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REPORT:

Bairnsdale Integrated Water Management Plan

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Alluvium acknowledges the Traditional Owners and custodians of the lands on which we work.

This project was undertaken in Bairnsdale, on the lands of the Gunaikurnai Nation, and in Naarm (Melbourne), on the lands of the Kulin Nation.

We pay our respects to their elders, and the elders of all Aboriginal and Torres Strait Islander Peoples, past, present, and into the future.

We would like to acknowledge and thank all those who attended consultation and workshop activities that were critical in developing this plan.

Executive Summary

Integrated water management (IWM) is a "collaborative approach to water planning and management that brings together organisations with an interest in all aspects of the water cycle" (DELWP, 2018). The IWM Plan for Bairnsdale has been prepared to support those organisations to meet future water cycle challenges and to ensure that Bairnsdale continues to be a great place to live, work and visit.

This Bairnsdale IWM Plan (2020 – 2030) sets out a vision, outcomes and objectives that are aligned with those defined within the East Gippsland IWM Forum's Strategic Directions Statement (SDS) document. The vision for the Bairnsdale IWM plan, adopted from the East Gippsland SDS (2018), is for "*Innovative and collaborative water management to maximise the resilience, liveability and economic prosperity of our East Gippsland communities and connected waterways, wetlands and Gippsland Lakes*."

As well as the outcomes expressed within the SDS, the stakeholders to this plan also identified three over-arching objectives:

1. Reduce reliance on potable water
2. Improve waterway, wetland and lake health through urban stormwater management, and
3. Enhance connection and understanding of the water cycle in the Bairnsdale community.

