection, recreational use and landscape character along the Hazel Creek corridor. The *2017 Waterway Management Plan Guidelines* has been developed to help guide integrated planning, design and management of open spaces along waterway corridors and around wetlands.

Waterways to the west of the Shire (Tarago River and King Parrot Creek sub-catchments) fall within Melbourne Water's boundary. In the *2018 Melbourne Water Healthy Waterways Strategy*, these two sub-catchments contain significant areas designated as 'Stormwater Priority Areas'. The waterways fed by these stormwater priority areas have potential to retain value if urban development within the catchments can be managed.

This Plan will focus on townships draining to high-value waterways and those located in Stormwater Priority Areas'. Figure 9 shows the condition of waterways across the Shire.

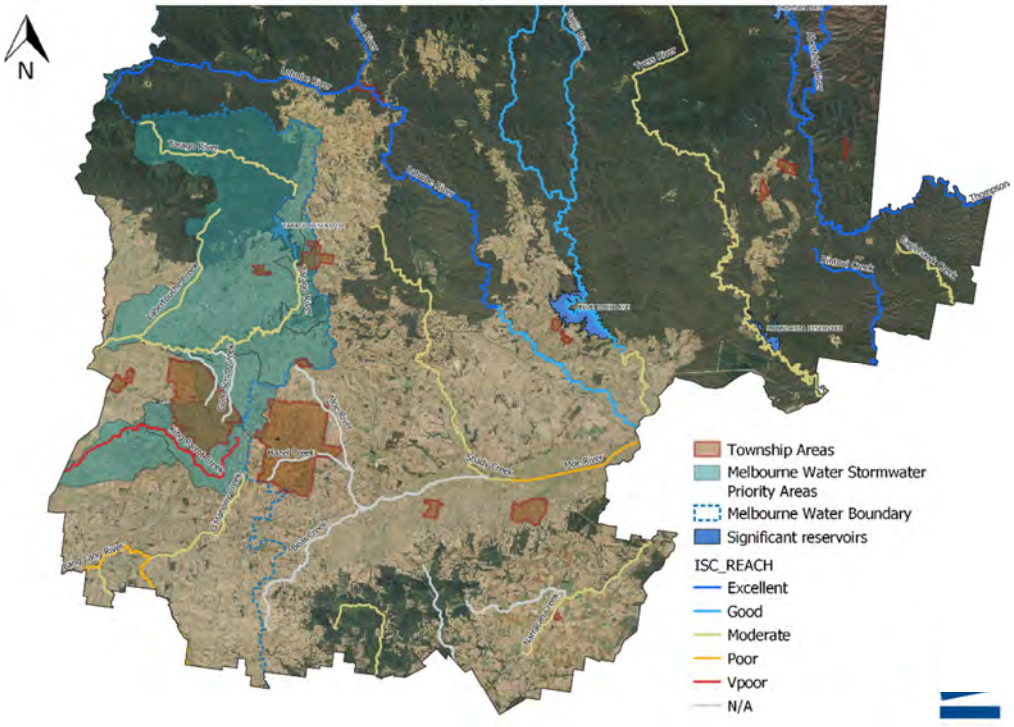


Figure 10 Waterway condition within Baw Baw Shire (ISC 2010)

To the east of the Shire, waterways within the boundary of the West Gippsland Catchment Management Authority fall under the *West Gippsland Waterway Strategy 2014-2022.* The waterways within the central portion of the Shire fall within the Mid-Latrobe management unit, while the north and north-eastern waterways fall within the Upper Thomson, Latrobe, Macalister and Avon management units.

Both strategies specify priority waterways within their jurisdictions, noting key actions and performance objectives important for effective preservation and rehabilitation of waterways. The two major urban centres of Drouin and Warragul fall within catchments of priority waterways. Managing urban growth within these catchments is critical to achieve the performance objectives of the waterway strategies. Among other important actions, stormwater harvesting is a focus within Melbourne Water priority areas, to reduce stormwater volumes generated in urban areas from reaching local waterways. Figure 10 compiles priority waterways and catchments of waterways across the Shire.

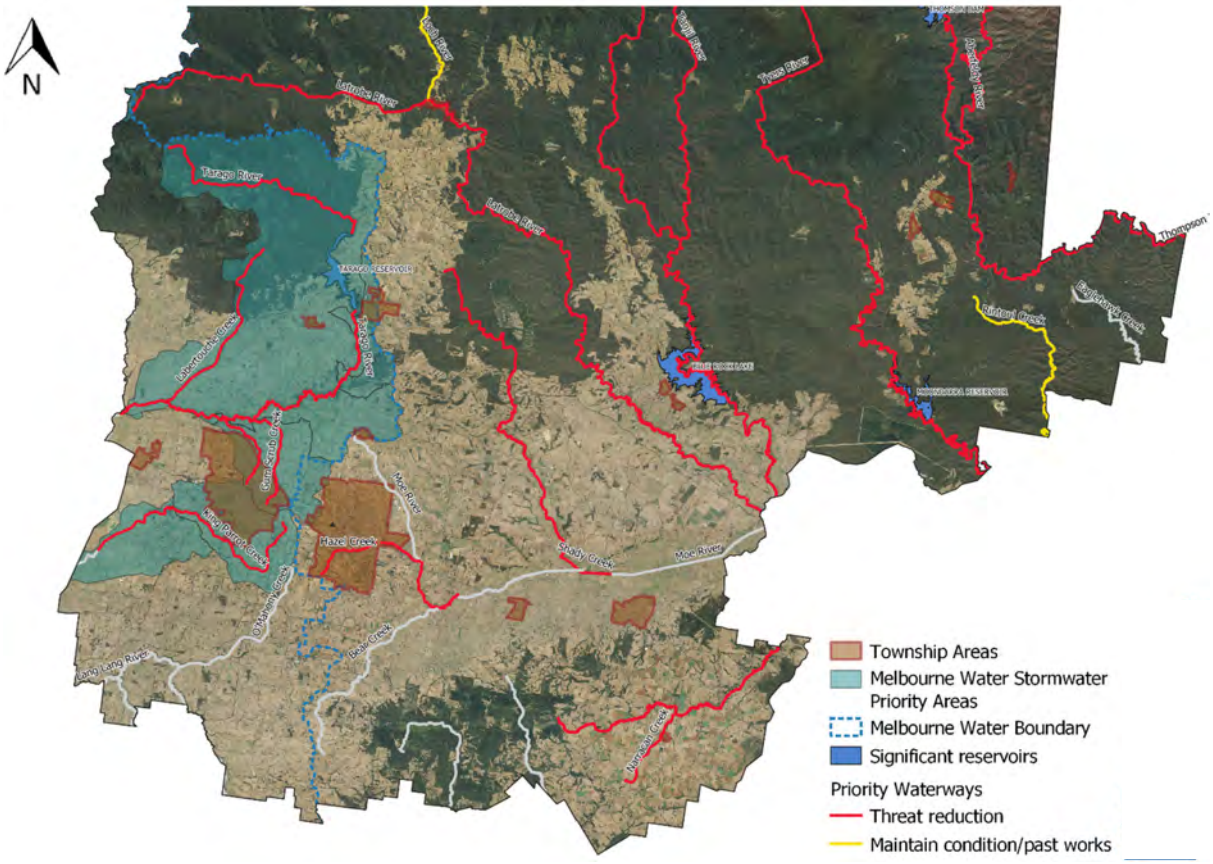


Figure 11 Priority catchments and waterways

- Most waterways in the north of the Shire are highly valued and are a priority to preserve.
- Melbourne Water has identified priority catchments for waterways in the west of the Shire that include large amounts of future development.

2.1.6 Alternative water supplies

Alternative water supplies are an attractive opportunity within Baw Baw Shire Council for the direct benefits that they provide to water users and environmental benefits to waterways. Through a cost-effective alternative water scheme; the water-user (e.g. Council, private industry) can reduce the cost of supply. The demand on the greater potable water system is reduced, potentially deferring water resource and infrastructure capacity upgrades. Alternative water schemes can help to drought-proof supplies as they are independent of urban water restrictions. By reusing stormwater or wastewater, alternative water schemes can reduce the pollution and excess urban flow volume discharged into local waterways. Figure 11 displays an example of the existing scheme at Neerim South wetland.

Potential alternative water schemes include:

- precinct-scale stormwater harvesting
- wastewater recycling
- lot-scale rainwater harvesting
- groundwater use.

Alternative water supplies are usually best suited to supplying non-potable uses such as irrigation of sports grounds, ovals and gardens, agricultural/industrial or toilet flushing and laundry demands. Existing examples of alternative water schemes within Baw Baw Shire include:

- Bellbird Park Wastewater Recycling Scheme
- Neerim South Wetland Stormwater Harvesting Scheme
- Longwarry Wastewater Recycling Scheme

Figure 12 Schematic of the Neerim South Wetland Stormwater Harvesting Scheme

2.1.7 Liveability and community well-being

Baw Baw Shire Council has a commitment to work towards improved community health and wellbeing. Statistically, Baw Baw Shire contains a larger proportion of people at 'retirement-age' (11.8%) and 'dependent/school-aged' (19.3%) to the averages across Victoria (8.6% and 18% respectively). These demographics represent the more vulnerable sectors of the community.

The *Baw Baw 2050 Vision* identifies a future for the Shire that includes sustainable, healthy living within productive and inspiring landscapes. Water plays an important role in the development of this vision of enhanced liveability and protection vulnerable community members.

The *2017-2022 Health and Wellbeing Plan*[4] identifies climate change and associated extreme weather events (flooding, heatwaves, bushfire, solar radiation) as a risk to vulnerable members of the community. The plan identifies safe, accessible passive and active recreation areas as important to improve mental health and promote healthy, active living.

Water can support and enable the liveability and well-being of communities in several ways. Tangible benefits that integrated water management can deliver for Baw Baw Shire include:

- supporting physical and mental health by enhancing community assets for recreation such as sports fields, lakes and green space.
- supporting physical activity, climate resilience and enhanced amenity through urban greening and support of street trees.
- supporting high quality and affordable housing with effective water infrastructure.
- supporting wellbeing by stimulating local economies and industries.

The greening of Baw Baw Shire Council's sporting reserves with alternative water supplies has been identified as a priority action within the *Gippsland IWM Forum Strategic Direction Statement.*

The enhancement of green space and urban trees is a key opportunity to embed the local, rural identity within the Shire's urban townships and provide equitable access to the benefits of enhanced landscapes to the entire community.

Waterways in urban areas can be important linkages for the community, providing valuable open space and areas of natural habitat. Through the restoration of waterways within urban townships, the Shire can improve outcomes for the local flora and fauna, while also improving community access and awareness of the local water cycle. The *2010 Hazel Creek Management Plan* and *2017 Waterway Management Plan Guidelines* identify key principles and actions to develop Hazel Creek and other urban waterways within the Shire to maximise environmental and community outcomes.

[4] (Baw Baw Shire Council, 2017)

2.2 Strategic IWM outcomes in Baw Baw Shire

Baw Baw Shire falls within the Westernport and Gippsland IWM forum areas and seven strategic outcomes across the Shire align with those identified in the *IWM Forum Strategic Directions Statements.* Figure 12 summarises the seven strategic outcomes.

These strategic IWM outcomes consist of:

- Safe, secure and affordable supplies in an uncertain future
- Effective and affordable wastewater systems
- Opportunities to manage existing and future flood risks and impacts
- Healthy and valued waterways and marine environments
- Healthy and valued urban, rural, agricultural and green landscapes
- Community values that are reflected in place-based planning
- Jobs, economic growth and innovation

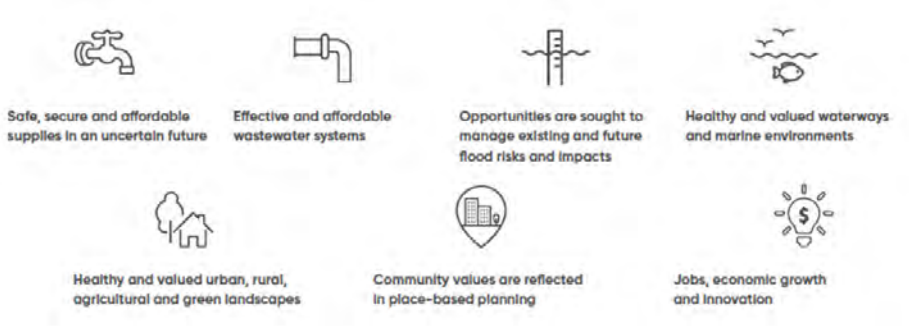


Figure 13 Strategic IWM outcomes identified in the IWM forums

The Westernport and Gippsland Strategic Directions Statements features two specific projects within the priority portfolio of IWM Opportunities across the two forum areas. These opportunities include:

- Baw Baw Shire IWM Plan (Westernport IWM Forum)
- Greening sporting reserves in Baw Baw Shire (Gippsland IWM Forum)

The formation of this Plan, and the prioritisation of project options across the township areas, contributes to these IWM Forum projects.

3. Exploring Opportunities: Preliminary option assessment and shortlisting

3.1 Baw Baw Shire's water balance

A water balance for the urban study areas within Baw Baw Shire Council describes the water demands, potable water supplies and the stormwater and wastewater generated by the area. Figure 13 presents water-balances undertaken across Baw Baw Shire considering current and future conditions. Future conditions are defined by completion of planned growth areas of Drouin and Warragul's PSPs, an estimated time frame of 30 years[5][6]. Current and future conditions are modelled over the same spatial footprint, however future conditions represent completion of major urban growth zones within Drouin and Warragul.

It is generally expected that climate change will increase temperature and evaporation, while reducing mean annual rainfall in Southern Victoria. Zhang, 2018 has investigated the impact of future climate scenarios of the reliability of stormwater treatment systems, finding that performance in pollutant removal and flow reductions under simulated future climates has minimal different to that under simulated historical conditions[7] As the purpose of this water balance is to demonstrate the impacts of urban growth and guide IWM responses across the Shire, rainfall and evaporation remain unchanged in the future scenario.

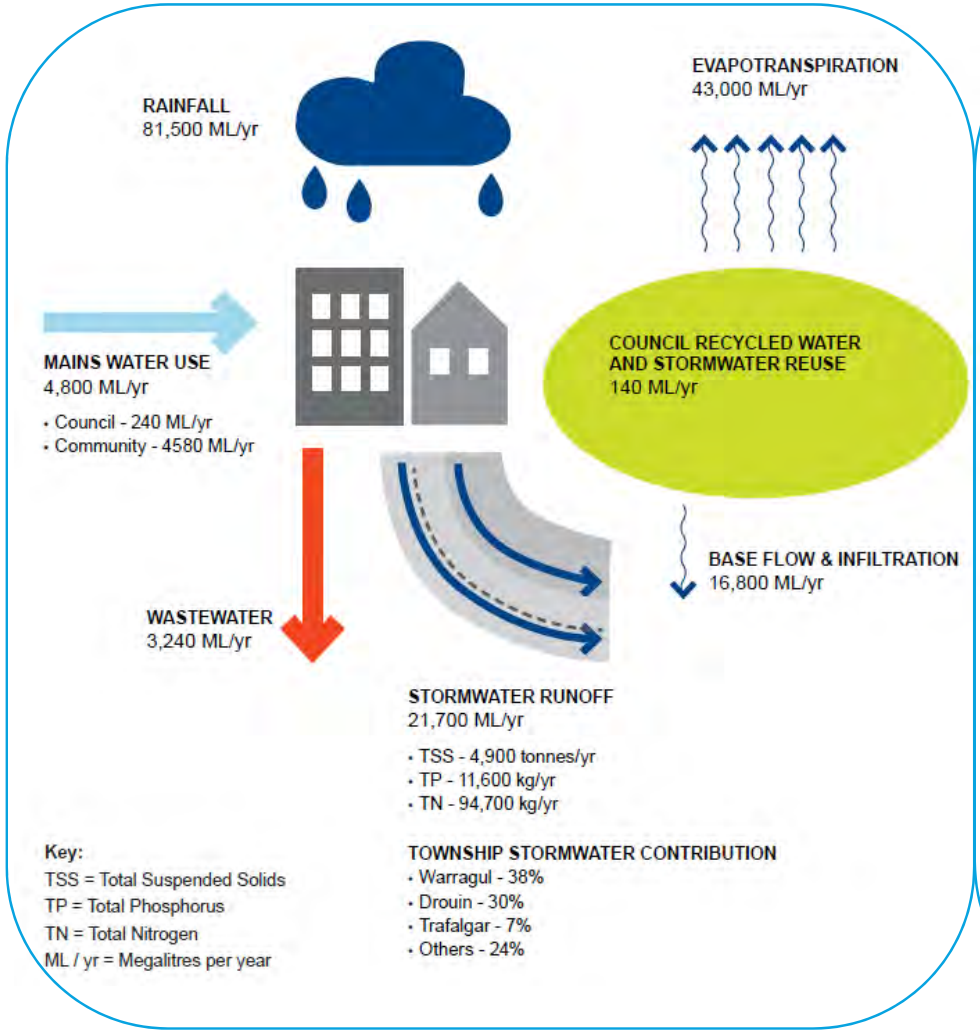
The total potable demand for Baw Baw Shire's urban study areas is estimated at 3,840 ML/y (Baw Baw Shire Council water use accounts for approximately 240 ML/y). This represents the volume used 'at-the-meter' across the study area and doesn't include potential losses associated with transfer and treatment. Current wastewater generation is estimated at 3,000 ML/y. The volume of stormwater generated from urban areas across the study townships of Baw Baw totals to approximately 21,000 ML/y.

[5] (VPA, Drouin Precint Structure Plan, 2014)
[6] (VPA, Warragul Precinct Structure Plan, 2014)
[7] (Zhang, 2019)

Existing alternative water supply volumes of 140 ML/y consists of:

- **Bellbird Park Wastewater Recycling Scheme (approx. 35 ML/y)**
  This scheme uses recycled water from Drouin wastewater treatment plant to irrigate community open space and parkland within Bellbird Park.
- **Neerim South Stormwater Harvesting Scheme (approx. 5 ML/y)**
  This scheme harvests treated stormwater from the Neerim South wetland to supply irrigation of Neerim South Recreation Reserve.
- **Longwarry Wastewater Recycling Scheme (approx. 100 ML/y)**
  This scheme is operated by South East Water and involves the use of recycled water from Longwarry wastewater treatment plant for irrigation of nearby forage crops over summer.

Current



Future

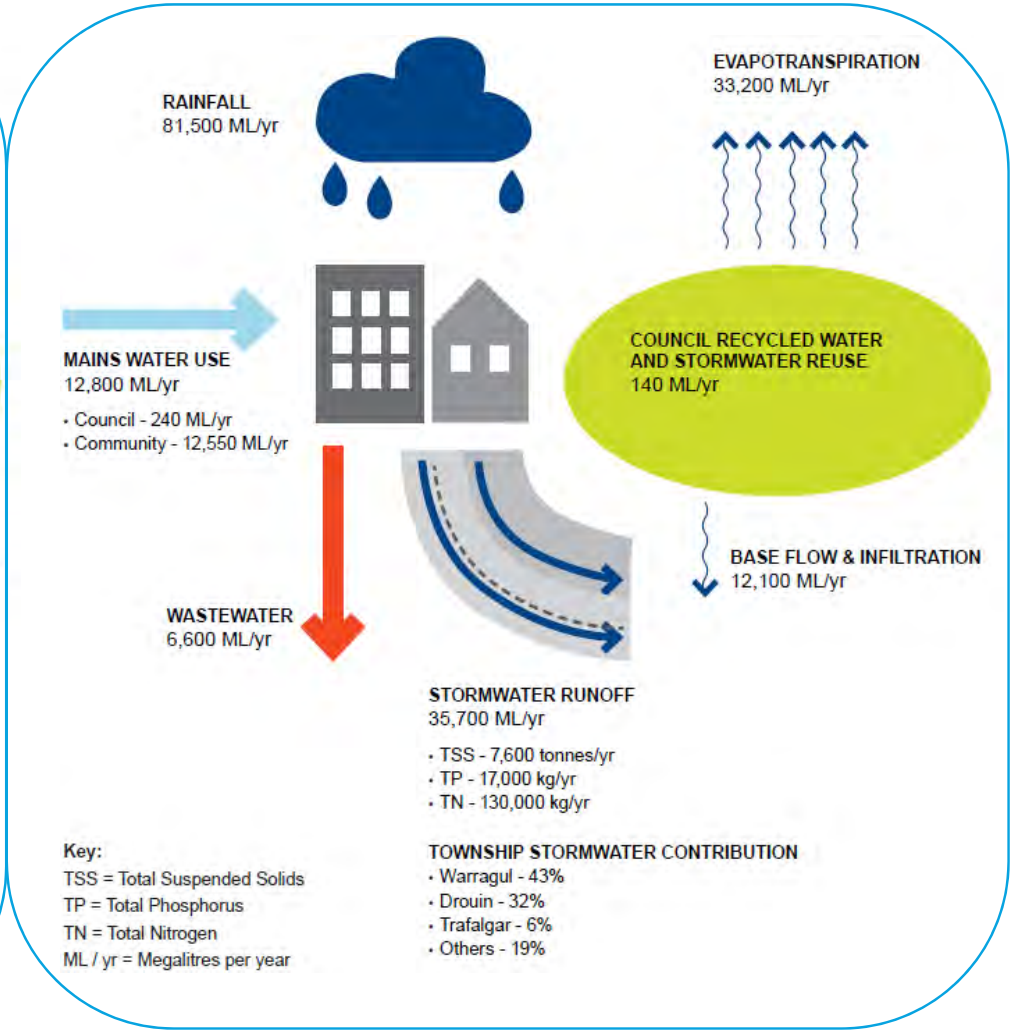


Figure 14 Water balance for the study townships across Baw Baw Shire

Figure 14 shows under current conditions, stormwater and wastewater volumes (noted as potential alternative water sources) far outweigh the total water demands of urban townships across Baw Baw. This highlights the potential of alternative water supplies to supplement potable water demands.

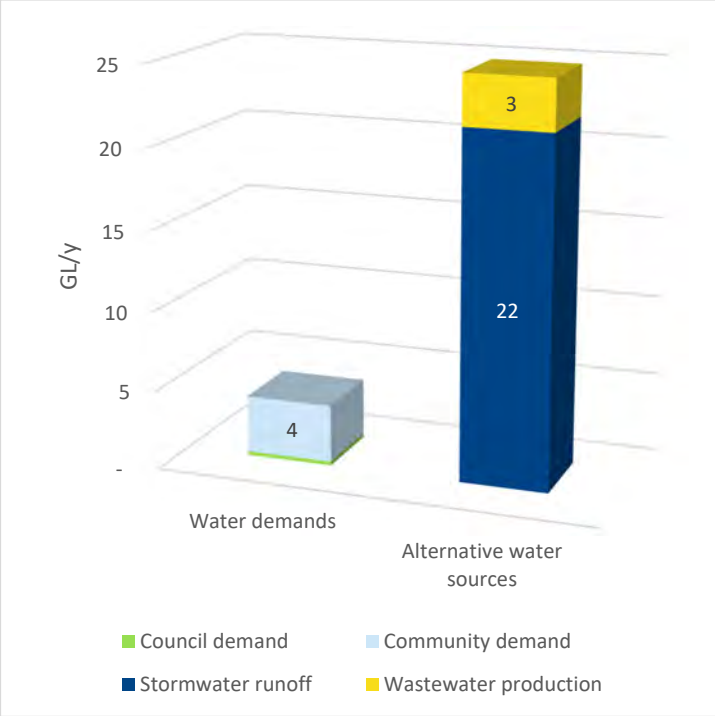


Figure 15 Comparison of total demands to stormwater and wastewater production

Under future conditions, the development of growth areas contributes to a significant change in the urban water cycle. Population growth will increase water demands and wastewater generation, placing existing infrastructure under stress. As agricultural land is developed, the hard surfaces of urban growth (roads, roofs etc.) reduce the volumes of infiltrated water and evaporation, as shown in Figure 15. Water previously captured by 'natural' processes of the water cycle (infiltration, evaporation) runs off to become stormwater.

Increased stormwater volumes have destructive potential for local creeks and waterways. Increased flood risk, erosion and loss of ecological value can be directly attributed to increased stormwater volumes from upstream development.

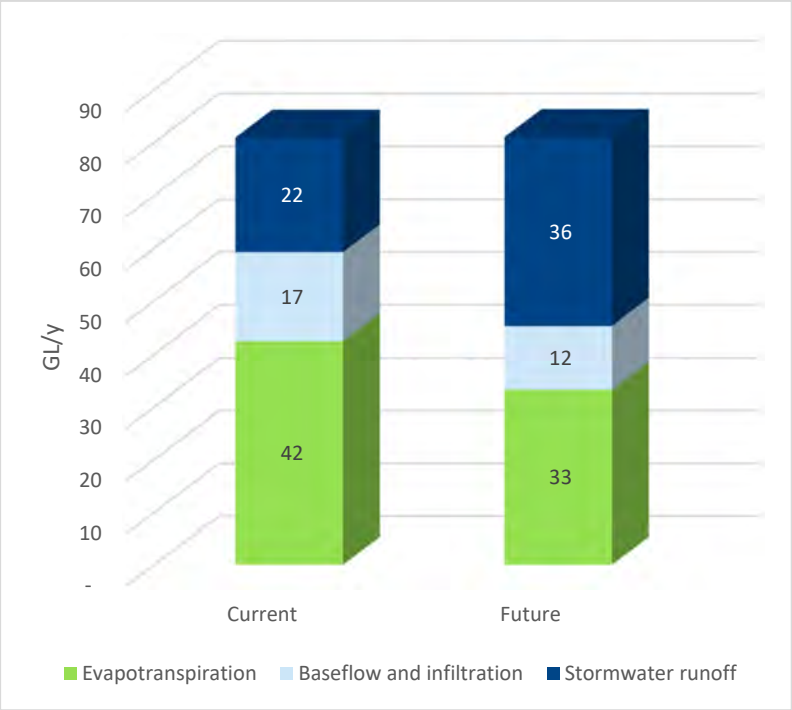


Figure 16 The impact of urban growth on the water cycle

Stormwater carries high levels of pollutants that wash off the hard surfaces within urban areas. Waterways and associated ecosystems are often sensitive to increases in pollutants. Modelled increases in stormwater pollutants (sediment and nutrients) have been quantified in Figure 16. Clause 56.07 of the Victorian Planning Provisions mandate a minimum level of pollutant load reductions for new developments; however, discharges still increase significantly over pre-development values.

In addition to increased stormwater pollutant loads discharged to waterways, an increase in wastewater volumes has a potential to significantly impact local creeks and waterways through a variety of issues (increased discharge volumes, nutrients and salinity etc

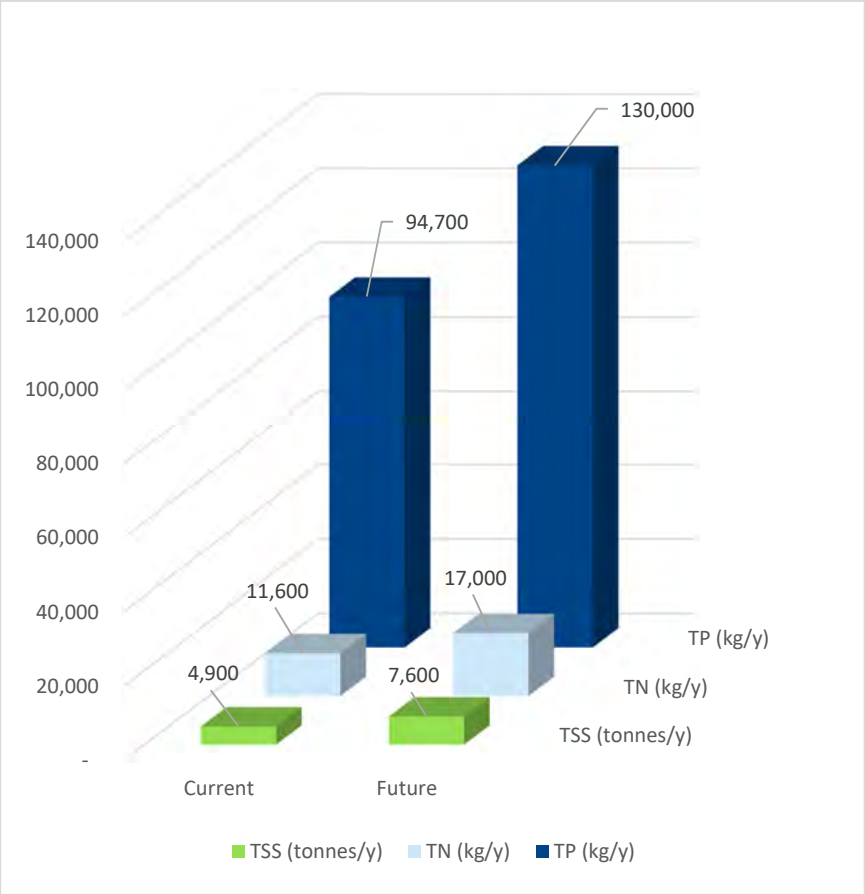


Figure 17 Impact of future growth on stormwater pollution

- There is a surplus of stormwater and wastewater that is damaging local waterways.
- Discharge volumes and pollutants increase with urban growth, along with demand for potable water.
- IWM responses can reduce damage to our waterways and supplement potable demand with alternative water supplies.

TSS = Total Suspended Solids TN = Total Nitrogen and TP = Total Phosphorus

3.2 Spatial profile of Baw Baw Shire Council water-users

Within the township study areas, it's useful to understand the location of Baw Baw Shire Council's major water-users. Figure 17 shows the 11 largest Council water-users across the Shire. Users have been assessed through Council meter data, averaged over the past five years.

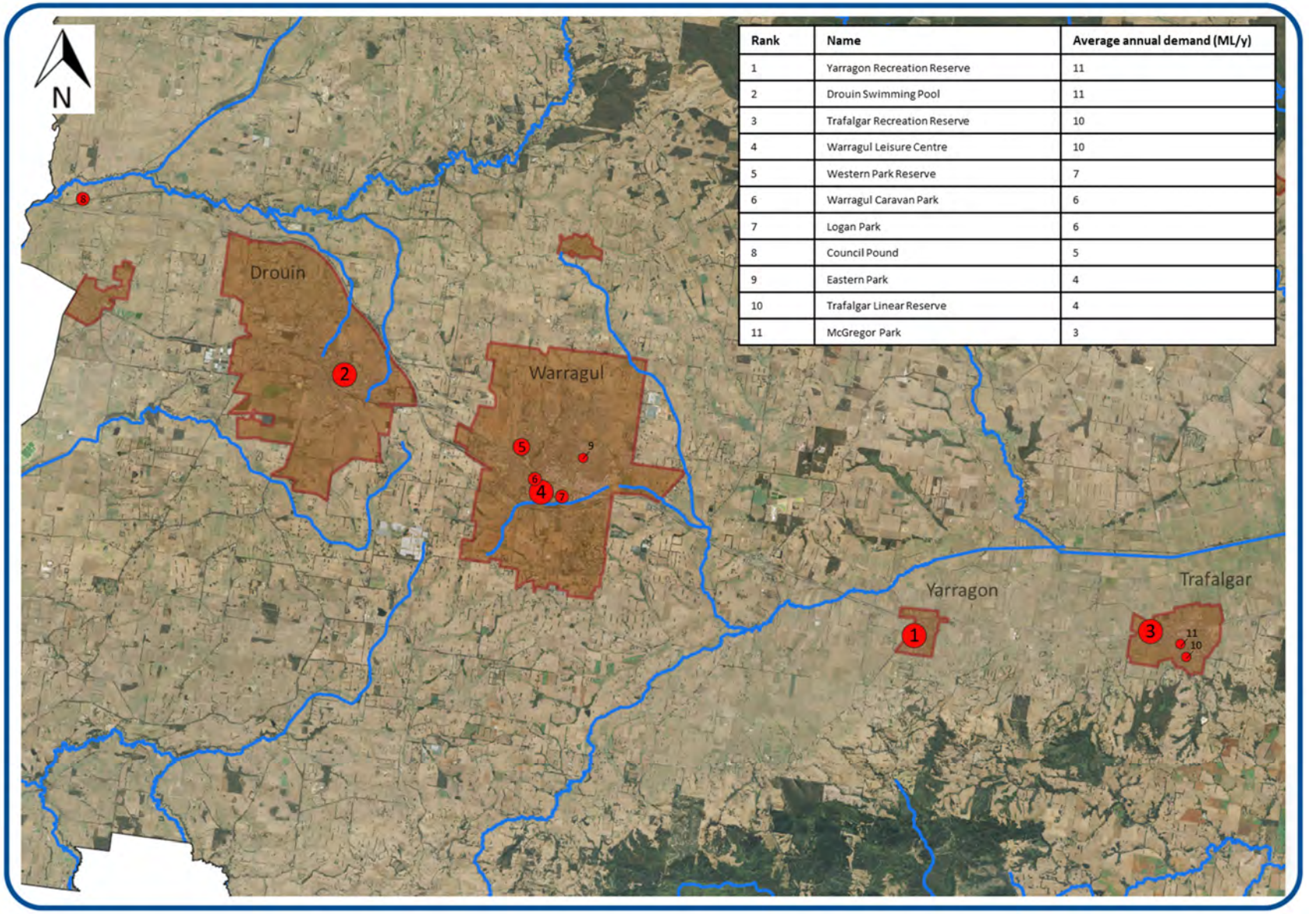
Note:

- Drouin swimming pool has noted issues with leakage, likely contributing to its reported demand.

- Yarragon Recreation Reserve has recently established new turf on the playing surface, likely contributing to its reported demand.
- Western Park Reserve's reported demand does not consider the second oval that has been recently constructed.

Irrigation of sports fields and open space are generally cost-effective demands to supply with alternative water, as in some cases they require less treatment than demands that require potable water (e.g. swimming pools).

Detailed water use information for industrial and agricultural demands within the study townships was not provided and the following map contains Council demands only. While not mapped, these commercial demands are often fit-for-purpose to use alternative supplies instead of drinking water. These alternative supplies (such as harvested stormwater and treated wastewater effluent) have potential to provide cost-effective supply that is attractive to water-intensive industries.



Rank	Name	Average annual demand (ML/y)
1	Yarragon Recreation Reserve	11
2	Drouin Swimming Pool	11
3	Trafalgar Recreation Reserve	10
4	Warragul Leisure Centre	10
5	Western Park Reserve	7
6	Warragul Caravan Park	6
7	Logan Park	6
8	Council Pound	5
9	Eastern Park	4
10	Trafalgar Linear Reserve	4
11	McGregor Park	3

Figure 18 Baw Baw Shire Council's sites with the largest average potable water demand over the past 5 years

3.3 Township threat and opportunity mapping

Contextual mapping of threats across the fourteen townships allows the development and assessment of IWM opportunities. Threats and opportunities have been identified across seven thematic action areas related to the IWM strategic outcomes for the region. These action areas sit below the catchment-level IWM strategic outcomes, aligned to each township's local IWM drivers.

Figure 19 IWM action areas for Baw Baw Shire

The threat and opportunity mapping (as shown in Attachment 2) identified threats unique for the context of each township, however several IWM-related threats are common across most of the fourteen townships:

- Stormwater runoff from urban areas
- Urban growth areas
- Supply security and drought resilience of community open space
- Wastewater effluent discharging into local waterways
- Townships requiring enhanced domestic wastewater management

By identifying threats across each township, project opportunities can be identified to mitigate these risks. The opportunity mapping process was undertaken through a combination of analysis and workshop discussions with the project stakeholders.

High-level identification of potential large-scale opportunities allows the development of a project long-list that can then move through a process of feasibility and prioritisation. The opportunity identification process included a workshop with an internal working group that included members of various Council teams. Each township was analysed to identify a *long list* of IWM opportunities. The long list of opportunities set the basis for the development of the *short-list* of project options.

3.4 Project identification and prioritisation

Using the information developed through threat and opportunity identification across the fourteen townships, opportunities can be critically analysed for feasibility and developed into project options.

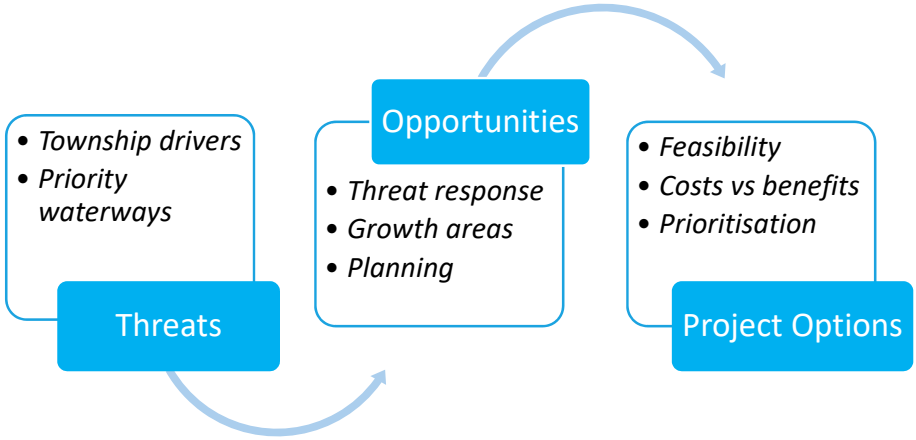


Figure 20 Process of developing priority project options

The purpose of the analysis is to establish the best IWM project options across Baw Baw Shire. To achieve this, each opportunity was spatially analysed including the following criteria:

- impact on established priority areas
  - Melbourne Water priority stormwater areas
  - impact on waterways with good current condition
- available catchment
- existing infrastructure
- nearby demands for alternative water supplies
- new development and growth and impacts on existing infrastructure
- planned reserves and stormwater wetlands
- public land.

This process resulted in the reduction from the *long list* of identified opportunities to a *short-list* of feasible project options. Due to economies of scale, precinct-scale project options generally achieve larger overall benefits (harvested water, pollutant reductions etc.) for each dollar invested. Baw Baw Shire has a limited number of precinct-scale project options, and this scale of project were targeted within this study.

To effectively compare different project options, preliminary investigations were undertaken to establish varying infrastructure requirements. This includes:

- treatment wetland (sized to achieve best practice pollutant load reductions according to estimate of developed catchment size)
- pits, pumps and transfer pipework
- above or below-ground storage for harvested water supply
- connection to electrical supply
- UV Disinfection system.

A summary of the short-listed projects is listed in Table 2. The three projects selected in consultation with Baw Baw Shire Council to develop concepts designs are:

1. Rawson wastewater recycling scheme.
2. Western Park Oval stormwater harvesting scheme.
3. Trafalgar Recreation Reserve stormwater harvesting scheme.

These projects were selected due to their strategic significant and alignment with the Shire's current infrastructure planning. Rawson wastewater recycling scheme was revealed as the….

Western Park Oval was selected as it represents a 'retrofit' of a stormwater harvesting system on an existing stormwater treatment wetland to supply one the Shire's largest reserves. The concept developed for Western Park can guide Council to implement other harvesting schemes where the wetlands were not originally planned for harvesting.

Trafalgar Recreation Reserve was included as it represents an opportunity to integrate a stormwater harvesting scheme into the panning phase of a future upgrade to the reserve. The concept developed for Trafalgar Recreation Reserve can guide Council to implement harvesting schemes where there is opportunity to influence decisions from the planning phase.

Table 2 Project option short-list

Project No.	Project Name	Town	Melbourne Water Priority Area	Project Description	Works description
1.0	**Rawson WW Recycling Scheme**	Rawson	-	An upgrade to the Rawson WWTP would improve the quality of water being discharged into Thomson River (rated excellent). The plant could provide recycled water to supply Crater Lake that is polished through a wetland within the lake footprint. The Lake currently has a small, urban catchment that is contributing to historical supply and water quality issues. A recirculation wetland, that constantly filters lake water through the wetland cell could be topped-up with recycled water. In addition, Rawson WWTP could be used to supply Rawson Recreation Reserve. Additional treatment to Class A is required for unrestricted spray irrigation at significant costs, however lower classes of recycled water can be tolerated with subsurface irrigation and access restriction. Rawson WWTP could also supply other demands that could be satisfied with recycled water (e.g. agriculture)	Proposed works at Crater Lake include modification of the existing island into a macrophyte zone with a pump system that recirculates water from the open water body through the wetland. A pumped transfer main connecting the WWTP. Required works at Rawson WWTP are contingent on how the recycled water is to be used. More information is required about the current class of effluent being produced.
2.0	**Yarragon Recreation Reserve Stormwater Harvesting**	Yarragon	-	Existing RB/stormwater asset has high potential to be upgraded into a Stormwater wetland that could partially supply Yarragon Recreation Reserve's large water demand. The site could retain its function as an RB, while improving aesthetics and proving alternative supply.	The major earthworks have been completed for this project, the RB will need some modification to function as SW harvesting asset, however the bulk of construction costs are avoided.
3.0	**Drouin Civic Park Stormwater Harvesting**	Drouin	✓	The masterplan mentions a stormwater treatment wetland and 'cascades' that are planned for the future of the park. The harvesting wetlands could be used to treat and harvest water to supply not only the cascades, but also Drouin Recreational Reserve. During dry weather, the system could operate in re-circulation mode to ensure the water quality of the ornamental lakes and the operation of the cascades. During storm events, the system could fill a storage tank for the irrigation of the reserve Upgrades to the park are planned to proceed in the 2019/2020 financial year.	This project would require the wetland system that is described in the park masterplan, which would require some modification to multi-function as a harvesting asset. Pumps, pipework and irrigation storage are required to operate the scheme in recirculation and harvesting mode.
4.0	**Warragul Civic Park Stormwater Harvesting**	Warragul	-	Informal treatment area already exists upstream of ornamental lake. Potential to formalise upstream area into dedicated macrophyte zone, recirculation could ensure high water quality in summer. Low cost response due to existing waterbodies and infrastructure. Could supply Irrigation of approx. 4ha of passive space within the park.	Formalisation of the first pond within the park into a formalised macrophyte wetland, that treats stormwater and discharges into the second ornamental pond. Pump system to recirculate water through the macrophyte zone in dry weather. This recirculated supply can be diverted to a header tank for irrigation use within the park.
5.0	**Hazeldean Road**	Yarragon	-	There is available space to implement a stormwater treatment system and provide an amenity boost to a currently vacant pocket of land, however there is not current an obvious demand for recycled water nearby. Currently, this system would be treatment-only.	A standard stormwater treatment wetland.
6.0	**Fairway Stormwater Harvesting**	Drouin	✓	PSP wetlands (RB-01a, RB-01b, RB-01c) can supply sporting reserve (SR-01) and potentially offset demand from the Drouin Country Club (golf course and race track). This option is attractive due to its proximity to Drouin Country Club, who could be approached as a future user of harvested water. Future irrigation of 1 x footy fields + 2 x soccer fields as planned in the PSP + 10 ha of Country Club.	Wetlands are already required from developers, Council can try and influence design choices so they can either construct integrated harvesting schemes or as a retrofit later. Infrastructure required from Council includes storage tank, associated pipework (incl. connection to Drouin Country Club) and UV disinfection system.

7.0	**Lillico Stormwater Harvesting**	Warragul	-	PSP wetland (DR-NE-01) can supply sporting reserve (SR-02). Future irrigation of 1 x footy fields + 3 x soccer fields + 2 ha of passive space as planned in the PSP.	Wetlands are already required from developers, Council can try and influence design choices so they can either construct integrated harvesting schemes or as a retrofit later. Infrastructure required from Council includes storage tank, associated pipework and UV disinfection system.
8.0	**Western Park Oval Stormwater Harvesting**	Warragul	-	Existing online wetlands that are servicing new development. This project is a precedent for Council to install a retrofit harvesting scheme to a developer wetland. The wetlands need to be in good condition so they are supplying water treated to best practice. Potential to supply current irrigation demand of Western Park Oval.	Depending on the condition of the wetland, may replanting and potentially reconfiguration, a pumped transfer to a storage tank, associated pipework and UV disinfection system.
9.0	**Wills St Stormwater Harvesting**	Warragul	-	PSP wetland (DR-SW-02) can supply sporting reserve (SR-01). Future irrigation of 2 x footy fields + 2 ha of passive space as planned in the PSP.	Wetlands are already required from developers, Council can try and influence design choices so they can either construct integrated harvesting schemes or as a retrofit later. Infrastructure required from Council includes storage tank, associated pipework and UV disinfection system.
10.0	**Landsborough & Spring Crk Stormwater Harvesting**	Warragul	-	PSP wetland (DR-SW-01) can supply sporting reserve (SR-03). Future irrigation of 1x footy oval and 2 x soccer fields + 2 ha of passive space as planned in the PSP.	Wetlands are already required from developers, Council can try and influence design choices so they can either construct integrated harvesting schemes or as a retrofit later. Infrastructure required from Council includes storage tank, associated pipework and UV disinfection system.
11.0	**Trafalgar Recreation Reserve Stormwater Harvesting**	Trafalgar	-	A stormwater harvesting scheme could be incorporated into the stormwater quality wetland that will service the new development to the south-west of Trafalgar. This harvesting scheme could supply the Trafalgar Recreation Reserve which is BBSC's highest water user. Note that an action has been raised in the road map to investigate supplying this reserve with bore water.	Wetlands are already required from developers, Council can try and influence design choices so they can either construct integrated harvesting schemes or as a retrofit later. Infrastructure required from Council includes storage tank, associated pipework and UV disinfection system.
12.0	**Cowan Stormwater Harvesting**	Drouin	✓	PSP wetlands (RB-07a, RB-07b, RB-07c) can supply sporting reserve (SR-02). Future irrigation of 2 x footy fields + 2 soccer fields + 2 ha of passive space as planned in the PSP.	Wetlands are already required from developers, Council can try and influence design choices so they can either construct integrated harvesting schemes or as a retrofit later. Infrastructure required from Council includes storage tank, associated pipework and UV disinfection system.
13.0	**Gabbot Stormwater Harvesting**	Drouin	✓	PSP wetland (RB-04) could supply passive open spaces (NP-BB-02, NP-BB-01) with active irrigation, however demand is likely to be less than active open space. The focus of this project could be less on harvesting and more towards establishing a corridor for biodiversity and natural habitat. Project could include waterway naturalisation.	The infrastructure costed in this estimate includes the works required for a retrofit harvesting scheme. Wetlands are already required from developers, Council can try and influence design choices so they can either construct integrated harvesting schemes or as a retrofit later. Infrastructure required from Council includes storage tank, associated pipework and UV disinfection system.
14.0	**Longwarry Recreation Reserve Stormwater Harvesting**	Longwarry	-	An existing wetland is treating a large residential area in Longwarry. This wetland could be modified into a stormwater harvesting scheme to supply Longwarry Recreation Reserve. Another option is to investigate the adjoining current harvesting scheme that South East Water is running out of the Longwarry Wastewater Treatment Plant.	The infrastructure costed in this estimate includes the works required for a retrofit stormwater harvesting project. This includes storage tank, associated transfer pipework and UV disinfection system.