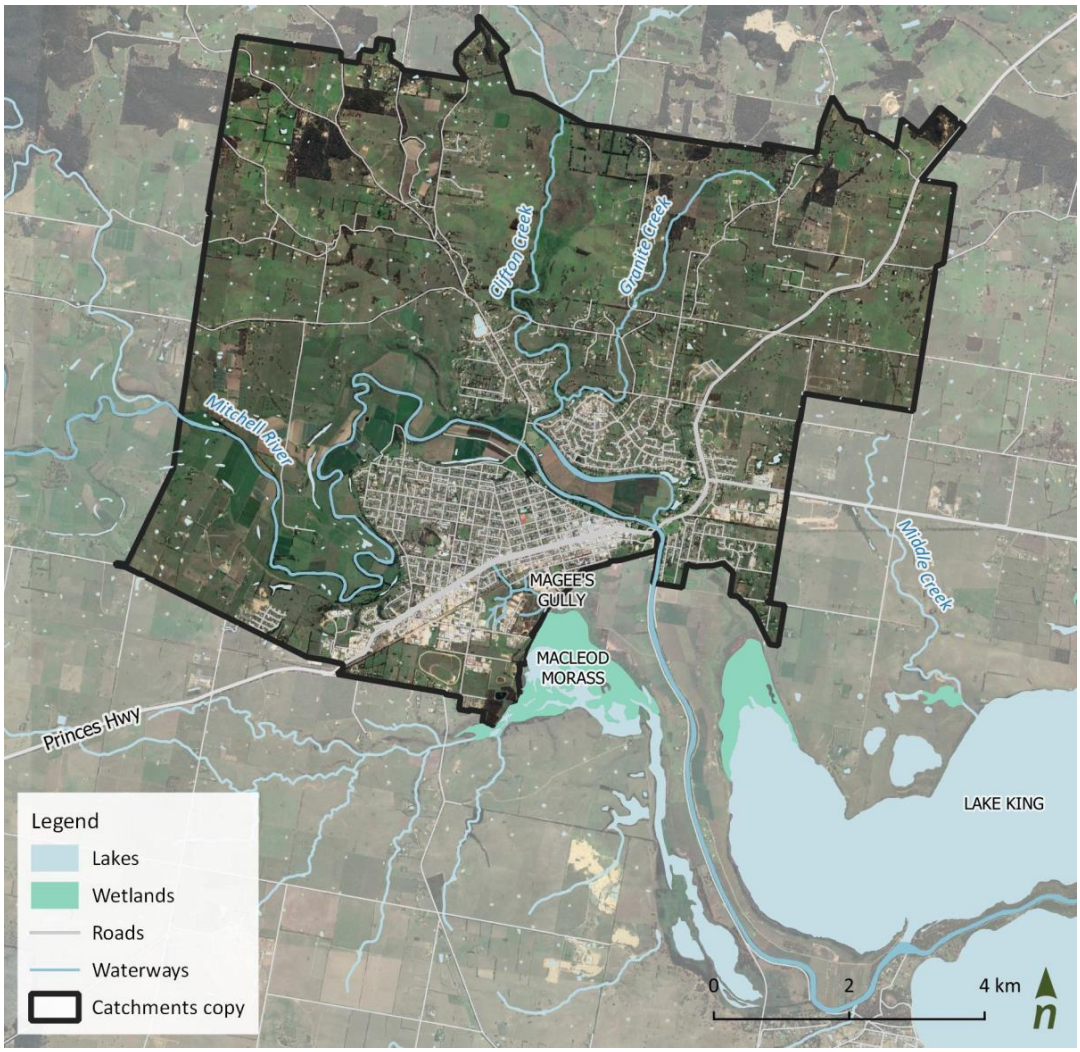

Figure A. *Bairnsdale IWM Plan project area*

The plan builds upon these foundations to identify and prioritise IWM opportunities across the Bairnsdale area that respond to Bairnsdale's unique social and biophysical context with critical aspects of this including:

- The Mitchell River that runs through the town and supplies water to Bairnsdale.
- The Gippsland Lakes and other surrounding environmental assets to provide such valuable recreational assets for locals and tourists.
- Ensuring secure water supplies into the future in the context of climate change and population growth.
- The impact of urbanisation and the impact that will have on receiving waterways and downstream environments such as the lake system.
- The development of social and recreational facilities, like the WORLD sporting precinct, to ensure they are planned for in a 'water sensitive' manner.

Through a number of workshops with stakeholders (principally East Gippsland Water, East Gippsland Catchment Management Authority and DELWP), review of strategic and operational documents and processing of available date, IWM issues and opportunities were identified. These were added to opportunities identified as part of previous work undertaken by the same stakeholders.

Having developed a long list of IWM opportunities (~21) all were evaluated and prioritised to identify a short list of preferred options. A program logic map was prepared to illustrate the link between each of our opportunities and the project's objectives. These opportunities were evaluated against a Preliminary Assessment Methodology (PAM) that included a qualitative assessment of each opportunity's benefit, risk, cost, urgency and potential impact on the township of Bairnsdale. A second stage of evaluation was undertaken where participants interrogated the outcomes of the PAM to consider what opportunities should be actioned as a matter of priority to ensure that opportunities were not 'lost' if not acted upon with a degree of urgency. The result was a prioritised list of opportunities, with the 'top 5' listed below:

1. WORLD sporting precinct IWM initiatives
2. Recycled water network plan (to extend recycled water use across the town)
3. Community outreach for IWM to improve community understanding of IWM
4. IWM plan for the Bairnsdale Hospital (as one of the towns largest water users)
5. (Ensuring) compliance with existing Council WSUD requirements during construction to reduce the impact of construction on downstream waterways.

An action plan was prepared for the implementation of the top 11 opportunities. High level cost estimates were also prepared for opportunities where the consultant's external advice on costs was likely to be most valuable in progressing the opportunity (i.e. where the consulting team had experience costing similar projects that were outside Council's immediate experience). Cost estimate were provided for the following opportunities:

a. WORLD sporting precinct IWM initiatives
b. Recycled water network plan (to extend recycled water use across the town)
c. IWM plan for Bairnsdale Hospital
d. Green and blue corridors
e. Large roof rainwater harvesting.

The aim now is for IWM stakeholders to this plan to incorporate high priority opportunities into their respective business planning and budgetary processes, to progress them in a collaborative way for the long-term benefit of the Bairnsdale community.