Table 3 Cost-benefit analysis of the project option short-list

Project No.	Project Name	Total Capex[1]	Total Opex /year[1]	Total PV life-cycle costs ($ Present value)	Total Nitrogen reduction (kg/y)	Nitrogen Value (MW rate)	Reuse Value ($)	Supplied Reuse Volume (ML/y)	Levelised cost of supply ($/kL)	BCR[2]	BCR[3]
1.0	**Rawson WW Recycling Scheme**	$ 1,088,640	$ 6,700	$ 1,310,000	>50,000.0	$ 569,500,000	$1,195,710	26.0	$ 3	>>1	0.9
2.0	**Yarragon Recreation Reserve**	$ 384,430	$ 5,750	$ 536,000	**45.0**	$ 512,600	$335,720	7.3	$ 4	1.6	0.6
3.0	**Drouin Civic Park**	$ 611,140	$ 7,370	$ 829,000	**85.0**	$ 968,200	$243,740	5.3	$ 9	1.5	0.3
4.0	**Warragul Civic Park**	$ 399,270	$ 6,960	$ 568,000	**44.1**	$ 502,300	$211,550	4.6	$ 7	1.3	0.4
5.0	**Hazeldean Road**	$ 172,530	$ 3,450	$ 272,000	**30.0**	$ 341,700	$-	-	-	1.3	-
6.0	**Fairway**	$ 1,082,830[4]	$ 51,780	$ 1,746,000	**33.0**	$ 375,900	$1,425,650	31.0	$ 3	1.0	0.8
7.0	**Lillico**	$ 636,090[4]	$ 21,730	$ 841,000	**13.7**	$ 156,000	$597,850	13.0	$ 4	0.9	0.7
8.0	**Western Park Oval**	$ 297,270[4]	$ 25,930	$ 584,000	**8.1**	$ 92,300	$349,510	7.6	$ 4	0.8	0.6
9.0	**Wills St**	$ 527,080[4]	$ 30,160	$ 863,000	**11.5**	$ 131,000	$501,280	10.9	$ 5	0.7	0.6
10.0	**Landsborough & Spring Crk**	$ 536,920[4]	$ 33,310	$ 923,000	**11.6**	$ 132,100	$505,880	11.0	$ 5	0.7	0.5
11.0	**Trafalgar Recreation Reserve**	$ 554,380[4]	$ 16,560	$ 697,000	**8.6**	$ 98,300	$367,910	8.0	$ 5	0.7	0.5
12.0	**Cowan**	$ 738,030[4]	$ 47,880	$ 1,367,000	**16.4**	$ 186,800	$689,830	15.0	$ 5	0.6	0.5
13.0	**Gabbot**	$ 334,220[4]	$ 10,750	$ 419,000	**4.3**	$ 48,500	$179,360	3.9	$ 6	0.5	0.4
14.0	**Longwarry Recreation Reserve**	$ 434,220	$ 12,070	$ 535,000	**5.6**	$ 63,800	$105,770	2.3	$ 13	0.3	0.2

1. Includes contingencies, 2 includes monetised nitrogen reduction value, 3 does NOT include monetised nitrogen reduction value, 4 wetland construction costs not incl. in CAPEX as wetland is already required from developers

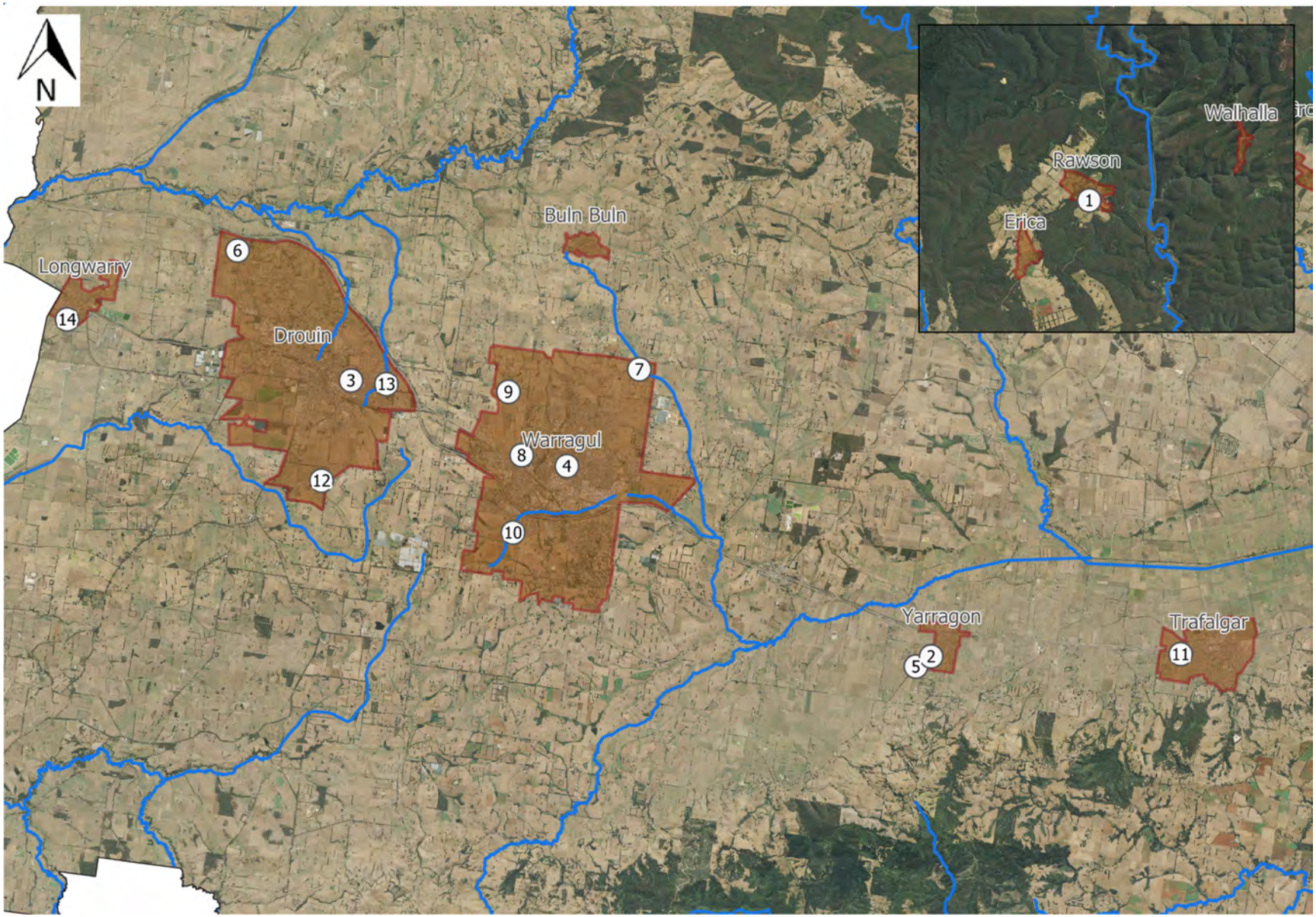


Figure 21 Short-listed project options across Baw Baw Shire

4. Setting a Way Forward: IWM transition framework and 5-year action plan

4.1 Overarching partnerships to support delivery of IWM projects

Integrated water management projects often deliver multiple outcomes (see figure 21) and accordingly require collaboration between multiple parties to establish governance models, delivery mechanisms and funding.

Figure 22 Multiple benefits of Integrated Water Management

Through the development of this Plan, input was sought from some of the key organisations within the Baw Baw Shire region. Baw Baw Shire Council is a member of two regional IWM forums that have been established for the Westernport and Gippsland regions to support delivery of IWM projects. To support the implementation of the recommended projects, the 5-year action plan sets out key tasks, timelines and delivery partners to increase internal capacity.

4.2 Building internal capacity within Baw Baw Shire Council

In addition to project-based responsibilities, the IWM transition framework was used by Baw Baw Shire Council to assess its organisational strengths for embedding IWM into mainstream practice and the results are shown in Figure 22. The framework focusing on five key transition factors required to stimulate the governance and delivery conditions needed to support IWM projects. These include:

1. Champions
2. Tools and instruments
3. Platforms for connecting
4. Knowledge
5. Projects and application.

Data was collated via surveys and face-to-face discussions with Council staff to measure the extent to which each of the indicators associated with each transition phase and enabling factor are present. The data informed a traffic light rating for each enabling factor/phase to provide a quick visual summary of organisational strengths and where future action/change is required to firmly embed IWM into mainstream practice. A validation workshop was held with Council staff to share and discuss the findings of the survey and confirm the status of each rating.

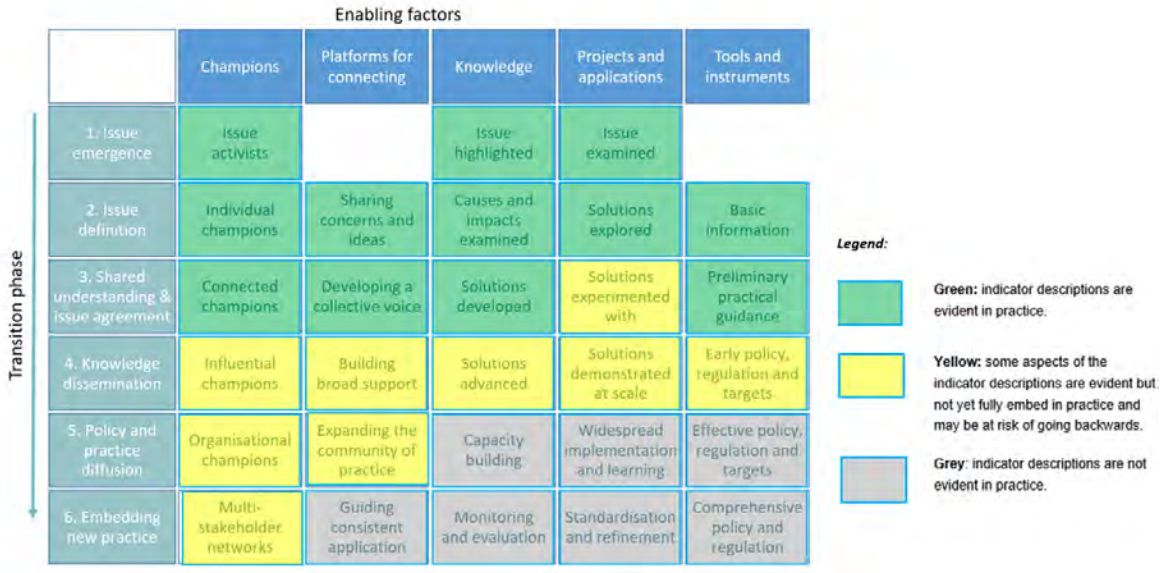


Figure 23 Results of using the IWM transition framework to assess Baw Baw Shire Council's organisational strengths for embedding IWM into mainstream practice.

A summary of the overall ratings and indictors that are not comprehensively embedded in Council practice are summarised in Attachment 5. Several 'easy win' actions evident from the findings are suggested to further progress Council's IWM journey. These include:

1. Strengthen interdisciplinary platforms

- Continue to foster existing interdisciplinary platforms between Council departments with formalising the WSUD working group to identify and discuss issues-based projects to broaden knowledge, sharing learning and deliver sustainable goals for the region.
- Further collaboration with industry stakeholders (such as, Melbourne Water and Gippsland Water) will strengthen environmental stewardship and deliver holistic water sensitive outcomes.
- Continue to strengthen organisational learning cultures to enable multidisciplinary and inter-organisational project planning and delivery for IWM.
- Continue to foster broader networks through formal and informal activities.

2. Comprehensive guidelines for WSUD construction review and handover

Develop a series of locally relevant WSUD guidelines and checklists that support best practice WSUD design and asset maintenance to ensure appropriate processes and procedures are in place to minimise Council's future liability and risk. When Council inherits a WSUD asset it is important that the asset is carefully assessed to ensure that its construction aligns to Council's standards, and that its condition at the time of handover is functioning as its' design intended (e.g. sediment inlet pond of wetlands have been cleaned out and reset post building phase of the upstream development). The document should provide a clear link between field inspections to determine asset condition and the rectification needs prior to Council accepting assets from developers.

3. Bring the community along on the water sensitive journey

Council should work towards providing as much information as possible on Council's website to share IWM aspirations, learnings from demonstration projects, and materials to support implementation of WSUD across the public and private realm. As a first step provide generic WSUD information on Council's website and provide links to broader information to encourage communities to uptake WSUD across the private development. Progress should be made towards proving information supporting planning applications associated with Amendment VC154 (Clause 53.18 Stormwater Management in Urban Development and Clause 55.03-4 Permeability and stormwater management objectives for residential multi-dwellings).

4.3 5-year action plan to support IWM

While this Plan has identified and considered a range of large-scale IWM infrastructure projects, there are also several water management initiatives which have been identified to support the uptake of IWM across Baw Baw Shire Council and the local community. A set of actions are recommended for each topic, with a suggested timeframe, indicative cost and delivery partners attributed to each. Note that the suggested timelines are indicative and subject to resourcing and

planning by Baw Baw Shire Council and partner organisations. Each suggested action falls under one of four main areas of improvement:

- Governance and delivery (Area of improvement 1)
- Technical capacity building (Area of improvement 2)
- Systems, processes and guidelines (Area of improvement 3)
- Community and communication (Area of improvement 4)
- Monitoring and reporting (Area of improvement 5)

Improvement areas are denoted in the code for each action as follows: (Area of improvement – action letter) e.g. (2-A) denotes the first action within the 'Technical capacity building' area.

Table 4 contains a prioritised summary of each action, including indications of required resources and stakeholders for delivery and an indication of actions that would be supported by an IWM officer. A detailed description of each action can be found within Attachment 7.

Table 4 Prioritised summary of 5 year action plan

Action	Action summary	Year 1	Year 2-3	Year 4-5	Priority	Resources	Lead	Role for IWM Officer
1-A	Formalise Integrated Water Management (IWM) project team	✓			High	In-Kind	IWM Project Team	Yes
1-E	Business case for IWM Officer	✓			High	$70,000	Community Infrastructure	No
1-B	Business case for securing the water supply at Crater Lake - Rawson	✓			High	In-Kind	Community Infrastructure	Yes
1-K	Review planned actions for Hazel Creek in terms of IWM - communicate, coordinate and implement with key stakeholders	✓			High	In-Kind	Community Infrastructure	Yes
2-E	Training for Statutory Planning team in relation to new State water management regulations	✓			High	$5,000	Planning and Development	Yes
3-A	Sediment monitoring on construction works	✓	✓	✓	High	In-Kind	Community Infrastructure	Yes
1-C	Business case for securing an alternative water supply at Western Park - Warragul	✓			High	In-Kind	Community Infrastructure	Yes
1-G	Business case for alternative water supply to promote economic development in Longwarry	✓			High	$40,000	Economic Development	Yes
2-A	Establish rainfall modelling templates to enable better investigation of stormwater harvesting opportunities	✓			High	$15,000	Planning and Development	Yes
2-B	Training in water modelling to allow better identification of harvesting opportunities	✓			High	5000	Planning and Development	Yes
2-C	Training in the assessment of Water Sensitive Urban Design to provide more rigour when assessing developer applications	✓			High	$10,000	Planning and Development	Yes
1-F	Continue implementation of the Domestic Wastewater Management Plan	✓	✓	✓	High	Current	Planning and Development	No
5-A	IWM Project Team to review and report progress against plan annually, including feedback and comment from Environmental Voice	✓	✓	✓	High	In-Kind	IWM Project Team	Yes
1-D	Business case for securing an alternative water supply at Trafalgar Recreation Reserve		✓		Medium	In-Kind	Community Infrastructure	Yes
1-H	IWM opportunities in master planning of smaller towns i.e. Trafalgar and Longwarry		✓		Medium	$20,000	Planning and Development	Yes
1-I	Design and construction of at least one major stormwater harvesting project to secure the water supply for future sporting precincts			✓	Medium	$350,000 - $1,000,000	Planning and Development	Yes
1-J	Greening waterway corridors to increase biodiversity	✓	✓	✓	Medium	In-Kind	Community Infrastructure	Yes
3-B	Continuous improvement of wetland handover process to ensure Council inherit high quality assets	✓			Medium	In-Kind	Planning and Development	Yes
3-C	Developers providing costed maintenance plans for wetlands and retarding basins	✓			Medium	In-Kind	Planning and Development	Yes

Table 4 Prioritised summary of 5 year action plan

Action	Action summary	Year 1	Year 2-3	Year 4-5	Priority	Resources	Lead	Role for IWM Officer
3-D	Mapping register and database of Council owned IWM assets		✓		Medium	In-Kind	Community Infrastructure	Yes
3-E	Audit existing Council owned IWM assets to understand current performance and future maintenance requirements		✓		Medium	$25,000	Community Infrastructure	Yes
3-F	Investigate options for an off-setting scheme for stormwater management		✓		Medium	$20,000	Community Infrastructure	Yes
4-B	Advocate for Gippsland Water to undertake community water literacy program		✓		Medium	In-Kind	Community Infrastructure	Yes
2-D	Review Neerim South stormwater harvesting scheme to inform future harvesting projects	✓			Medium	In-Kind	IWM Officer	Yes
4-A	Provide a central location for IWM information and resources for land developers			✓	Low	$10,000	IWM Officer	Yes
4-C	Develop IWM component of BBSC website for the community			✓	Low	$15,000	IWM Officer	Yes

5. Concept designs

The identified opportunities at Rawson, Western Park and Trafalgar have been selected from the list of project options to progress to concept design. For full detail, see individual concept designs.

Concept Design 1: Rawson Wastewater Recycling Scheme

Project Summary;
This scheme involves the construction of a surface flow wetland on the island of Crate Lake to receive and treat effluent from the Rawson Wastewater Treatment Plant. The scheme can be described in two separate phases; treatment of wastewater effluent in Crater Lake and connection to irrigation systems.

Concept Design 2: Western Park Oval Stormwater Harvesting Scheme

Project Summary;
An existing wetland located adjacent to the Western Park Ovals in Warragul treats runoff from upstream urban development before discharging to Hazel Creek. A stormwater harvesting scheme is proposed to irrigate the ovals to add value to an existing asset; reduce potable water consumption (to supply irrigation demands) and enhance the protection of Hazel Creek from the impact of urban development.

Concept Design 3: Trafalgar Stormwater Harvesting Scheme

Project Summary;
A 60ha catchment to the south-west of the Trafalgar township is zoned for residential development. This scheme involves the treatment and capture of stormwater runoff generated from these future residential growth areas to supply irrigation demands at Trafalgar Recreation Reserve. The harvesting scheme proposed is as an addition to the constructed wetland treatment system required for the development under Clause 56:07 of the Victorian Planning Provisions.

6. References

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Attachment 1 – Water and pollutant balance

Stormwater runoff from the area has been modelled using MUSIC v.6 and based on a 10-year rainfall sequence, and an estimation of impervious surfaces across the study areas. The imperviousness of each township area was established using planning zones (e.g. residential, industrial, open space etc.). Percentage imperviousness and pollutant generation has been matched to land-use.

To account for the climate variation due to the size of Baw Baw Shire's municipal area, two climate models were used for the water balance. Through the analysis of rainfall bands and local rainfall stations, the study areas were modelled using either of the two climate templates. The lowland townships of *Buln Buln, Drouin, Longwarry, Trafalgar, Warragul and Yarragon* were modelled with the Melbourne Water's Narre Warren North 10-year rainfall template. The townships of *Erica, Jindivick, Neerim South, Noojee, Rawson, Thorpdale, Walhalla and Willow Grove* were modelled with Melbourne Water's Mount St Leonard 10-year rainfall template that represents the higher mean annual rainfall in these townships.

The key MUSIC parameters used are shown in Table 8. Estimates of water demands and wastewater generation are based on scaled figures provided by Gippsland Water.

Table 5 Rainfall parameters used in catchment runoff modelling using MUSIC v.6

Mean Annual Rainfall	955mm	1,235mm
Rainfall Template	Narre Warren North	Mt St Leonard
Period	1984-1993	1995-2004
Interval	6mins	6mins

The following tables contain the tables summarising the water and pollutant balance for each of the study townships.

			Impervious fraction		ET losses (ML/y)		Baseflow and infiltration (ML/y)		Stormwater runoff (ML/y)	
	Total Area (ha)	Total Rain in (ML/y)	*Current*	*Future*	*Current*	*Future*	*Current*	*Future*	*Current*	*Future*
Buln Buln	70	649	50%	50%	276	276	93	93	277	277
Drouin	2,944	27,324	25%	47%	15,380	12,072	5,823	4,134	5,915	10,963
Ellinbank	231	2,141	0%	0%	1,507	1,507	610	610	3	3
Erica	69	836	48%	48%	308	308	177	177	353	353
Jindivick	62	753	20%	20%	375	375	244	244	135	135
Longwarry	191	1,770	63%	63%	625	625	188	188	950	950
Neerim South	342	4,168	38%	38%	1,714	1,714	1,036	1,036	1,424	1,424
Noojee	138	1,682	36%	36%	707	707	432	432	545	545
Rawson	114	1,387	35%	35%	591	591	362	362	437	437
Thorpdale	27	329	62%	62%	100	100	51	51	179	179
Trafalgar	460	4,271	61%	61%	1,558	1,558	478	478	2,215	2,215
Walhalla	35	423	61%	61%	130	130	67	67	226	226
Warragul	3,578	33,200	28%	60%	18,129	12,254	6,791	3,791	8,039	17,005
Willow Grove	103	1,253	32%	32%	555	555	345	345	356	356
Yarragon	137	1,269	61%	61%	461	461	141	141	661	661
Total	**8,499**	**81,453**			**42,416**	**33,232**	**16,838**	**12,149**	**21,714**	**35,728**

Township	TSS (kg/y)			TP (kg/y)			TN (kg/y)		
	Current	*Future*	*Increase*	*Current*	*Future*	*Increase*	*Current*	*Future*	*Increase*
Buln Buln	58,998	58,998	-	131	131	-	1,004	1,004	-
Drouin	1,351,031	2,342,855	991,824	3,356	5,279	1,923	28,102	40,792	12,690
Ellinbank	8,970	8,970	-	103	103	-	1,333	1,333	-
Erica	75,659	75,659	-	177	177	-	1,403	1,403	-
Jindivick	31,251	31,251	-	97	97	-	918	918	-
Longwarry	200,675	200,675	-	429	429	-	3,164	3,164	-
Neerim South	309,800	309,800	-	769	769	-	6,364	6,364	-
Noojee	119,072	119,072	-	300	300	-	2,512	2,512	-
Rawson	95,572	95,572	-	243	243	-	2,047	2,047	-
Thorpedale	37,780	37,780	-	83	83	-	627	627	-
Trafalgar	468,548	468,548	-	1,007	1,007	-	7,468	7,468	-
Walhalla	48,937	48,937	-	104	104	-	754	754	-
Warragul	1,836,683	3,598,569	1,761,886	4,336	7,753	3,416	35,043	57,586	22,543
Willow Grove	78,487	78,487	-	206	206	-	1,776	1,776	-
Yarragon	139,747	139,747	-	300	300	-	2,224	2,224	-
Total	**4,861,210**	**7,614,921**	**2,753,711**	**11,642**	**16,981**	**5,339**	**94,740**	**129,974**	**35,234**

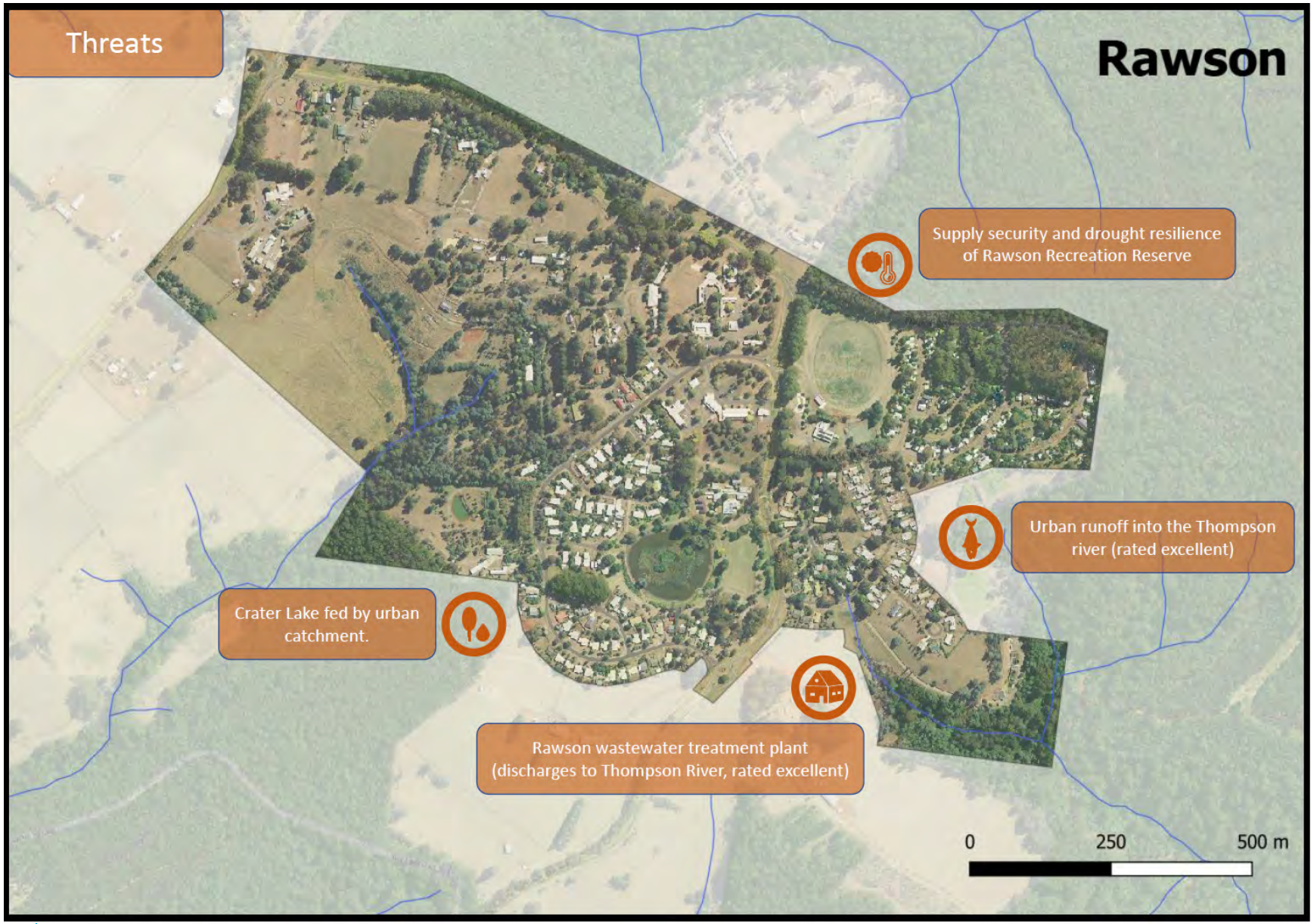
Township	Supplied potable water (ML/y)1	Current Wastewater (ML/y)	Current recycling schemes	Estimated Lot Count	Planned Lots	Future Potable demand (ML/y)	Future Wastewater production (ML/y)
Warragul	1,869	1,628		8,279	12,574	4,707.60	1,700.14
Drouin	1,397	821	Bellbird Park (30 ML/y)	5,559	7,418	3,261.17	1,631.96
Neerim South	183	49	Neerim South Stormwater Harvesting Scheme (5ML/y)	550	-	-	-
Noojee	16	31		226	-	-	-
Willow Grove	41	19		193	-	-	-
Erica	26	20		149	-	-	-
Rawson	39	31		215	-	-	-
Longwarry	260	122	South East Water Scheme (105 ML/y Class C to 1 customer)	913	-	-	-
Thorpedale	14	26		195	-	-	-
Trafalgar	461	334		2,069	-	-	-
Walhalla	70	43		318	-	-	-
Buln Buln	33	12		89	-	-	-
Jindivick	6	4		27	-	-	-
Yarragon	160	97		812	-	-	-
Existing Total	**4,579**	**3,239**			**Future Total**	**12,548**	**6,571**

Attachment 2 – Township threat and opportunity mapping

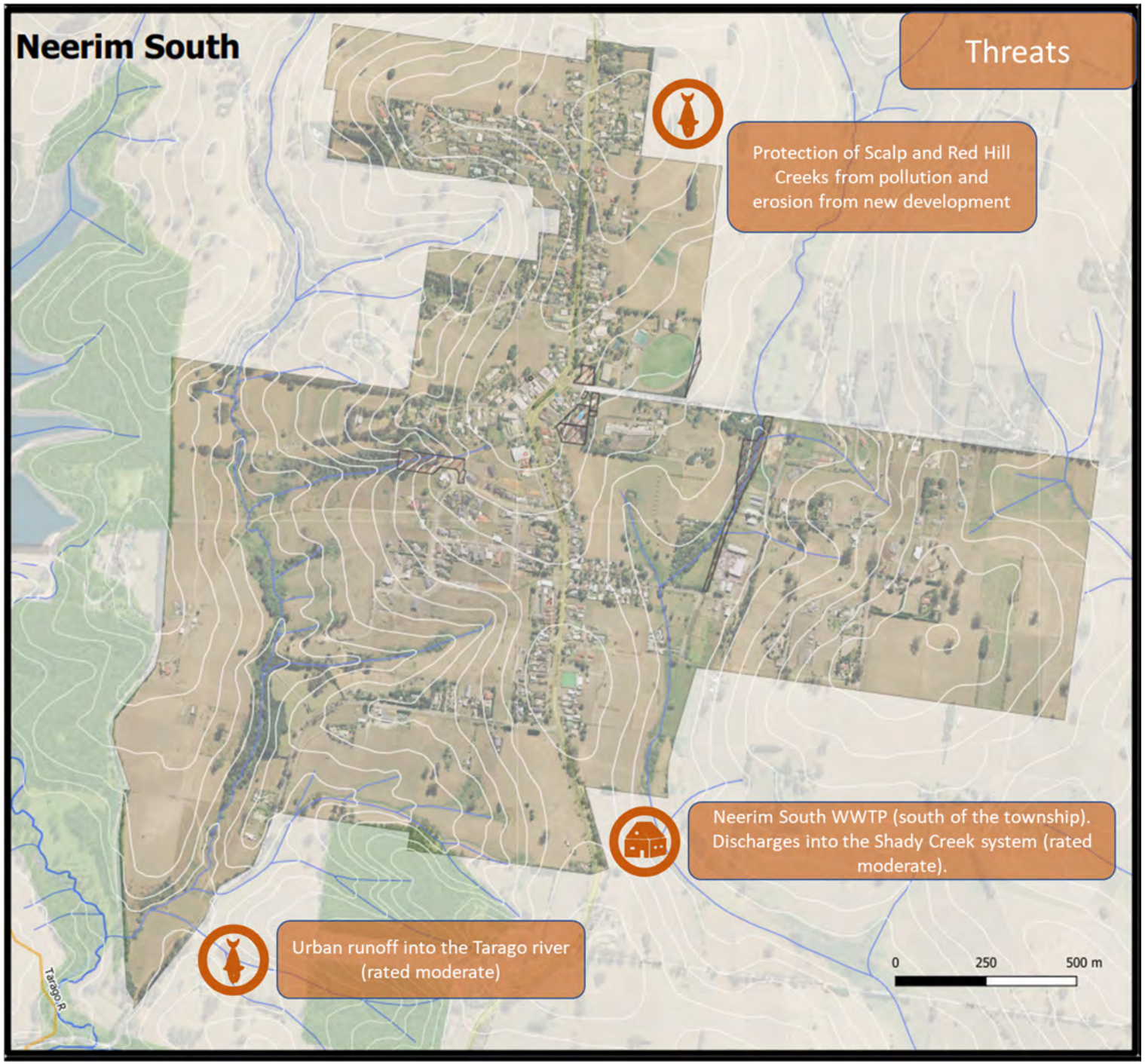
The first two tables include the long list of identified threats and opportunities for the study townships. The following pages contain threats and opportunities for each township displayed spatially, as indicated through the workshop and analysis process.

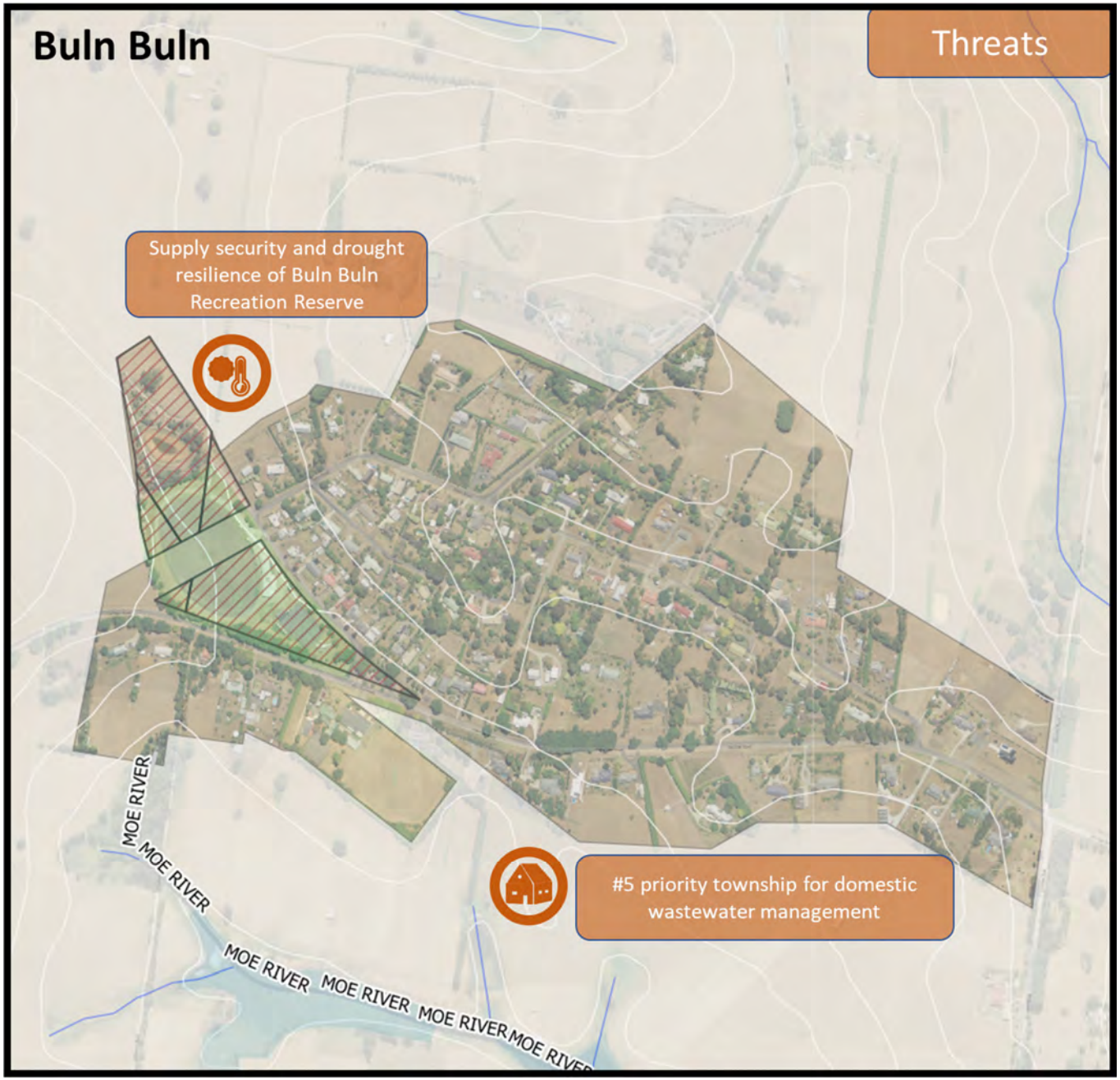
Township	Indentified threats	Themes
Rawson	Water quality and drought resilience issues for Crater Lake. The Lake is currently being fed by a small urban catchment.	
	Rawson wastewater treatment plant discharging into the Thomson River (condition rated excellent by ISC).	
	Urban stormwater runoff into the Thomson River (condition rated excellent by ISC).	
	Supply security and drought resilience of Rawson Recreation Reserve.	
Jindivick	Urban stormwater runoff into the Tarago River (condition rated moderate by ISC). The Tarago River system is a Melbourne Water's priority stormwater catchment.	
	Supply security and drought resilience of Kudd Park Reserve.	
Neerim South	Sedimentation and erosion of Scalp and Red Hill Creeks from new development. Scalp Creek is a Melbourne Water priority stormwater catchment.	
	Urban stormwater runoff into the Tarago River (condition rated moderate by ISC) and Shady Creek systems (condition rated moderate by ISC). The Tarago River system is a Melbourne Water's priority stormwater catchment.	
	Neerim South wastewater treatment plant discharging into Shady Creek (condition rated moderate by ISC).	
Buln Buln	Supply security and drought resilience of Buln Buln Recreation Reserve.	
	Identified as the #5 highest priority township for enhanced domestic wastewater management by the DWMP.	
Longwarry	Supply security and drought resilience of Longwarry Recreation Reserve.	
	Urban stormwater runoff into the Bunyip River.	
	Longwarry wastewater treatment plant discharging towards the Bunyip River.	
Drouin	[illegible] as King Parrot Creek (condition rated very poor by ISC). Whiskey Creek, Gum Scrub Creek and King Parrot Creek are Melbourne Water priority stormwater catchments.	
	Large areas of new development causing construction sediments and erosion of Whiskey Creek, Gum Scrub Creek, King Parrot Creek and Stony Creek. Whiskey Creek, Gum Scrub Creek and King Parrot Creek are Melbourne Water priority stormwater catchments.	
	Increased potable demand and wastewater production due to large areas of urban growth.	
	Drouin wastewater treatment plant discharging towards King Parrot Creek (condition rated very poor by ISC).	
	Supply security and drought resilience of existing reserves (apart from Bellbird Park), as well as reserves proposed in Drouin's PSP.	
Warragul	Existing urban stormwater runoff into Hazel Creek.	
	Supply security and drought resilience of existing reserves, as well as reserves proposed in Warragul's PSP.	
	Large areas of new development causing construction sediments and erosion of Hazel Creek and upstream tributaries.	
	Increased potable demand and wastewater production due to large areas of urban growth.	
	Warragul wastewater treatment plant discharging into Hazel Creek.	
Walhalla	Increased potable water demand and wastewater production of public facilities caused by tourism.	
	Identified as the #1 highest priority township for enhanced domestic wastewater management by the DWMP.	
	Existing urban runoff into Stringers Creek (towards the Thomson River system, condition rated excellent by ISC).	
Erica	Identified as the #4 highest priority township for enhanced domestic wastewater management by the DWMP.	
	Existing urban runoff towards Tyers River (condition rated moderate by ISC).	
Noojee	Increased potable water demand and wastewater production of public facilities caused by tourism.	
	Identified as the #3 highest priority township for enhanced domestic wastewater management by the DWMP.	
	Existing urban stormwater runoff towards Tyers River (condition rated moderate by ISC).	
Trafalgar	Supply security and drought resilience of Trafalgar Recreation Reserve.	
	Resilience of flood-prone areas of Trafalgar.	
Yarragon	Supply security and drought resilience of Downton Park Recreation Reserve.	
	Resilience of flood-prone areas of Yarragon.	
Willow Grove	Existing urban stormwater runoff into LaTrobe River system and causing erosion into Blue Rock Lake.	
	Supply security and drought resilience of Willow Grove Recreation Reserve.	
Thorpedale	Identified as the #8 highest priority township for enhanced domestic wastewater management by the DWMP.	
	Supply security and drought resilience of Thorpedale Recreation Reserve.	
	Existing urban stormwater runoff into Narracan Creek (condition rated good by ISC).	

Township	Identified opportunities	Themes
Rawson	Develop an alternative water supply for Rawson Recreation Reserve.	
	Improve water quality and drought resilience of Crater Lake.	
	Investigate required upgrades of Rawson WWTP to provide alternative water supply.	
Jindivick	Investigate stormwater harvesting opportunities for new development to meet Melbourne Water Healthy Waterway Strategy targets.	
	Continue implementation of actions developed in Domestic Wastewater Management Plan.	
Neerim South	Investigate stormwater harvesting opportunities to meet Melbourne Water Healthy Waterway Strategy targets for development discharging into Scalp Creek.	
	Investigate the operation of the existing stormwater harvesting scheme. Document any lessons learnt to improve future schemes.	
Buln Buln	Explore stormwater harvesting opportunity to supply Buln Buln Recreation Reserve.	
	Continue implementation of actions developed in Domestic Wastewater Management Plan.	
Longwarry	Develop an alternative supply for Longwarry Recreation Reserve	
	Explore stormwater harvesting opportunities on new developer wetlands for irrigation of adjacent open space.	
Drouin	Investigate opportunity to supply Drouin Golf & Country Club and planned PSP sporting reserves with harvested water from treatment system planned for the north-east of Drouin.	
	Explore integrating stormwater harvesting into the wetland within Drouin Civic Park upgrade masterplan to supply Drouin Recreation Reserve.	
	Develop further uses for water recycled at the Drouin Wastewater Treatment Plant (recycled water is presently being used for irrigation at Bellbird Park).	
	Investigate stormwater harvesting opportunities with planned wetlands and sporting reserves in growth areas.	
	Investigate stormwater harvesting opportunities to meet Melbourne Water Healthy Waterway Strategy targets.	
Warragul	Investigate a stormwater harvesting scheme at Warragul Civic Park.	
	Investigate the feasibility of retrofitting a stormwater harvesting scheme to the existing wetland at Western Park	
	Investigate stormwater harvesting opportunities in PSP growth areas along tributaries of Hazel Creek.	
	Undertake a condition and performance audit of Western Park wetland.	
	Improve the water quality of stormwater discharge from existing industrial sites into Hazel Creek.	
	Stormwater harvesting to protect biodiversity outcomes within planned business and industrial growth areas.	
Walhalla	Investigate options for supplementing the Walhalla Day Visitor Centre's existing rainwater harvesting scheme.	
	Continue implementation of actions developed in Domestic Wastewater Management Plan.	
Erica	Continue implementation of actions developed in Domestic Wastewater Management Plan.	
Noojee	Upgrade public toilet facilities with water harvesting system to reduce increased potable demand.	
	Continue implementation of actions developed in Domestic Wastewater Management Plan.	
Trafalgar	Explore alternative water supply at Trafalgar Recreation Reserve (site of BBSC's largest potable water demand that is undergoing master planning for expansion).	
	Trafalgar retarding basin planned to service new residential development could be used for multiple additional functions.	
	Explore the possibility of a precinct structure plan for growth areas, including strategic IWM outcomes.	
Yarragon	Alternative water supply for Yarragon Recreation Reserve.	
	Explore opportunity to upgrade existing minor RB system to the south of Yarragon Recreation Reserve.	
	Understand future growth areas for PSPs and developer contribution plans, to allow for strategic IWM planning from an early stage.	
	Explore opportunity to upgrade existing RB system at Hazeldean Rd into stormwater treatment system.	
Willow Grove	Explore the opportunity to improve drainage from urban areas into Blue Rock Lake to reduce erosion. Investigate the opportunity to naturalise drainage line.	
Thorpdale	Continue implementation of actions developed in Domestic Wastewater Management Plan.	

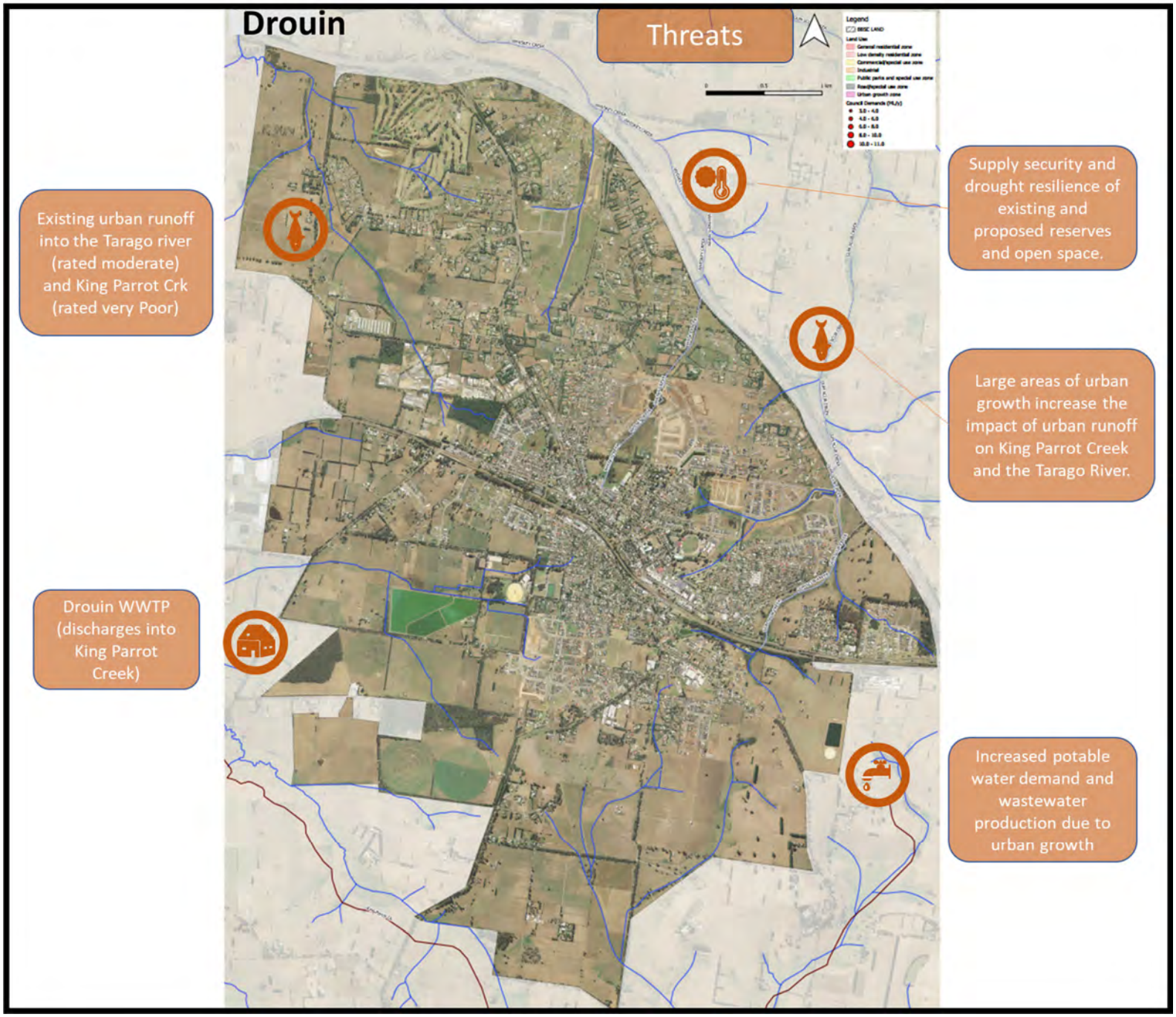

Threats
Rawson
Supply security and drought resilience of Rawson Recreation Reserve
Urban runoff into the Thompson river (rated excellent)
Crater Lake fed by urban catchment.
Rawson wastewater treatment plant (discharges to Thompson River, rated excellent)
0
250
500 m