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Abbreviations

Alluvium	Alluvium Consulting Australia Pty Ltd
BPEM	Best Practice Environmental Management
CBD	Central Business District
CMA	Catchment Management Authority
DELWP	Department of Environment, Land, Water and Planning
EGCMA	East Gippsland Catchment Management Authority
EGSC	East Gippsland Shire Council
EGW	East Gippsland Water
GL	Gigalitre
GLaWAC	Gunaikurnai Land and Waters Aboriginal Corporation
GPT	Gross pollutant trap
Ha	Hectare
IWM	Integrated Water Management
LGA	Local Government Area
MERI	Monitoring, evaluation, reporting and improvement
ML	Megalitre
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
PET	Potential Evapotranspiration
SDS	Strategic Directions Statement
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total suspended solids
WSUD	Water sensitive urban design
WWTP	Wastewater treatment plant

1 Introduction

Integrated water management (IWM) is a "collaborative approach to water planning and management that brings together organisations with an interest in all aspects of the water cycle" (DELWP, 2018). The process of developing an IWM plan involves identifying where the objectives of all water cycle stakeholders intersect and in doing so, leveraging collective effort and investment to optimise social, economic and environmental outcomes for the community.

The IWM Plan for Bairnsdale will guide East Gippsland IWM Forum members to meet future water cycle challenges to contribute to Bairnsdale being a great place to live, work and visit.

The Bairnsdale IWM Plan was identified as one of the top 10 project priorities in the East Gippsland Strategic Directions Statement (SDS) that was an output of the State Government of Victoria's IWM Forum program. The SDS lists IWM opportunities identified through a collaborative process involving Local Government, water authorities, catchment management authorities (CMAs), local indigenous groups, health authorities and Department of Environment, Land, Water and Planning (DELWP).

This Bairnsdale IWM Plan sets out a vision, outcomes and objectives that are aligned with those defined within the SDS document. It also includes prioritised IWM opportunities and an action plan to guide their implementation or progression.

1.1 Developing the plan

The following pillars supported the development of this plan:

Consultation
The plan was informed by consultation with East Gippsland Water (EGW), East Gippsland Shire Council (EGSC), East Gippsland CMA, Gunaikurnai Land and Waters Aboriginal Corporation (GLaWAC) and DELWP. The engagement centred around three workshops held between May and July 2020 with the following subjects:

- IWM plan objectives and opportunity review
- IWM plan program logic, opportunities long-list and evaluation framework for prioritisation
- IWM opportunities prioritisation.

While community engagement activities were planned, these were made difficult to plan and hold given the community was focussed on the recent bushfires and ultimately COVID, which made travel and gathering difficult.

Outcomes and objectives
The consultation process was guided initially by the vision, outcomes and objectives defined within the East Gippsland SDS. This provided a basis for initial engagement, direction as to what the IWM plan should address and ultimately the opportunities and plan's actions.

System understanding: Analysis establishes the baseline understanding of Bairnsdale's water cycle and systems. This is critical to identifying issues and opportunities that the IWM Plan can address. Having compiled investigated water cycle information from our stakeholder groups, some of the critical factors that arose include:

- Long term water supply security and the need to identifying alternative water supply sources
- Stormwater quality, particularly associated with new developments and stormwaters impact on sensitive receiving environments including Macleod Morass, the Gippsland Lakes, the Mitchell River and other waterways like McGees Gully.
- Liveability, including the connection of community to waterways, greening of open space and cooling of the Bairnsdale central business district (CBD).

1.2 Strategic Context

IWM Forum

The East Gippsland Strategic Directions Statement (IWM Forum, 2018): The East Gippsland IWM Forum is one of nine regional IWM Forums across Victoria. Each SDS is tailored to its local region with the vision for the East Gippsland SDS stated as:

Innovative and collaborative water management to maximise the resilience, liveability and economic prosperity of our East Gippsland communities and connected waterways, wetlands and Gippsland Lakes.