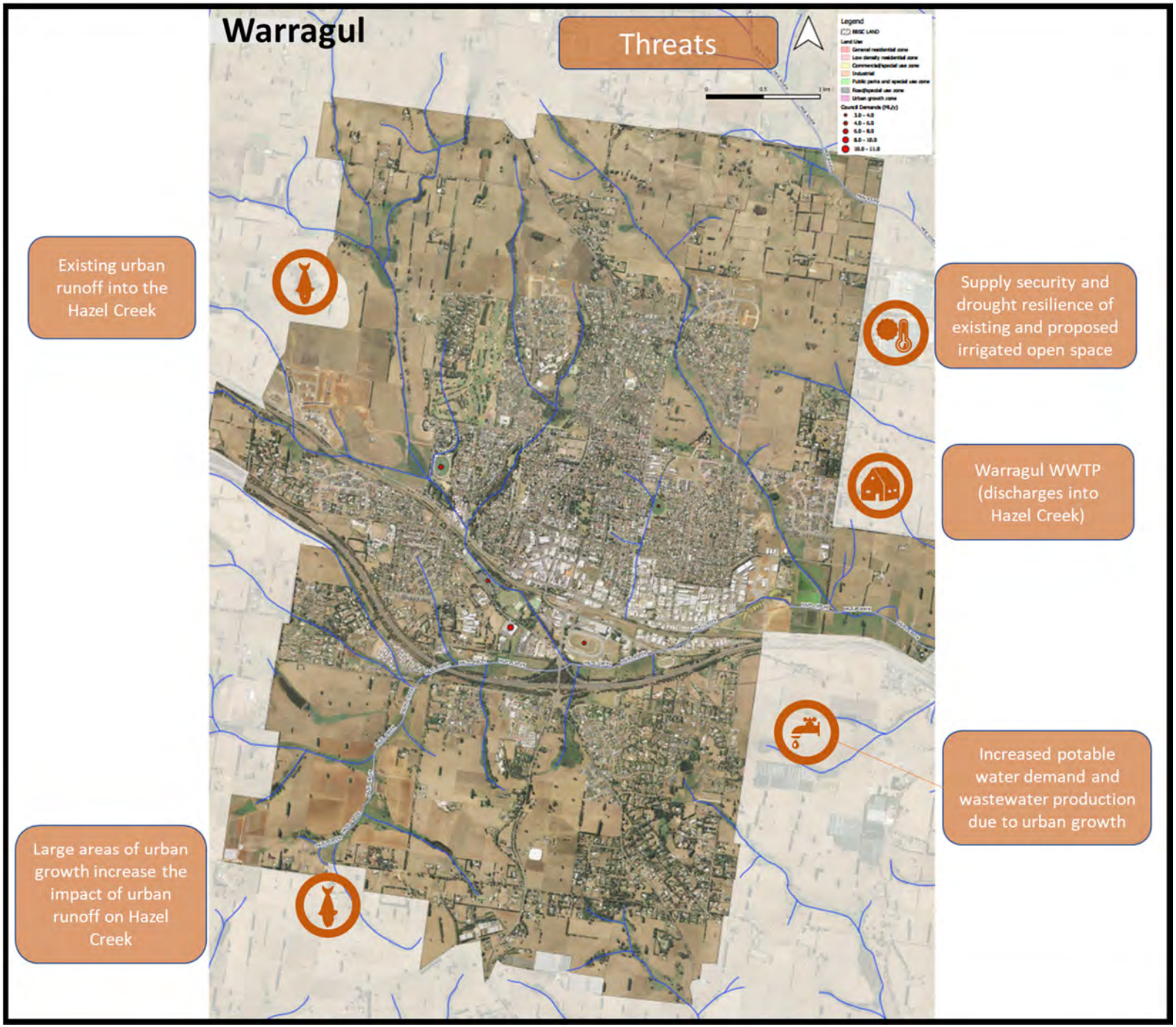

Jindivick
Threats
Urban runoff into the Tarago river (rated moderate)
Supply security and drought resilience of Kudd Park Reserve
0
250
500 m


Neerim South
Threats
Protection of Scalp and Red Hill Creeks from pollution and erosion from new development
Neerim South WWTP (south of the township). Discharges into the Shady Creek system (rated moderate).
Urban runoff into the Tarago river (rated moderate)
0
250
500 m
Tarago R


Buln Buln
Threats
Supply security and drought resilience of Buln Buln Recreation Reserve
#5 priority township for domestic wastewater management
MOE RIVER
MOE RIVER
MOE RIVER
MOE RIVER
MOE RIVER
MOE RIVER

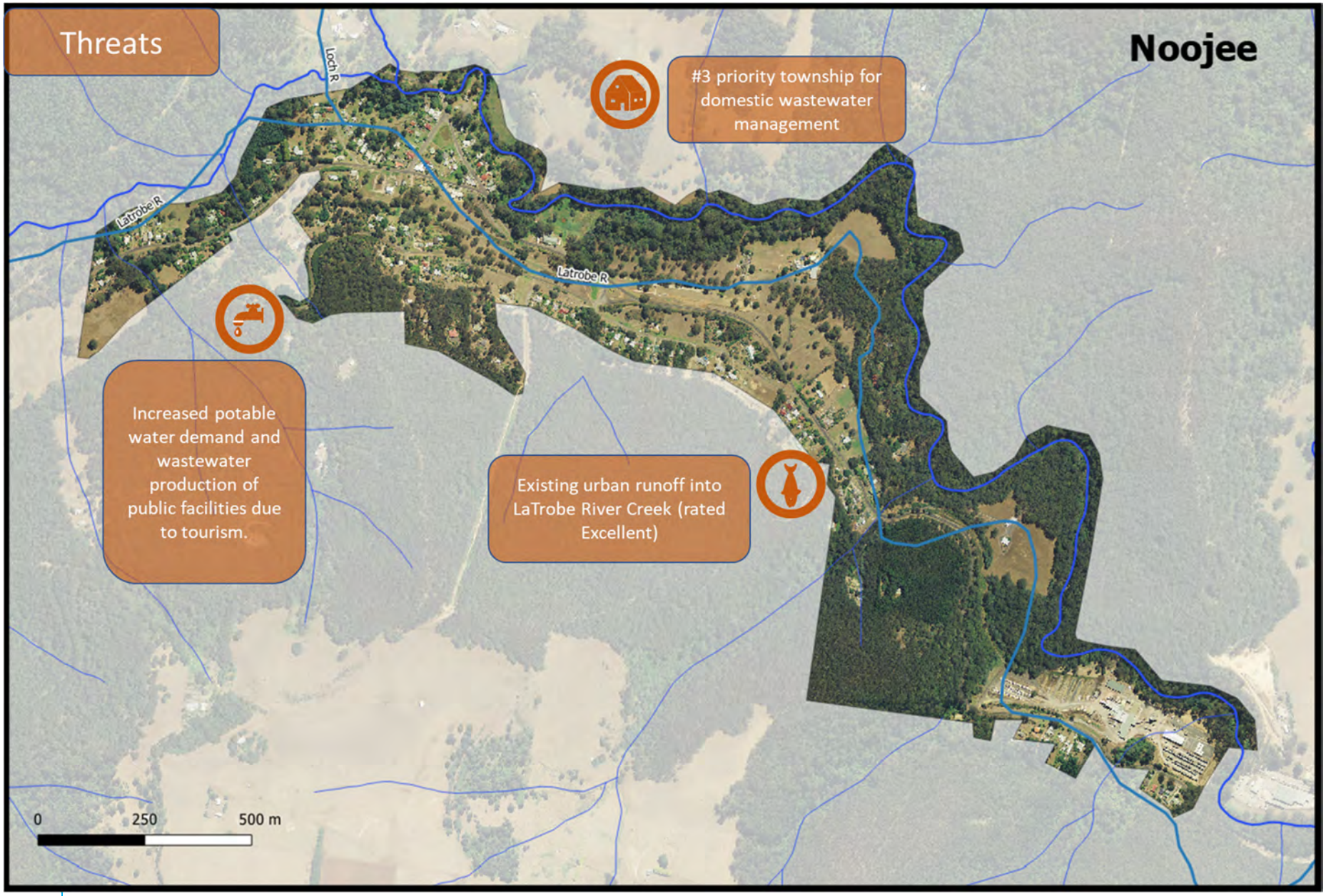

Longwarry
Threats
Urban runoff into the Bunyip river
Longwarry WWTP (discharges towards Bunyip River)
Supply security and drought resilience of Longwarry Recreation Reserve


Drouin
Threats
Existing urban runoff into the Tarago river (rated moderate) and King Parrot Crk (rated very Poor)
Drouin WWTP (discharges into King Parrot Creek)
Supply security and drought resilience of existing and proposed reserves and open space.
Large areas of urban growth increase the impact of urban runoff on King Parrot Creek and the Tarago River.
Increased potable water demand and wastewater production due to urban growth

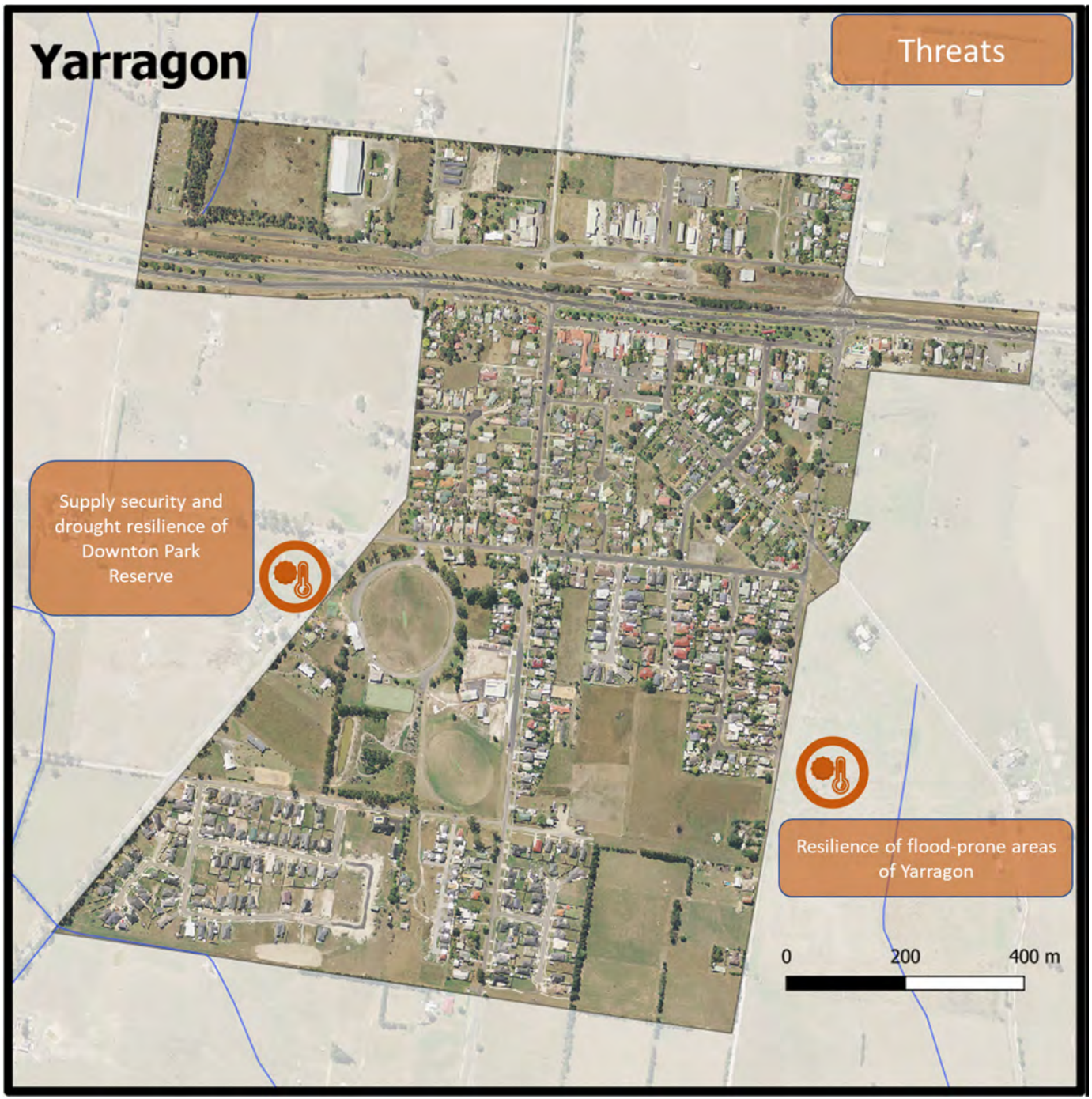

Warragul
Threats
Existing urban runoff into the Hazel Creek
Supply security and drought resilience of existing and proposed irrigated open space
Warragul WWTP (discharges into Hazel Creek)
Increased potable water demand and wastewater production due to urban growth
Large areas of urban growth increase the impact of urban runoff on Hazel Creek


Walhalla
Threats
Increased potable water demand and wastewater production of public facilities due to tourism.
Existing urban runoff into Stringers Creek and the Thompson River (rated excellent)
#1 priority township for domestic wastewater management
0
250
500 m

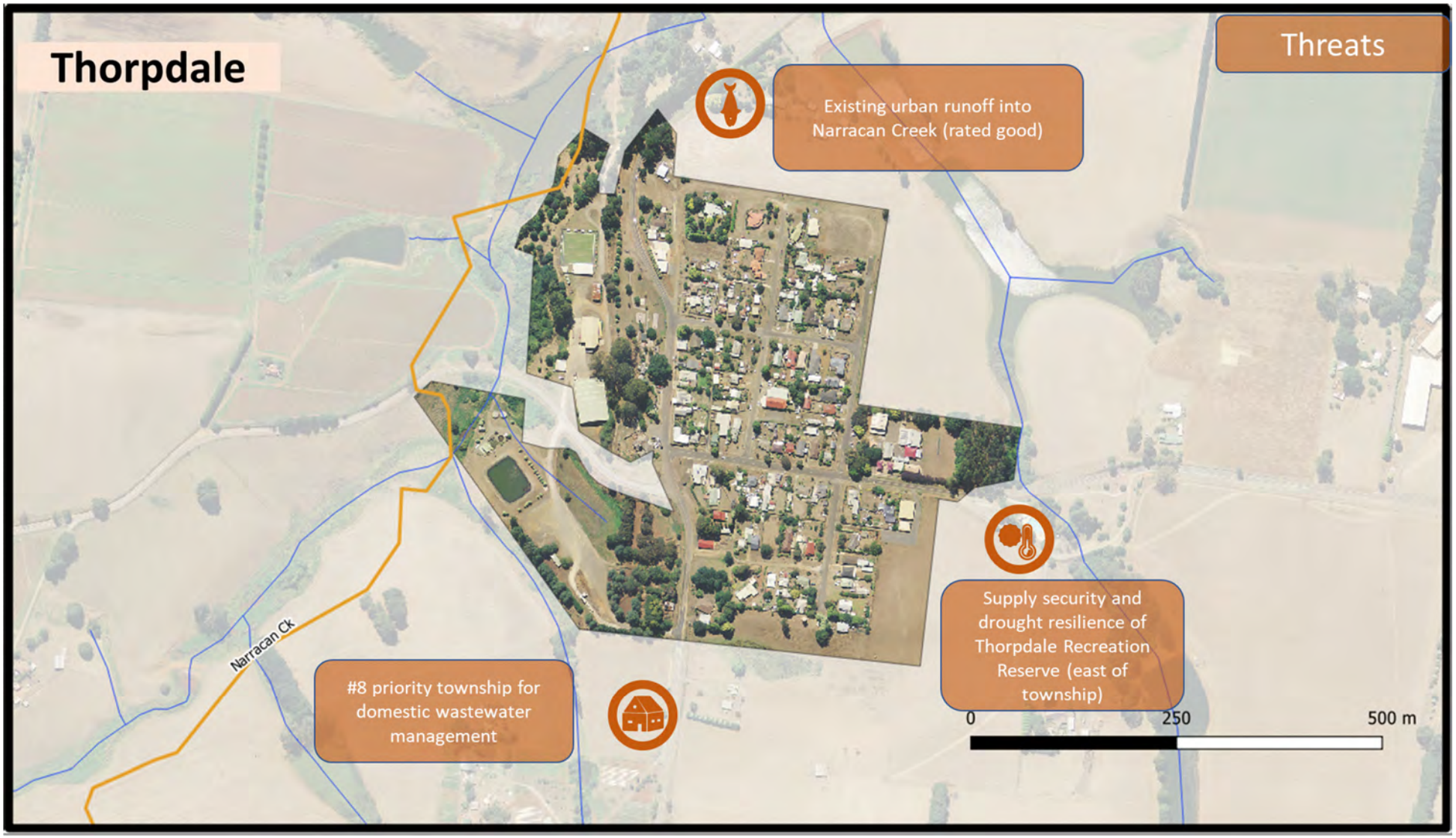

Erica
Threats
Existing urban runoff into Tyers Creek (rated moderate)
#4 priority township for domestic wastewater management
0
250
500 m

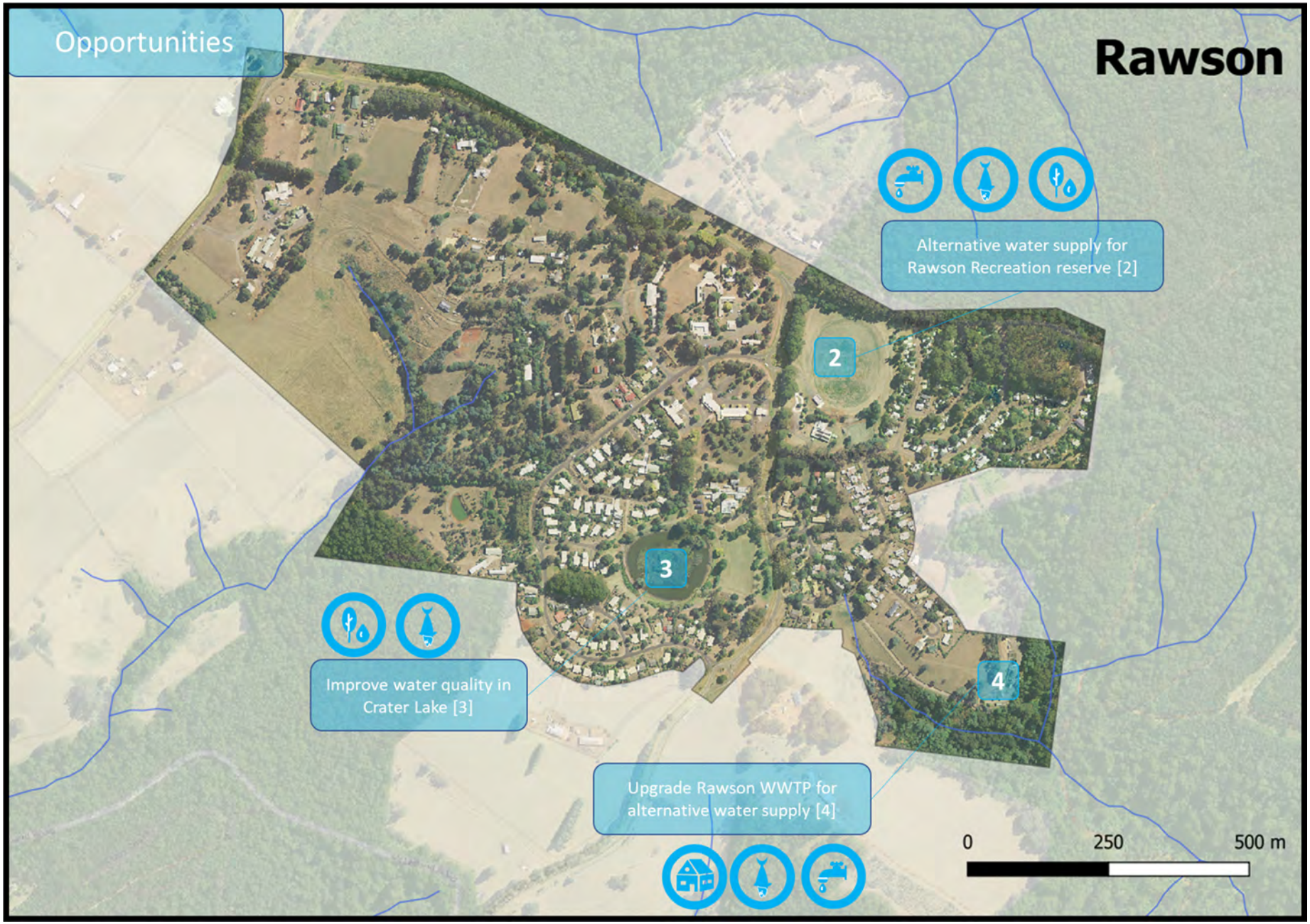

Threats
Noojee
#3 priority township for domestic wastewater management
Increased potable water demand and wastewater production of public facilities due to tourism.
Existing urban runoff into LaTrobe River Creek (rated Excellent)
Loch R
Latrobe R
Latrobe R
0
250
500 m


Trafalgar
Threats
Supply security and drought resilience of Trafalgar Recreation Reserve
Resilience of flood-prone areas of Trafalgar
0
250
500 m

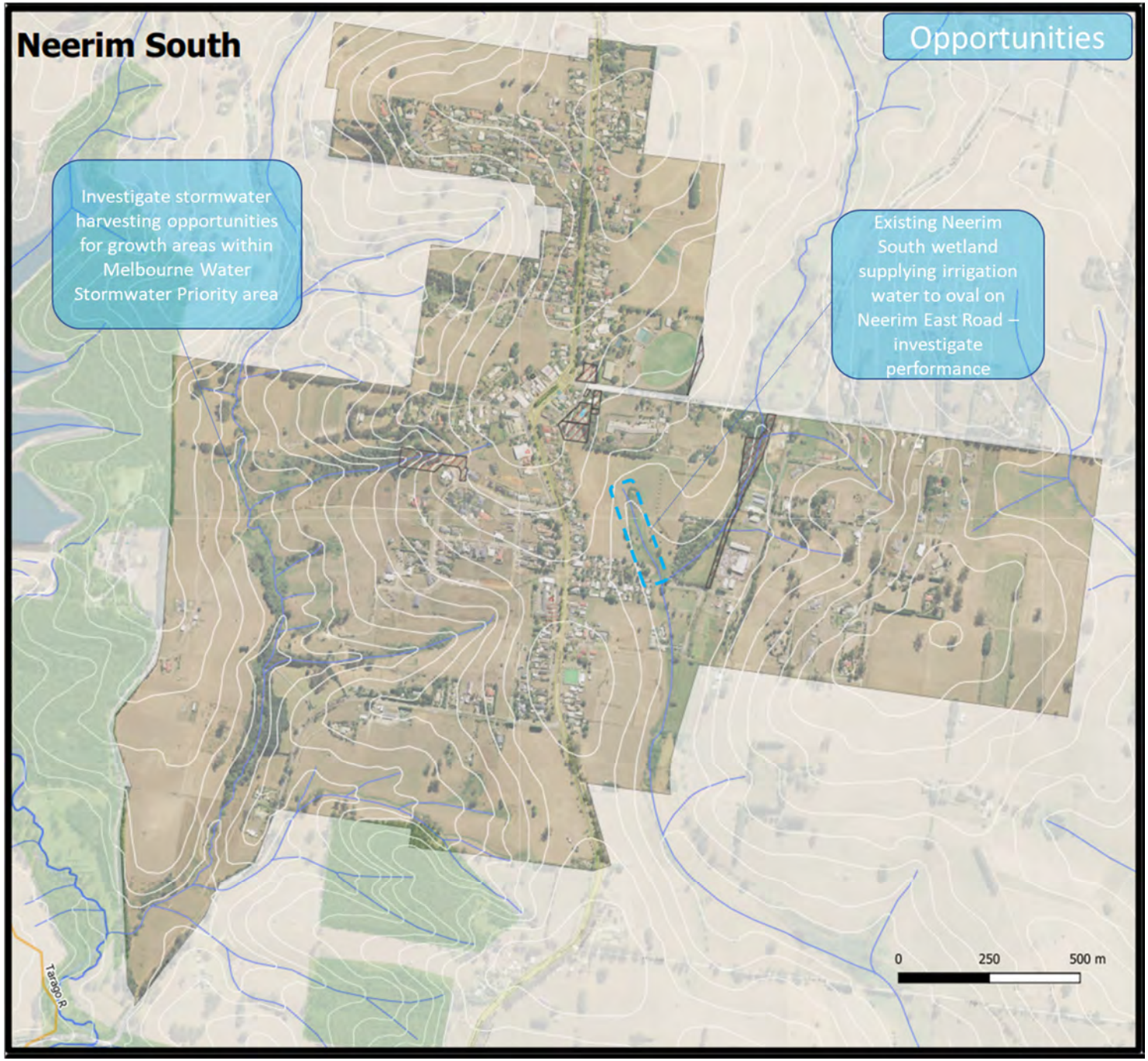

Yarragon
Threats
Supply security and drought resilience of Downton Park Reserve
Resilience of flood-prone areas of Yarragon
0
200
400 m

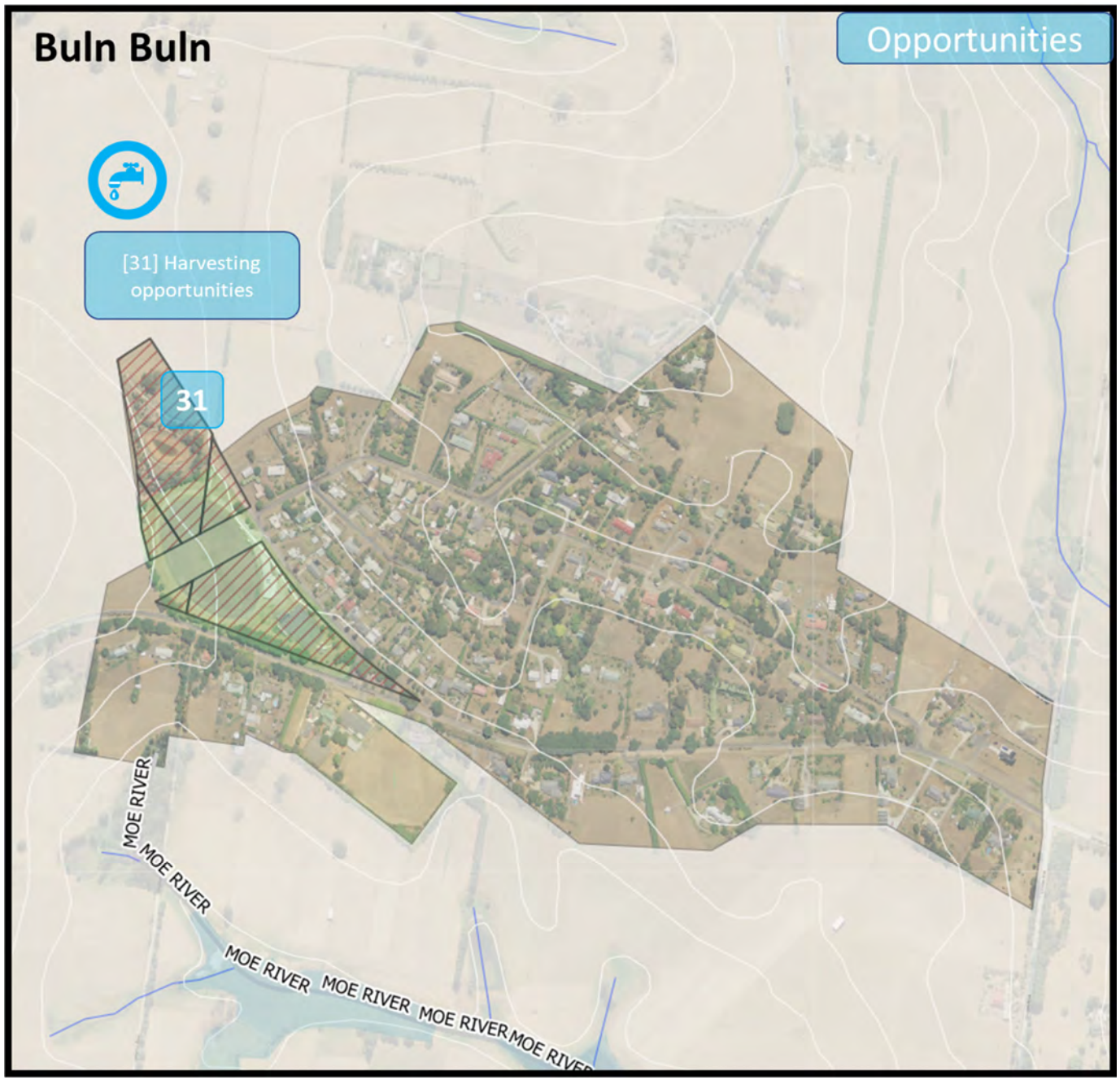

Willow Grove
Threats
Existing urban runoff causing erosion into Blue Rock Lake and LaTrobe River Creek (rated good)
Supply security and drought resilience of Willow Grove Recreation Reserve
Willow Grove WWTP (south of the township). Discharges into the LaTrobe River.
0
250
500 m


Thorpdale
Threats
Existing urban runoff into Narracan Creek (rated good)
Supply security and drought resilience of Thorpdale Recreation Reserve (east of township)
#8 priority township for domestic wastewater management
Narracan Ck
0
250
500 m

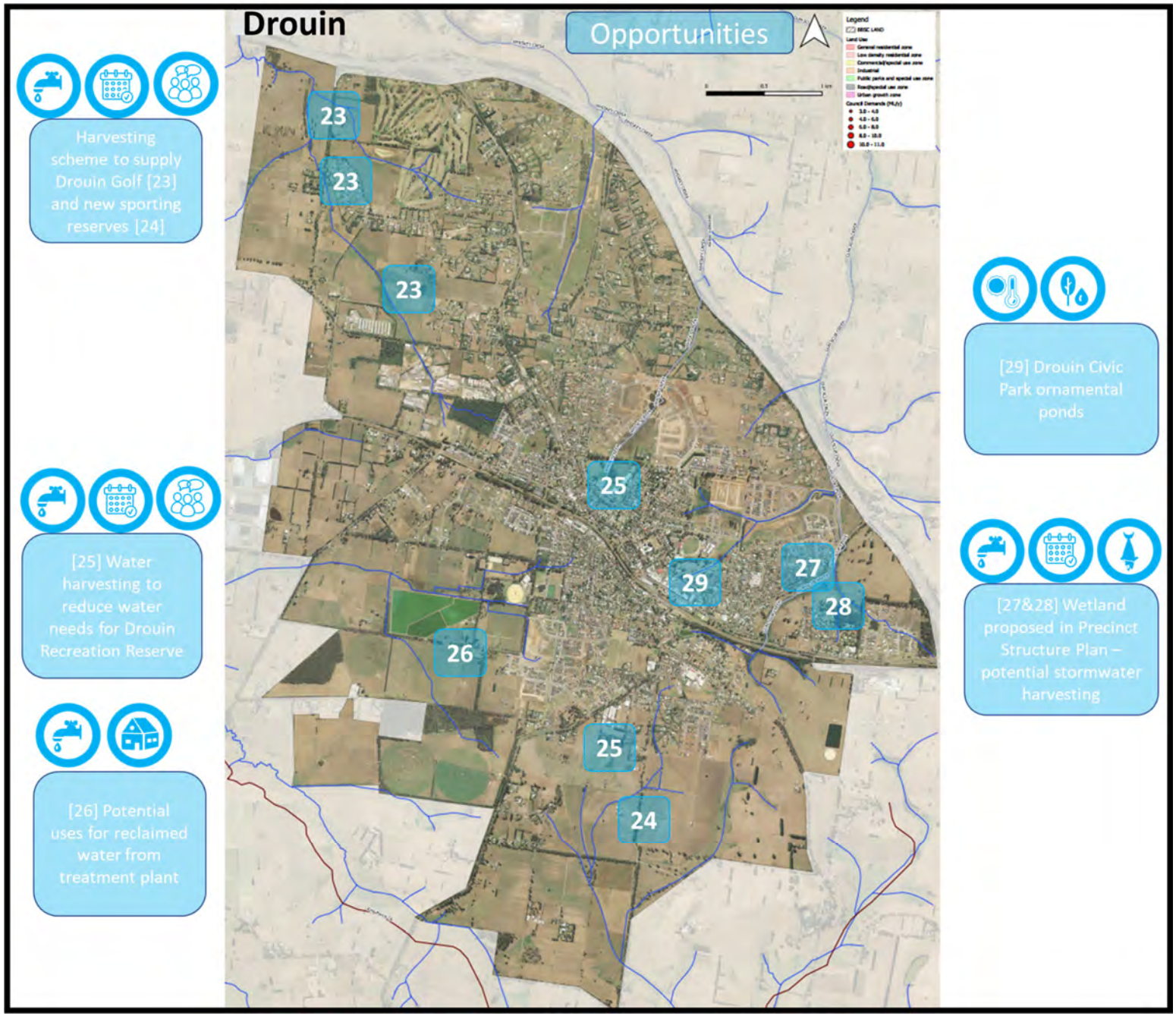

Opportunities
Rawson
Alternative water supply for Rawson Recreation reserve [2]
2
3
4
Improve water quality in Crater Lake [3]
Upgrade Rawson WWTP for alternative water supply [4]
0
250
500 m

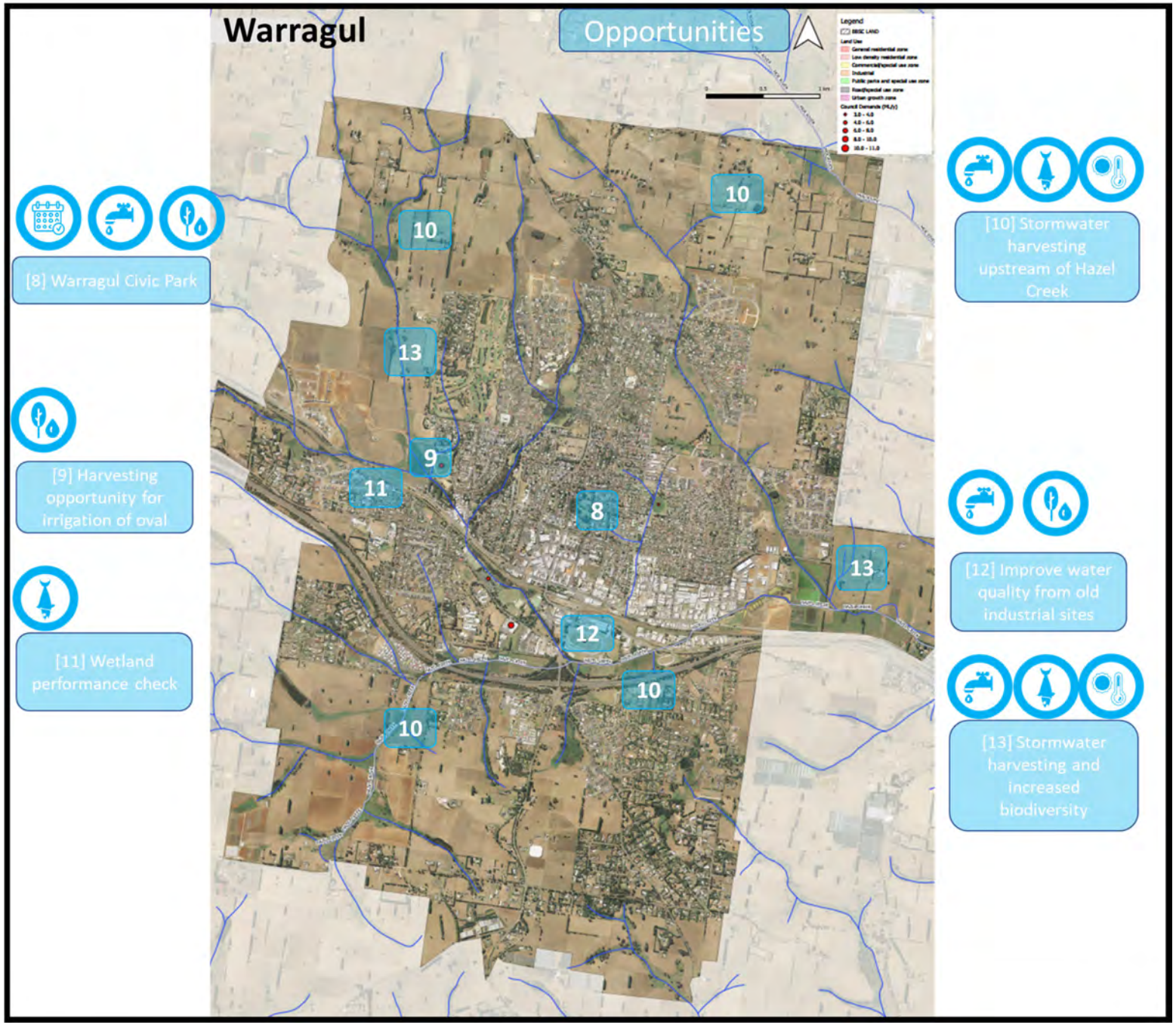

Jindivick
Opportunities
0
250
500 m


Neerim South
Opportunities
Investigate stormwater harvesting opportunities for growth areas within Melbourne Water Stormwater Priority area
Existing Neerim South wetland supplying irrigation water to oval on Neerim East Road – investigate performance
0
250
500 m
Tarago R.


Buln Buln
Opportunities
[31] Harvesting opportunities
31
MOE RIVER
MOE RIVER
MOE RIVER
MOE RIVER
MOE RIVER
MOE RIVER

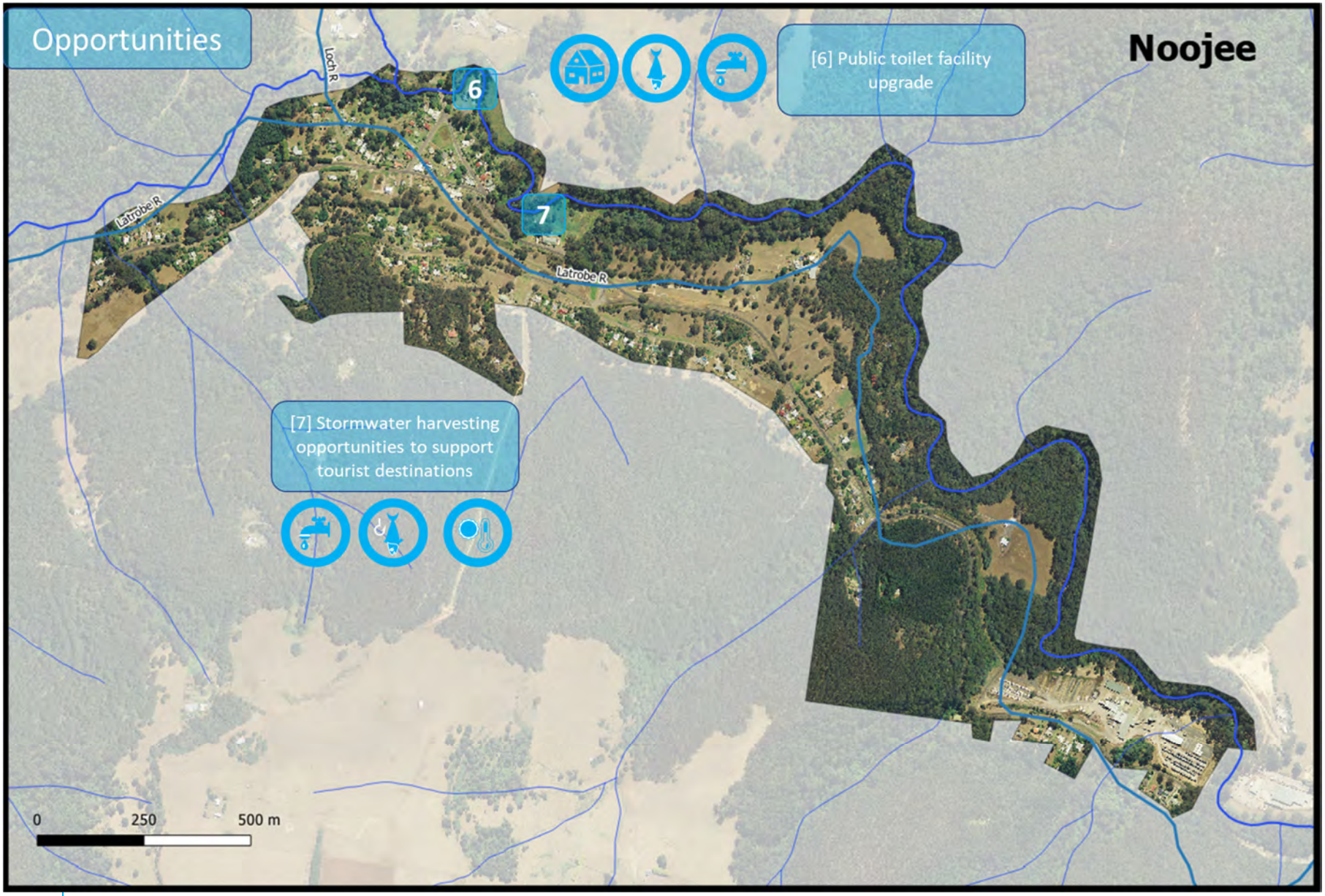

Longwarry
Opportunities
[30] Harvesting opportunities
30
Existing wastewater recycling at WWTP
Excess recycled water for oval irrigation?


Drouin
Opportunities
Harvesting scheme to supply Drouin Golf [23] and new sporting reserves [24]
[25] Water harvesting to reduce water needs for Drouin Recreation Reserve
[26] Potential uses for reclaimed water from treatment plant
[29] Drouin Civic Park ornamental ponds
[27&28] Wetland proposed in Precinct Structure Plan – potential stormwater harvesting
23
23
23
25
29
27
28
26
25
24

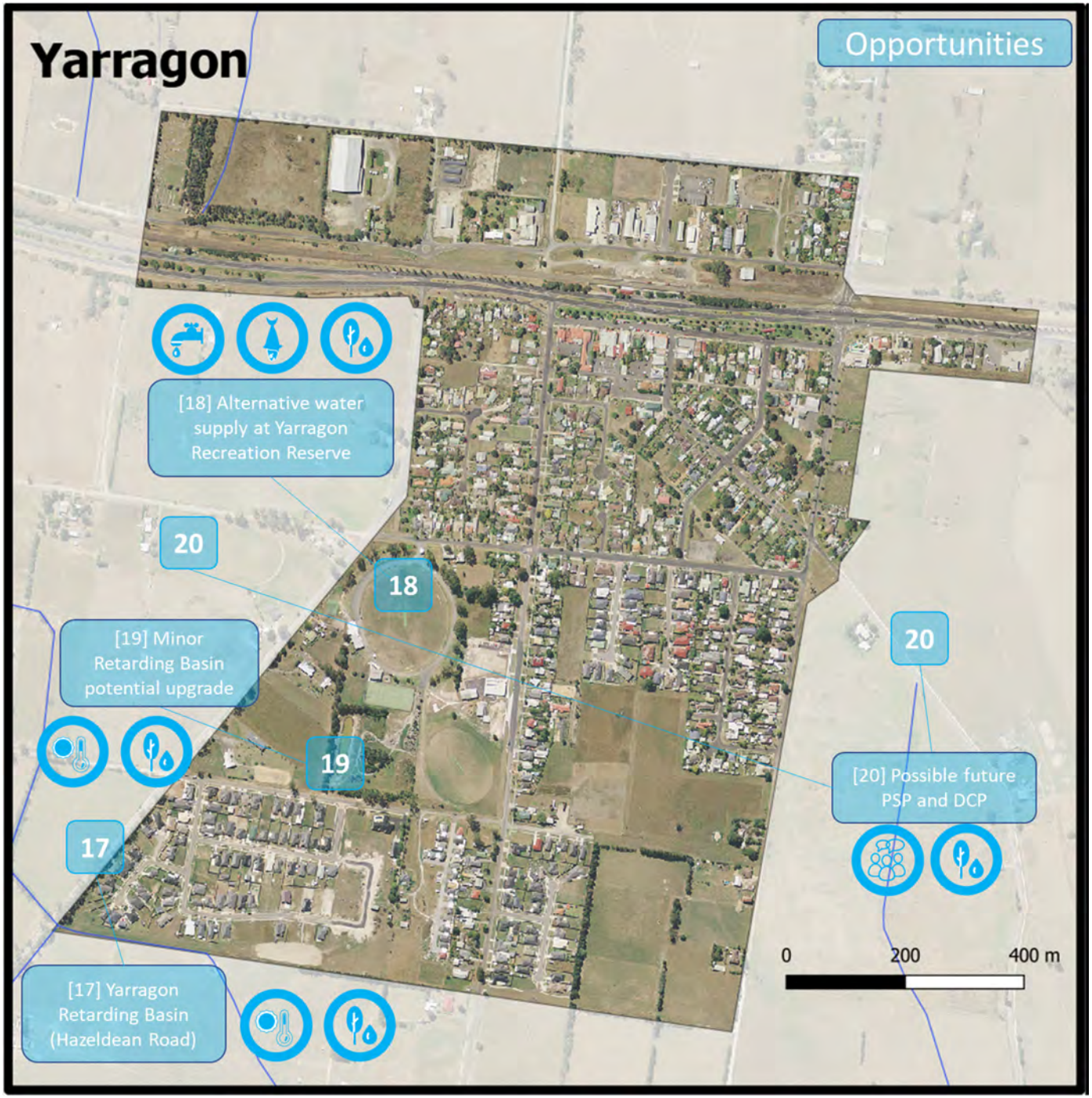

Warragul
Opportunities
[8] Warragul Civic Park
[9] Harvesting opportunity for irrigation of oval
[11] Wetland performance check
[10] Stormwater harvesting upstream of Hazel Creek
[12] Improve water quality from old industrial sites
[13] Stormwater harvesting and increased biodiversity
10
10
13
9
11
8
13
12
10
10


Walhalla
Opportunities
5
[5] Walhalla Day Visitor Centre harvesting scheme
0
250
500 m


Erica
Opportunities
0
250
500 m


Opportunities
Noojee
[6] Public toilet facility upgrade
[7] Stormwater harvesting opportunities to support tourist destinations
6
7
Loch R
Latrobe R
Latrobe R
0
250
500 m


Trafalgar
Opportunities
[15] Alternative water supply at Trafalgar Recreation Reserve
15
14
16
[16] Possible Precinct Structure Plan (PSP) Area
[14] Trafalgar Retarding Basin (RB)
0
250
500 m


Yarragon
Opportunities
[18] Alternative water supply at Yarragon Recreation Reserve
20
18
[19] Minor Retarding Basin potential upgrade
19
17
20
[20] Possible future PSP and DCP
[17] Yarragon Retarding Basin (Hazeldean Road)
0
200
400 m


Willow Grove
Opportunities
21
[21] Willow Grove gully works
0
250
500 m


Thorpdale
Opportunities
22
[22] Alternative water supply opportunities for pool
Pool
Narracan Ck
0
250
500 m

Attachment 3 – Preliminary assessment

Below is a detailed breakdown of the preliminary cost-benefit estimates that were used for comparative purposes during the prioritisation of the sort-list of project options. Note that the unique components of Rawson Wastewater Harvesting Scheme required separate costing and has been included at the end of this attachment.

A high-level estimate of capital and operational costs for each project option is established from the combined total of required infrastructure. This includes allowance for maintenance and rectification over a 25-year design life. It should be noted that for several project options, existing and planned infrastructure reduce the required CAPEX and OPEX. For instance, where a harvesting scheme is proposed for a wetland servicing new development (e.g. Fairway), CAPEX for construction of the wetland have been assumed at nil. Maintenance costs comprise a large proportion of total OPEX costs, and for wetlands servicing new developments this has been reduced to 50% of the required total. This reflects Council's existing obligation to maintain assets handed over by developers, but also that maintenance for a harvesting asset will require a better standard of maintenance than is currently provided. These high-level cost-estimates are produced primarily to allow comparison of project options within the short-list.

Most project options represent stormwater harvesting schemes, which are modelled in MUSIC to establish available reuse options and to develop indicative pump-rates and storage sizes. The quantification adjacent demand offset by the scheme allows for the calculation of a monetised benefit of the supplied volume. IWM project options also provide significant environmental benefits that are difficult to monetise. Melbourne Water's monetised value for nitrogen reductions is an industry standard across greater metropolitan Melbourne for recognising the value of pollutant reductions of IWM projects. This rate has been applied to each project option's annual load reduction of nitrogen. Projects that use existing or planned assets have not been given credit for existing nitrogen reductions of these assets. Instead, only the additional pollutant reductions of the harvesting scheme have been credited towards the quantified benefits.

The costs and benefits of each project option have been brought into present value and combined to ascertain a benefit-cost ratio. This benefit-cost ratio is useful to compare the merit and value that each project option represents.

Portfolio	Project	Name / ID	Catchment			Treatment Type	Treatment Area (m2)	Inlet properties	
			Area (ha)	TI %	DCI %			Low flow bypass (L/s)	High flow bypass (L/s)
1.0	2	Warragul Civic Park	10.0	70%	40%	Wetland	1,150.0	0	100
1.0	3	Western Park Oval	140.0	70%	40%	Wetland	25,000.0	5	100
1.0	4	Landsborough & Spring Crk	240.0	70%	40%	Wetland	36,000.0	5	100
1.0	5	Wills St	200.0	70%	40%	Wetland	30,000.0	5	100
1.0	6	Lillico	100.0	70%	40%	Wetland	15,000.0	0	100
1.0	7	Trafalgar Recreation Reserve	60.0	70%	40%	Wetland	9,000.0	0	100
1.0	8	Hazeldean Road	6.5	70%	40%	Wetland	1,000.0	0	100
1.0	9	Yarragon Recreation Reserve	7.0	70%	40%	Wetland	1,300.0	0	100
1.0	10	Fairway	465.0	70%	40%	Wetland	70,000.0	10	100
1.0	11	Cowan	445.0	70%	40%	Wetland	67,000.0	10	100
1.0	12	Gabbot	76.0	70%	40%	Wetland	4,500.0	10	100
1.0	13	Drouin Civic Park	20.0	70%	40%	Wetland	2,500.0	10	100
1.0	14	Longwarry Recreation Reserve	27.0	70%	40%	Wetland	6,000.0	10	100

Note: nominal low-flow bypass added to harvesting schemes proposed for existing online assets to represent the likely requirement for a passing flow volume.

Project	Wetland Treatment Properties										Storage							
	Inlet Pond				Wetland						Main storage				Header tank			
	Surface Area (m^2)	Depth (m)	Volume (m^3)	Inlet pond volume to Wetland SA ratio	Surface Area (m^2)	Extended Detention Depth (m)	Permanent Pool Depth (m)	Permanent Pool Volume (m^3)	Initital Wetland Volume (m^3)	Overflow Weir Width (m)	Storage type	Volume (kL)	# Units	Total volume (kL)	Storage type	Volume (kL)	# Units	Total volume (kL)
2	230.0	1.0	230	25%	920.0	0.30	0.40	368	184	4	Pond	1,000	1	1,000	Above Ground Tank < 5ML	150	1	150
3	5,000.0	1.0	5,000	25%	20,000.0	0.30	0.40	8,000	4,000	4	Above Ground Tank < 5ML	140	1	140				Eqn
4	7,200.0	1.0	7,200	25%	28,800.0	0.30	0.40	11,520	5,760	4	Below Ground Tank < 5ML	300	1	300				Eqn
5	6,000.0	1.0	6,000	25%	24,000.0	0.30	0.40	9,600	4,800	4	Below Ground Tank < 5ML	300	1	300				Eqn
6	3,000.0	1.0	3,000	25%	12,000.0	0.30	0.40	4,800	2,400	4	Below Ground Tank < 5ML	500	1	500				Eqn
7	1,800.0	1.0	1,800	25%	7,200.0	0.30	0.40	2,880	1,440	4	Below Ground Tank < 5ML	400	1	400				Eqn
8	200.0	1.0	200	25%	800.0	0.30	0.40	320	160	4				Eqn				Eqn
9	200.0	1.0	200	20%	1,000.0	0.30	0.40	400	200	4	Above Ground Tank < 5ML	200	1	200				Eqn
10	14,000.0	1.0	14,000	25%	56,000.0	0.30	0.40	22,400	11,200	4	Below Ground Tank < 5ML	1,000	1	1,000				Eqn
11	13,400.0	1.0	13,400	25%	53,600.0	0.30	0.40	21,440	10,720	4	Below Ground Tank < 5ML	500	1	500				Eqn
12	900.0	1.0	900	25%	3,600.0	0.30	0.40	1,440	720	4	Below Ground Tank < 5ML	150	1	150				Eqn
13	500.0	1.0	500	25%	2,000.0	0.30	0.40	800	400	4	Above Ground Tank < 5ML	100	1	100				Eqn
14	1,200.0	1.0	1,200	25%	4,800.0	0.30	0.40	1,920	960	4	Above Ground Tank < 5ML	300	1	300				Eqn

Project	Demands										Additional treatment - Average
	Annual Deamnd (kL/yr)			Daily Deamand (kL/d)			Demand Name(s)	Allowing for irrigation		Allowing for seasonal demands only		UV disinfection
	Seasonal	Constant	Total	Seasonal	Constant	Total		Flow Rate (L/s)	Flow Rate (kL/d)	Flow Rate (L/s)	Flow Rate (kL/d)	
2	6,000		6,000	16	Eqn	16	Irrigation of passive spaces within the Park	2.0	180	1.0	90	0.01
3	11,000		11,000	30	Eqn	30	Current irrigation demand of Western Park Oval	3.0	260	1.0	90	0.02
4	15,000		15,000	41	Eqn	41	Future irrigation of 1x footy oval and 2 x soccer fields + 2 ha of passive space as planned in the PSP	4.0	350	2.0	180	0.03
5	15,000		15,000	41	Eqn	41	Future irrigation of 2 x footy fields + 2 ha of passive space as planned in the PSP	4.0	350	2.0	180	0.03
6	18,000		18,000	49	Eqn	49	Future irrigation of 1 x footy fields + 3 x soccer fields + 2 ha of passive space as planned in the PSP	5.0	440	2.0	180	0.04
7	11,000		11,000	30	Eqn	30	Current irrigation of Trafalgar Recreation Reserve	3.0	260	1.0	90	0.02
8			Eqn	Eqn	Eqn	Eqn		Eqn	Eqn	Eqn	Eqn	
9	11,000		11,000	30	Eqn	30	Current irrigation of Yarragon Recreation Reserve	3.0	260	1.0	90	0.02
10	41,000		41,000	112	Eqn	112	Future irrigation of 1 x footy fields + 2 x soccer fields as planned in the PSP + 10 ha of Country Club	10.0	870	4.0	350	0.08
11	16,000		16,000	44	Eqn	44	Future irrigation of 2 x footy fields + 2 soccer fields + 2 ha of passive space as planned in the PSP	4.0	350	2.0	180	0.04
12	5,000		5,000	14	Eqn	14	Future irrigation of passive open space	2.0	180	1.0	90	0.01
13	7,000		7,000	19	Eqn	19	Current estimated irrigaiton demand of Drouin Recreation Reserve	2.0	180	1.0	90	0.01
14	6,000		6,000	16	Eqn	16	Current estimated irrigaiton demand of Longwarry Recreation Reserve	2.0	180	1.0	90	0.01

Project	CAPEX										
	Pit 1: Diversion		Pit 1: Outlet		Pit 3: Other		Pit 4: Other		Pump 2 - Treatment to storage		
	Type	Cost	Type	Cost	Type	Cost	Type	Cost	Peak Flow Rate (L/s)	Pump Power (kW)	Pump Cost
2	Diversion (gravity) from standard pit	$4,000	Standard pit / end wall	$4,000	Diversion (gravity or pumped) from multi-	$7,000		Eqn		Eqn	Eqn
3		Eqn	Diversion (gravity or pumped) from deep / complex pit	$10,000	Diversion (pumped) from pipe with diameter < 1000mm	$5,000		Eqn	20.00	1.4	$39,060
4		Eqn	Diversion (gravity or pumped) from deep / complex pit	$10,000	Diversion (pumped) from pipe with diameter < 1000mm	$5,000		Eqn	30.00	2.1	$50,426
5		Eqn	Diversion (gravity or pumped) from deep / complex pit	$10,000	Diversion (pumped) from pipe with diameter < 1000mm	$5,000		Eqn	30.00	2.1	$50,426
6		Eqn	Diversion (gravity or pumped) from deep / complex pit	$10,000	Diversion (pumped) from pipe with diameter < 1000mm	$5,000		Eqn	30.00	2.1	$50,426
7		Eqn	Diversion (gravity or pumped) from deep /	$10,000	Diversion (pumped) from pipe with	$5,000		Eqn	30.00	2.1	$50,426
8	Diversion (pumped) from pipe with diameter < 1000mm	$5,000	Standard pit / end wall	$4,000		Eqn		Eqn		Eqn	Eqn
9	Diversion (gravity) from standard pit	$4,000	Diversion (gravity or pumped) from multi-chamber pit	$7,000		Eqn		Eqn	10.00	0.7	$25,242
10	Diversion (gravity or pumped) from deep / complex pit	$10,000	Diversion (gravity or pumped) from deep / complex pit	$10,000	Diversion (gravity or pumped) from deep / complex pit	$10,000	Diversion (gravity or pumped) from multi-chamber pit	$7,000	30.00	2.1	$50,426
11	Diversion (gravity or pumped) from deep / complex pit	$10,000	Diversion (gravity or pumped) from deep / complex pit	$10,000	Diversion (gravity or pumped) from deep / complex pit	$10,000	Diversion (pumped) from pipe with diameter < 1000mm	$5,000	30.00	2.1	$50,426
12	Diversion (gravity or pumped) from deep /	$10,000		Eqn	Diversion (pumped) from pipe with	$5,000		Eqn	20.00	1.4	$39,060
13	Diversion (pumped) from pipe with diameter < 1000mm	$5,000	Standard pit / end wall	$4,000	Diversion (pumped) from pipe with diameter < 1000mm	$5,000		Eqn	10.00	0.7	$25,242
14		Eqn	Diversion (pumped) from pipe with diameter < 1000mm	$5,000		Eqn		Eqn	10.00	0.7	$25,242

Project	CAPEX						CAPEX										
	Pump 3 - Storage to demand			Pump 4 - Other			Electrics and power	GPT	WSUD Treatment	WSUD Establishment (3.5 x annual maintenance)	Storage		Additional treatn	Miscellaned	Total Capex (exc. contingencies)	Capex Contingency: Contingency, investigations, design, supervision	**Total Capex** (inc. contingencies)
	Peak Flow Rate (L/s)	Pump Power (kW)	Pump Cost	Peak Flow Rate (L/s)	Pump Power (kW)	Pump Cost					Main storage	Header tank	UV disinfection	Item 1: Transfer mains			
2	8.00	0.6	$21,932		Eqn	Eqn	$35,000	Eqn	$135,411	$11,726	$95,460	$115,008	$729	$0	$430,266	$124,260	$554,526
3	8.00	0.6	$21,932		Eqn	Eqn	$35,000	Eqn	$2,196,178	$75,500	$109,570	Eqn	$1,205	$0	$2,493,446	$643,418	$297,268
4	8.00	0.6	$21,932		Eqn	Eqn	$35,000	Eqn	$3,054,660	$94,130	$318,688	Eqn	$1,744	$0	$3,591,581	$940,000	$536,920
5	8.00	0.6	$21,932		Eqn	Eqn	$35,000	Eqn	$2,590,092	$84,302	$318,688	Eqn	$1,728	$0	$3,117,169	$821,397	$527,076
6	8.00	0.6	$21,932		Eqn	Eqn	$35,000	Eqn	$1,383,331	$55,433	$456,239	Eqn	$2,061	$0	$2,019,422	$560,715	$636,091
7	8.00	0.6	$21,932		Eqn	Eqn	$35,000	Eqn	$871,334	$40,700	$390,052	Eqn	$1,268	$0	$1,425,712	$405,669	$554,378
8		Eqn	Eqn		Eqn	Eqn		Eqn	$119,325	$10,776	Eqn	Eqn	Eqn	$0	$139,101	$33,425	$172,526
9	8.00	0.6	$21,932		Eqn	Eqn	$35,000	Eqn	$151,298	$12,629	$140,745	Eqn	$1,157	$0	$399,003	$122,143	$384,425
10	8.00	0.6	$21,932	30.00	2.1	$50,426	$35,000	Eqn	$5,575,472	$140,735	$742,396	Eqn	$4,915	$0	$6,658,302	$1,750,793	$1,082,830
11	8.00	0.6	$21,932		Eqn	Eqn	$35,000	Eqn	$5,358,809	$137,055	$456,239	Eqn	$2,378	$0	$6,096,839	$1,577,070	$738,030
12	8.00	0.6	$21,932		Eqn	Eqn	$35,000	Eqn	$465,367	$26,762	$195,849	Eqn	$618	$0	$799,589	$228,581	$334,222
13	8.00	0.6	$21,932		Eqn	Eqn	$35,000	Eqn	$273,407	$18,755	$86,519	Eqn	$840	$0	$475,695	$135,443	$611,139
14	8.00	0.6	$21,932		Eqn	Eqn	$35,000	Eqn	$603,736	$31,848	$187,090	Eqn	$365	$0	$910,212	$255,479	$434,216

Note: For harvesting schemes that are proposed on wetlands that are already required to achieve BPEM stormwater requirements, The CAPEX costs have been reduced to not include construction costs of the treatment wetland.

Project	OPEX (annual)												
	GPT	WSUD Treatment	Pumps				Storage		Additional treat	Miscellan	Total Opex (exc. contingencies)	Opex Contingency: Maintenance design, supervision	**Total Opex** (inc. contingencies)
			Pump 1 - Diversion to treatment	Pump 2 - Treatment to storage	Pump 3 - Storage to demand	Pump 4 - Other	Main storage	Header tank	UV disinfection	Item 1: Transfer mains			
2	Eqn	$3,350	Eqn	Eqn	$329	Eqn	$2,463	FALSE	$70	$0	$6,212	$745	$6,958
3	Eqn	$21,572	Eqn	$586	$329	Eqn	$1,145	Eqn	$116	$0	$23,747	$2,850	$26,596
4	Eqn	$26,894	Eqn	$756	$329	Eqn	$1,593	Eqn	$167	$0	$29,741	$3,569	$33,310
5	Eqn	$24,086	Eqn	$756	$329	Eqn	$1,593	Eqn	$166	$0	$26,931	$3,232	$30,163
6	Eqn	$15,838	Eqn	$756	$329	Eqn	$2,281	Eqn	$198	$0	$19,402	$2,328	$21,731
7	Eqn	$11,628	Eqn	$756	$329	Eqn	$2,178	Eqn	$122	$0	$15,014	$1,802	$16,815
8	Eqn	$3,079	Eqn	Eqn	Eqn	Eqn	Eqn	Eqn	Eqn	$0	$3,079	$369	$3,448
9	Eqn	$3,608	Eqn	$379	$329	Eqn	$704	Eqn	$111	$0	$5,131	$616	$5,746
10	Eqn	$40,210	Eqn	$756	$329	$756	$3,712	Eqn	$472	$0	$46,235	$5,548	$51,784
11	Eqn	$39,159	Eqn	$756	$329	Eqn	$2,281	Eqn	$228	$0	$42,753	$5,130	$47,884
12	Eqn	$7,646	Eqn	$586	$329	Eqn	$979	Eqn	$59	$0	$9,600	$1,152	$10,752
13	Eqn	$5,359	Eqn	$379	$329	Eqn	$433	Eqn	$81	$0	$6,580	$790	$7,369
14	Eqn	$9,099	Eqn	$379	$329	Eqn	$935	Eqn	$35	$0	$10,778	$1,293	$12,071

Note: For harvesting schemes that are proposed on wetlands that are already required to achieve BPEM stormwater requirements, The OPEX costs have been costed at 50% of actual value to represent Council's existing obligation to maintenance of these assets, but also considering the increased burden that harvesting infrastructure represents.

Project	Renewal						Present Value (PV)					
	WSUD Treatment						Time period of analysis (years)	Discount rate (%)	PV Opex	PV Renewal Cost		Total PV costs
	Year Constructed	Lifespan (with maintenance)	Renewal Cost	Replacement Year 1	Replacement Year 2	Replacement Year 3				Total	Annual	
2	2020	25	$162,000	2045	0	0	50	5.00%	$127,020	$41,325	$2,264	$723,000
3	2020	25	$2,635,000	2045	0	0	50	5.00%	$485,543	$672,172	$36,819	$706,000
4	2020	25	$3,666,000	2045	0	0	50	5.00%	$608,096	$935,173	$51,226	$923,000
5	2020	25	$3,108,000	2045	0	0	50	5.00%	$550,650	$792,831	$43,429	$863,000
6	2020	25	$1,660,000	2045	0	0	50	5.00%	$396,715	$423,455	$23,196	$841,000
7	2020	25	$1,046,000	2045	0	0	50	5.00%	$306,979	$266,828	$14,616	$743,000
8	2020	25	$143,000	2045	0	0	50	5.00%	$62,950	$36,478	$1,998	$272,000
9	2020	25	$182,000	2045	0	0	50	5.00%	$104,904	$46,427	$2,543	$536,000
10	2020	25	$6,691,000	2045	0	0	50	5.00%	$945,360	$1,706,832	$93,495	$1,746,000
11	2020	25	$6,431,000	2045	0	0	50	5.00%	$874,165	$1,640,507	$89,862	$1,367,000
12	2020	25	$558,000	2045	0	0	50	5.00%	$196,283	$142,342	$7,797	$419,000
13	2020	25	$328,000	2045	0	0	50	5.00%	$134,529	$83,671	$4,583	$829,000
14	2020	25	$724,000	2045	0	0	50	5.00%	$220,364	$184,688	$10,117	$535,000

Note: For harvesting schemes that are proposed on wetlands that are already required to achieve BPEM stormwater requirements, The CAPEX and OPEX costs have been adjusted to represent the future sunk costs of these required assets and maintenance.

Project	Benefits				Benefit Cost Ratio (BCR)
	Nitrogen Value	Levellised cost of abatement ($/kg)	Reuse Value	Levellised cost of supply ($/kL)	
2	$502,300	$16,390	$211,550	9.1	0.99
3	$92,300	$72,100	$349,510	4.5	0.76
4	$132,100	$79,570	$505,880	4.9	0.69
5	$131,000	$75,040	$501,280	4.6	0.73
6	$156,000	$61,390	$597,850	3.7	0.90
7	$98,300	$80,760	$367,910	5.0	0.67
8	$341,700	$9,070	$0		1.26
9	$512,600	$11,910	$335,720	4.3	1.58
10	$375,900	$52,910	$1,425,650	3.3	1.03
11	$186,800	$83,350	$689,830	5.3	0.64
12	$48,500	$98,360	$179,360	6.2	0.54
13	$968,200	$9,750	$243,740	9.1	1.46
14	$63,800	$95,540	$105,770	13.5	0.32

Rawson Reuse scheme preliminary cost estimate	Quantity	Rate	Cost
Connection to WWTP (incl. pump and electrical works)	$ 85,000	1	$ 85,000
Pipeline to lake	$ 600	220	$ 132,000
Outfall to lake	$ 15,000	1	$ 15,000
Pump and pit in lake	$ 50,000	1	$ 50,000
Electric connection to Lake	$ 35,000	1	$ 35,000
Pipeline to oval	$ 450	220	$ 99,000
UV system and shed at oval	$ 20,000	1	$ 20,000
Electric connection to oval	$ 35,000	1	$ 35,000
Polishing wetland in Crater Lake	$ 350,000	1	$ 350,000
Indicative PV life cycle costs	**$**		**1,310,000**
Estimated BCR			**>>1**

Attachment 4 – Transition framework

See below for specific areas of improvement for Baw Baw Shire Council from the IWM transition framework process.

Enabling factor: Champions

- Champions are being strategic in how they seek organisational commitment.
- Council is committed to WSUD/IWM which is documented in a water-related vision and aspirations with clear strategic priorities.
- Council has internal systems and processes to support the mainstreaming of WSUD/IWM.
- Council is leading the sector and bringing other stakeholders along.

Enabling factor: Platforms for connecting

- Building broader support across the community for outcomes associated with WSUD/IWM.
- Processes and procedures are in place that connect people and organisations.
- Meaningful and active participation in catchment-wide based actions to achieve regional outcomes.
- Formal multi-departmental process in place that support transparency and alignment.

Enabling factor: Knowledge

- Building internal knowledge and capabilities to improve practice.
- Site specific WSUD design solutions are developed with an understanding of local context.
- Building experience of implementation to apply design solutions in the private realm.
- Council providing information to the community about how they can contribute to best practice across the private domain.
- Reflection, evaluation and active feedback loops building knowledge for continued improvement across systems

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Enabling factor: Projects and applications

- Pilot scale project(s) being trialled.
- One or more WSUD projects are showcased to the community as a demonstration of the practice and values that WSUD contributes to.
- Design solutions have advanced to achieve integrated outcomes by addressing more than one issue.
- WSUD solutions are implemented broadly across the municipality.
- Strategic investment in WSUD, municipal or catchment wide understanding of priority projects to deliver on strategic outcomes for the municipality.
- Funding mechanisms provide flexibility in how WSUD practices are applied.
- All development actively incorporates WSUD and assets are effectively implemented and maintained.

Enabling factor: Tools and instruments

- Separate strategic documents directed at single stream of water cycle.
- Single issue design tools used to provide insights for integrated decision making.
- Generic WSUD information and guidelines in use and available on Council website.
- Practical and locally relevant guidance provides consistent application of WSUD across the private realm.
- Strategic documents directed at driving the uptake of IWM practice and these objectives are reinforced in other Council documents.
- Sufficient budgets to support good on-ground practice.
- Integrated planning and design tools used to provide insights for integrated and collaborative decision making.
- Strategic documents directed at driving integrated practices that deliver catchment/regionally important outcomes.
- Council systems and frameworks driving an integrated approach to achieve sustainable water management practice.

Attachment 5 – Workshop materials

Baw Baw Shire Council IWM Plan -Workshop 1

Summary of Workshop 1, Thursday 21st of February 2019

The following information was collated from the discussions that took place in workshop 1 to help frame Baw Baw Shire Council's IWM plan. The themes covered in the discussion include:

1. Sustainability and climate change
2. Alternative water supplies for recreational facilities
3. Waterway and catchment management
4. WSUD assets and maintenance

We are seeking to ensure that the participant's comments have been captured correctly and provide an opportunity for any further thoughts to be added.

Key Q's – Sustainability and climate change
What other key issues should we hold front of mind when thinks about water and vegetation within our urban areas?   **Water:** • There is not enough interaction between authorities (Melbourne Water, Water corps, affect from small developments are not recognised by Melbourne Water when it is not a designated waterway). • Townships are built on historic wetland areas. Often poor drainage of urban areas, issues around cleaning out drains from sediments and organics. • Lots of waterways/drains that the CMAs used to do works on but have since ceased. There is an issue with responsibility for maintenance and upgrades. New townships are directing more runoff into drainage channels that are undersized and in need of maintenance.   **Vegetation:** • Lots of tree planting occurred in urban areas. There has been discussion with developers about roadways and setbacks to try and get the trees in. IWM in PSPs will not currently cater for this. Looking to incorporate heat island in ESD in sub-divisions. New suburbs are a problem area for canopy – essentially cleared when they are subdivided. • Community perception can be an issue, re-veg programs have been seen as creating fire hazards in urban areas. Also concerns around leaf litter from trees near properties. • Development outside the PSPs are dealt with on individual basis. This increases the risk of remnant vegetation loss. A planning tool for non-PSP areas to encourage ESD and WSUD would be helpful. • Note that it is critical to get in early with the developers to ensure that the IWM strategies are designed for from the beginning.   **Valuable outputs E2D can identify:**   • Planning tool for non-PSP areas to push ESD and WSUD would be helpful. • Process to ensure that IWM strategies are being discussed as early as possible with developers

Key Q's – Alternative water supplies for recreational facilities

- **Are there perceived exposure risks of alternative water supply by the community? If so, what are the concerns?**
- **Do you know of other strategic site than the ones shown on the slide? This could include significant gardens or parks.**
- **Why has uptake of alternative water supplies been slow to date, what challenges exist (capacity, strategic thinking, resources, other)?**
- **Are there tools or processes that need to be created or improved to help your division overcome challenges or take up opportunities?**

Sites/Opportunities:

- Willow grove Recreation reserve has obtained a license to pump out of the dam.
- Weebar Road development designed with SW harvesting.
- Drouin Recreation reserve from Bellbird Park source? Pipeline?
- Ellinbank access to catchment area (same as willow grove) travelling irrigator?
- Thorpdale is currently carting water in, there is a bore at the swimming pool.
- Jindivick is currently investigating a bore for the oval.

Water supply for industry. Interest from State level around SW harvesting for economic growth. Major water supplies could support new industries. (Tomato farm north-east of Warragul, hydroponic, harvesting off roof area). What future water price could dictate the viability of different scenarios (alternative irrigation of Community gardens and third pipe schemes)? More exploration of alternative water supplies and water use efficiency. Include analysis of major swimming pools, Council depots and water used for road maintenance/construction.

Challenges:

Community concern about Darnum and Bellbird reuse. Public signage could include information about treatment. Currently warning signage causes concern. Projections that agricultural area will shift from grazing to cropping. Recycled water from Fonterra (dairy excess) could be used by strawberry farms (who have currently applied for a bore). The wetland next to the footy oval in Warragul is considered too shallow to harvest from. Missed opportunity, didn't get in early enough to influence the design. Getting the design done early enough can be an issue.

Valuable outputs E2D can identify:

- Business case study for the highest usage recreation reserve to provide supporting evidence for harvesting scheme, detail pay-off period. Demonstrate the trade-offs and the best way to go about the scheme.
- Define the additional features/costs of harvesting schemes over standard treatment wetlands and RBs.
- Provide advice around greenfield developments with Recreation Reserves (in PSPs). Timeline: Weebar (1st), McGlone's Rd (2nd), Logan Park (3rd).
- Consider retrofit opportunity - Western Park reserve, Brooker Park, Darnum Reserve, Trafalgar Rec (feasibility done for wetland, bore currently in the works)
- Exploration of alternative water supplies and efficiency for major swimming pools, depots and road grading.

Key Q's – Waterway and catchment management

- ***Thinking about waterway values and what impacts them (urban growth, unsealed roads, for example) can you identify short- and long-term opportunities for Council in better managing these assets?***
- ***Do you have any ideas about how best to communicate and engage the local community on waterway and catchment values and issue?***
    - ***What are you currently doing?***

- Many of the unsealed roads in the forest areas are DEWLP fire tracks. Unsealed roads are not a key issue in urban areas. The main issue is the urban excess cases by development.
- Hydrological requirements are put in place in waterways that have an identified important species but more lenient where streams do not have identified species to protect.
- Developers are currently being asked to maintain pre-development flows as a high-level goal, this is applied and assessed on a case to case basis.
- History of Hazel Creek being realigned by a developer, how to prevent this happening in the future.

Key Q's – WSUD assets and maintenance

- ***What are the common concerns and interests of developers regarding WSUD?***
- ***Are there communication barriers for developers?***
- ***Are Council's WSUD design guidelines useful and adequate?***
- ***Does this extend to processes for asset handover and maintenance?***
- ***How can efforts around WSUD asset handover and maintenance be streamlined?***

Challenges:

- Most assets are handed over from developers. Council has implemented some streetscape works, have steered away from raingardens due to associated maintenance costs. Installing a GPT was looked at but fell over due to maintenance costs.
- Identify maintenance and life-cycle costs for executives at Council. Need to push up to Council to ensure the resources are available to provide adequate maintenance.
- Guidelines have not kept up with increased knowledge of Council and developers. Most modifications happen on-site in an ad-hoc manner.
- Lack of good implementation plans for new assets that capture lifecycle costs (maintenance, renewal). Designs often don't have separated, costed maintenance plans.

Opportunities:

- Developers accept that wetlands are Council's preference over bioretention basins. Baw Baw generally has the space for large scale wetlands.
- Demonstration projects would be valuable to prove to developers that the general public are interested in the benefits that IWM can provide to their suburb.
- Design and landscaping have improved a lot over the past 5 years. Skills within Council and contractors has improved (maintenance, planting). Onsite communication has improved, this allows for design feedback within the construction phase.

Valuable outputs E2D can identify:

- Key action to apply for living rivers to support the development of new Council guidelines
- Ensure new assets from developers come with costed maintenance plans
- Register to classify and monitor WSUD assets to assist tracking of maintenance requirements/activities

Baw Baw Shire Council IWM Plan - Workshop 2

Summary of Workshop 2, Wednesday 10th of April 2019

The 2nd workshop involved an explanation of the threat mapping that had been undertaken for the study townships. The group had a chance to note any threats from their local knowledge of the townships. Following this, the group worked through an opportunity identification exercise using printed maps to spatially note IWM/WUSD opportunities within the townships. These opportunities were direct responses to noted threats or other, unrelated opportunities. This exercise built the foundation for the opportunity mapping that contained within Attachment 2.
The group then discussed through what may be required internally to support the uptake of IWM principles across Baw Baw Shire. This exercise helped contribute towards the formation of the 5-year action plan.

Attachment 6 – Relationship to other strategic documents

Council strategic documents	Success in the delivery of this IWM plan has the potential to deliver on key aspects (identified below) of other Council strategies and plans
Council Plan 2017 - 2021	Safe and sustainable environments: Protecting and sustainably managing Baw Baw's environment. Safe and sustainable environments: Preparing for the impacts and consequences of climate change and extreme events. Community services and infrastructure (drainage): 1. Several towns, such as Longwarry, Trafalgar and Yarragon, are impacted by local groundwater issues. This will require investment …. for implementing effective drainage solutions, river and stream drainage network maintenance, and protection of town centres and connector roads. Changing environment: Baw Baw's biodiversity and environment is fundamental to the future health and wellbeing of our community……we face challenges to protect and sustainably manage our unique biodiversity and environmental assets Council will need to work closely with the community, developers and industry to protect and sustainably manage these assets into the future. Changing environment: Council will need to be both prepared and resilient to the future impacts of climate change.
Environment Sustainability Strategy 2018 - 2022	Direction: Adequate and suitable water is available for homes, industry and agriculture. Direction: Improve community health by preserving and enhancing our street trees and vegetation within wetlands, waterways and bushland reserves. Action 26. Investigate and promote Water Sensitive Urban Design (WSUD) principles and initiatives within new developments. Action 33. Develop a Council Integrated Water Management Plan (IWMP) through established regional stakeholder forum groups.

Municipal Health and Well Being Plan 2017-2021	Opportunities to improve health - being active: Improving places to include features that encourage people to be active. Assets such, as shade trees…… are examples of what can encourage people to use parks and paths (*provision of passive irrigation of stormwater to a tree maximises the health and canopy cover of the tree, also increases soil moisture retention that together with shade from trees creates greener, cooler spaces across our urban areas*). Opportunities to improve mental health - foster stronger connection to the natural environment (*water enables greener, diverse and resilient landscapes*). Strategy 1.3 Improve access to recreation opportunities and places for healthy connections public spaces and recreation opportunities are welcoming (*excess urban water – recycled wastewater or harvested urban stormwater can provide an alternative water supply for optimal irrigation of sports fields, ovals, parks and gardens, even during periods of drought when water restrictions may be imposed).* Strategy 3.3 Support a local food system that uses sustainable practices (*excess urban water – recycled wastewater or harvested urban stormwater can provide alternative water supplies to local agriculture and in doing so reduce impacts on local waterways and nuisance flooding*).
Flood Management Plan for Baw Baw Shire 2018	Objective 2: 2. Flood risks are addressed to reduce impacts and get the best social, economic and environmental outcomes (*urban stormwater harvesting schemes can reduce impact of nuisance flooding whilst providing other benefits to water quality improvement in receiving waterways and provision of alternative water supply. IWM seeks to deliver urban areas that are resilient to local flood risk and climate change*).
Domestic Wastewater Management Plan, 2016	Key objective: Identify priority areas that require investigation of existing on-site systems to understand and manage risk to public and environmental health *(the outcome of Council's Domestic Wastewater Management Plan has direct beneficial outcomes for IWM in terms of managing part of the urban water cycle and protecting the environmental values of receiving water including waterways and groundwater. IWM seeks to exceed public health and environmental outcomes as well as provide effective sewerage systems for both septic and non-septic systems).*
Council Recreational Strategy 2017 - 2022	Ensure universal design (including female friendly), ESD and CPTED principles are followed in development of new facilities and redevelopment of existing facilities (*excess urban water – recycled wastewater or harvested urban stormwater can provide an alternative water supply that enable optimal irrigation of sports fields and ovals, even during periods of drought when water restrictions may be imposed).* Potential opportunities identified include: • Ellinbank Recreation Reserve (oval upgrade – includes irrigation) – bore supply identified as water supply • Jindivick Recreation Reserve (oval upgrade – includes irrigation) – bore supply identified as water supply • Neerim South Recreation Reserve (oval upgrade – includes irrigation) – no source of supply is identified • Darnum Recreation Reserve (oval upgrade – includes irrigation) – no source of supply is identified • Longwarry Recreation Reserve (oval upgrade – includes irrigation) – no source of supply is identified Willow Grove Recreation Reserve (oval upgrade – includes irrigation) – no source of supply is identified
Public Open Space Strategy 2014	Principle: To design and develop the public open space in a way that maximises community benefit from the place *(IWM seeks to deliver diverse urban landscapes that reflect local conditions and community values, as well as local water related risks and issues, including emerging and legacy issue, being understood and managed*)
Baw Baw Shire Council Road Management Plan, 2017	*Local roads, ancillary areas and carparks are a key source of sediment, metals and hydrocarbons that are conveyed to waterways. IWM seeks to reduce nutrient, sediment and discharges to receiving waters. These are generated from hard surfaces across urban areas including roads and carparks. Road networks could be used to connect patches of high value urban landscapes, contributing to liveability, amenity and biodiversity outcomes.*
ESD Subdivision in Regional Victoria, 2018	Key environmental impact categories noted for ESD Local Policy for built form outcomes, include: • Stormwater management – to improve quality, encourage re-use and mitigate localised flooding • Urban ecology – landscape and biodiversity

Attachment 7 – 5 year action plan

The following table documents the actions that comprise the 5-year action plan for Baw Baw Shire Council. The actions fall within 5 categories; Governance and delivery, Technical capacity building, Systems, processes and guidelines, Stakeholder communication (developers and community) and Monitoring and reporting. Each action has a description, suggested timeline, estimated cost of delivery and relevant teams within Council responsible for delivery (incl. external organisations where relevant).

No.	Recommended Action	Suggested Timeline	Cost	Delivery Partners (lead underlined)
1	**Governance and delivery**			
1-A	Continue to strengthen the existing IWM working group through formalised arrangements with internal 'IWM champions' from different teams (e.g. across Council to implement and monitor the delivery of the actions in this Plan). This should be done in coordination with other regional governance groups such as the Westernport and Gippsland IWM Forums. This action includes: ▪ Facilitating regular internal IWM meetings, where IWM champions can bring threats, opportunities and questions from their respective teams. ▪ Facilitate knowledge transfer between internal teams. ▪ Advocating for the embedding of IWM principles and responses into business-as-usual operations of internal teams. ▪ Work together with partner organisations to deliver IWM outcomes.	Short-Term	In-kind	Representatives from different departmental areas of BBSC.
1-B	Develop a business case for securing the future water supply at Crater Lake -Rawson.	Short-Term	In-kind	Community Infrastructure
1-C	Develop a business case for securing an alternative water supply at Western Park – Warragul.	Short-Term	In-kind	Community Infrastructure
1-D	Business Case for securing an alternative water supply at Trafalgar Recreation Reserve.	Medium-Term	In-kind	Community Infrastructure
1-E	Apply for funding to support a dedicated IWM officer as a resource within Council to help support the effective delivery of this action plan. There is possibility that this position could be partly funded by Melbourne Water Living Rivers.	Short-Term	$70-$80k	Community Infrastructure

1-F	Continue delivery of the existing *Domestic Wastewater Management Plan*. For several rural study townships (Walhalla, Noojee, Thorpdale, Erica and Buln Buln), adequate management of domestic wastewater systems is the highest IWM priority action in their township area.	Short-Term	In-kind	Planning and Development
1-G	Undertake an investigation to identify the feasibility of large-scale alternative water supply to supply water-intensive industries/employers in a local Future Employment Zone around Longwarry and other growth townships. Establishing water intensive peri-urban agriculture should be considered as a demand.	Medium-Term	$30-50k	Economic Development
1-H	Integrate precinct-scale IWM opportunities into masterplans for growth areas **outside** of PSPs. Urban growth within smaller townships (e.g. Neerim South, Longwarry, Trafalgar, Yarragon etc.) are unlikely to be governed by PSPs. These areas are an opportunity for Council to embed IWM principles within new developments in the master planning for open space networks.	Medium-Term	$20k	Planning and Development, WGCMA, Local sporting clubs
1-I	Begin detailed design and construction on one precinct-scale alternative water schemes within 5 years.	Long-Term	$350k-1.1m	Planning and Development, Melbourne Water, WGCMA,
1-J	Continue to invest in greening along waterway corridors to further enhance existing biodiverse habitats (such as Hazel Creek) to increase the size and connectivity of patches to deliver a range of social and ecological services. Maintaining a high number of well-connected and maintained green spaces adjacent to waterways with active recreational infrastructures such as bike paths and walking grounds help strengthen community connection with nature and water.	On-going	In-kind	Planning and Development, Melbourne Water, WGCMA,
1-K	Maintain momentum of activation and enhancement of waterway corridors in existing urban areas. (Linkage with Hazel Creek 2010 and Health and Wellbeing plan)	On-going	In-kind	Community Infrastructure, Melbourne Water, WGCMA

No.	Recommended Action	Suggested Timeline	Cost	Delivery Partners
2	**Technical capacity building**			
2-A	Establish local MUSIC templates that adequately represent local climate conditions. The current MUSIC template recommended in Council's Water Sensitive Urban Design (WSUD) guidelines is inadequate for the modelling and design of large scale IWM responses (e.g. stormwater harvesting schemes). To reduce the risk of poor design outcomes and increase the confidence in modelled yield, development of an adequate template should include: ▪ A minimum 10-year rainfall period at 6-minute intervals. ▪ Analysis of township rainfall to establish regional rainfall bands ▪ Development of multiple rainfall templates to adequately represent the large spatial area of the municipality	Short-Term	$10-15k	Planning and Development
2-B	Upskilling internal staff with MUSIC and RORB training to better assess complex MUSIC models (e.g. stormwater harvesting schemes) and inform hydrology, to provide a better understanding of availability of flows and impact of harvesting opportunities. Enhancing internal capacity with these models would: ▪ Strengthen internal capacity to assess IWM response as part of the planning application process. ▪ Confidence to use the MUSIC Auditor (https://www.musicauditor.com.au/auditor)	Short-Term	$2-5k	Planning and Development
2-C	Enhance the ability to assess submissions from developers, improving the chances to identify design issues and avoid future liability for Council. This action includes: ▪ Ensuring that communication channels exist between the approvals team and maintenance teams within Council to allow for feedback and ensure that handover of information takes place.	Short-Term	$5-10k	Planning and Development

	▪ Provide support for problematic/complex systems. An effective model adopted by other Councils includes providing independent, expert advice on-call for Council staff to access when required.			
2-D	The IWM working group uses the Neerim South Stormwater Harvesting Scheme to review, reflect and document successes and areas of improvement to incorporate into future Council-led projects. It will develop capacity within relevant departments in the design and delivery of multi-functional IWM responses including: ▪ Increase awareness of regulations and requirements for water recycling. ▪ Understand cost-implications, relationships between infrastructure components, key design principles and space constraints that are critical to the success of large-scale IWM projects. ▪ Develop capacity to address the various skills required to facilitate large-scale projects (e.g. landscape architecture, WSUD design, ▪ Establish case studies for successful multi-functional IWM responses.	Short-Term	In-kind (once-off time investment by IWM Officer)	IWM Officer
2-E	Develop capacity within Council's planning team to improve the successful uptake of IWM now required under amendment VC 154. Successfully upskilling Council planning staff would: ▪ Develop knowledge and capacity around Amendment VC 154, that affects the IWM responses of a large proportion of development across Victoria. ▪ General upskilling around the principles of IWM to help identify potential issues within planning applications. (DELWP are developing planning support example development types (such as commercial, industrial and townhouses), checklists and step-by-step notes for Council planners.	Medium-Term	$2-5K	Planning and Development

No.	Recommended Action	Suggested Timeline	Cost	Delivery Partners
3	**Systems, processes and guidelines**			
3-A	Ensure that construction sites within Council's municipal areas are demonstrating adequate sediment management. This is critical for the large swathes of development occurring within stormwater priority areas and This action includes: ▪ Ensure responses for site-level construction sediment management within Environmental Management Plan (EMP) align with requirements and industry best practice. ▪ Strengthen inspections of construction sites to check that the necessary steps described in the EMP have been undertaken on site.	Short-Term	In-kind	Community Infrastructure
3-B	Using the Stormwater Victoria Asset Maintenance Guide ensure developers hand-over assets in excellent condition. Improvement in this area can help to reduce Council's future liability of poorly designed or damaged assets.	Short-Term	In-kind	Planning and Development
3-C	Ensuring that new assets from developers come with costed maintenance plans and these plans are passed on to the maintenance team with Council who will ultimately be responsible for allocating appropriate maintenance budgets and undertaking maintenance activities across all IWM assets.	Short-Term	In-kind	Planning and Development
3-D	Establish a GIS register and database of Council owned and maintained IWM assets (incl. wetlands, alternative water schemes and other IWM assets etc.): ▪ Ensure that IWM register is compatible with any existing Council asset register ▪ Register system should enable easy updating of status/condition of assets	Medium-Term	$10-15k	Community Infrastructure

	▪ Register should be compliant with the Stormwater Victoria Asset Maintenance Guidelines (Stormwater Victoria have available material to help Council's set up an asset register).			
3-E	Undertake an audit of existing assets to establish a baseline of current IWM asset condition and understand future maintenance budget allocations. This would underpin future maintenance programs for Council's IWM assets. ▪ Ensure that the asset audits identify required works to rectify assets in poor condition ▪ Ensure asset checklists and report are compliant with Stormwater Victoria Asset Maintenance Guidelines (Stormwater Victoria have available material to help Council's undertake asset audits incl. checklist for different asset types and advice on what to look for).	Medium-Term	$20-30k	Community Infrastructure
3-F	Work with an economist (specialising in the stormwater industry) to investigate options for introducing flexibility for contributions to offsite stormwater management in lieu of onsite compliance to Amendment VC 154. This mechanism would allow developers on constrained sites to contribute to large-scale Council IWM projects through offset payments. This plan includes a costed prioritisation list of Council IWM opportunities that an offset scheme could be based on.	Long-Term	$15-20k	Community Infrastructure

No.	Recommended Action	Suggested Timeline	Cost	Delivery Partners
4	**Stakeholder communication (developers and communities)**			
4-A	Establish easy access for land-developers to industry facing material such as Council guidelines, resources (e.g. MUSIC templates) and visions for IWM objectives. Communicate and provide information around handover requirements, Clause 56 and Amendment VC 154 (resources supporting the amendment are currently being DEWLP and supported by Clearwater. Links to these resources can be provided on Council's website).	Short-Term	$10k	IWM Officer, Melbourne Water
4-B	Advocate for Gippsland Water to undertake a community water literacy program. There is a need to improve water literacy across the community and disseminate information to empower individuals to make choices that support IWM. This will ultimately enable the community to become more actively involved in the planning, management and maintenance of green-blue water infrastructure owned and operating at a range of scales. Recent research by the CRC for Water Sensitive Cities[1] suggests that the first step for industry is to: ▪ Describe the vision and aspirations of IWM using language that will not be lost on the wider community. ▪ Explicitly link IWM outcomes to broader community aspirations for greener urban landscape and improved liveability. ▪ Clarify where and how community can make choices and contribute to solutions. ▪ Inform the community about the basic requirements for installation and maintenance of assets that could be located on their properties.	Medium-Term	TBC	Gippsland Water, Community Infrastructure.
4-C	Develop an IWM section of Council website to promote community education and engagement. This action could include: ▪ Publish the IWM plan summary report.	Long-Term	$15k	IWM Officer

	▪ Showcasing local IWM projects (Bellbird Park Wastewater Recycling Scheme, Neerim South Stormwater Harvesting Scheme etc.). ▪ Distribute information regarding local water balance, water quality drivers, Amendment 154 and what local community members can do to become 'water-sensitive citizens'. A spatial map of IWM responses across Council (following action 3-D) that allows users to see basic information about Council initiatives.			

No.	Recommended Action	Suggested Timeline	Cost	Delivery Partners
5	**Monitoring and reporting**			
5-A	IWM Project Team to review and report progress against plan annually, including feedback and comment from Environmental Voice. Monitoring and reporting of progress is essential to ensure that the strategic outcomes of the IWM plan are achieved.	Short-Term	In-Kind	IWM Project Team, IWM Officer