Precursors to the SDS include DELWP's *Water for Victoria* (2016) that contained Chapter 5: *Water's role in resilient and liveable cities and towns.* This document was relevant for establishing some of the seven desired outcomes defined within the SDS and illustrated in Figure 1. This is referred to again further below.

A priority opportunity noted within the SDS is the preparation of the Bairnsdale IWM Plan. EGW and EGSC developed a number of opportunities as part of the Forum process, and these are considered in this document alongside newly identified opportunities.

Figure 1. *East Gippsland SDS outcomes*

East Gippsland Shire Council

East Gippsland Shire Council have a range of strategies and plans that offer context for water management, community preferences, economic opportunities and environmental values in the area.

Council Plan (2017-2021, Revised 2020) The Council Plan presents a vision to make East Gippsland "the most liveable region in Australia. A place of natural beauty, enviable lifestyles, and opportunities". Three key themes include: Strong Communities, A Liveable Region and A Growing Regional Area with Opportunities. Notable outcomes from consultation undertaken to prepare the plan, include 93% of people replying that they "enjoy and feel connected to the natural environment", representing a strong driver for people to live in the region.

Shaping the Future – Long term community vision 2030 (2012): This 2030 vision articulates what the community values about the region, through the lenses of Natural Environment, Local economy, Community, Land use and the built environment, Infrastructure, and Governance, and sets out priorities for the future. Under 'What we value', the document identifies "*The ecological diversity and beauty of East Gippsland's national parks, forests, waterways, beaches and oceans",* and the *"traditional owners' connection to the land, identification with 'country' and awareness of the natural rhythms of the environment".*

Sustainable Water Use Plan (2014): The Sustainable Water Use Plan focussed on water use in the Shire region and identifying opportunities to reduce potable water demand by identifying water efficiency measures for Council buildings and assets. The Plan identified Council's highest water users and prioritises assets where targeted water saving initiatives would be most effective.

The plan identified that the ten highest water-consuming Council assets represented 58% of Council's total potable water consumption in 2012/13. The key objectives of the plan include:

- In-house and external education of water smart practices
- Leakage management
- Investigate high water usage
- Implement water efficient practices at swimming pools, caravan parks, Council facilities, open space and toilet facilities
- Implement water reuse and recycling options.

EGSC Urban Stormwater Management Plan (2003): This plan identified "improvements in environmental management of stormwater runoff from urban areas are necessary to meet the community's expectations and values regarding the health and quality of waterways". The plan identifies the Mitchell River, Jones Bay, McGees Gully and MacLeod Morass as key environmental assets.

Some of the key threats include: Commercial land use runoff, runoff from the Princes Highway, industrial land use runoff (Bairnsdale South node) and residential land use runoff in Bairnsdale. Recommendations included:

- Bairnsdale South industrial area drainage contribution scheme,
- An artificial wetland in McGees Gully upstream of McLeods Morass and
- Ensuring minimal run off from all development.

Urban Waterway Guidelines (2013): with its companion document "Water guidelines", this document focusses on "the improvement of waterways that are subject to future development and identifies measures that may improve the health of waterways across the local government area". It concentrates on minor waterways that may be ephemeral and subject to high nutrient loads, litter and weed invasion, highlighting McGees Gully. Key waterway health risks include weed invasion, changed hydrology due to urbanisation and sediment loads from developing areas and major roads.

Bairnsdale Growth Strategy: Building a Better Bairnsdale (2009)*:* This document proposes a stronger relationship between the Bairnsdale township and community and its natural riverside setting, reflecting the community's "desire to protect the environment". The relevance for this IWM plan is the vision of Green Belt and River Corridor that will act to increase connectivity and pedestrian movement between town and river.

Re-imagining Bairnsdale Masterplan: Analysis and Discussion (2013 - 2023): This document highlights Master planning priorities for the CBD including addressing the connection of town and river as noted above. From a water and IWM perspective, there is a focus on pedestrian connection, including between the town centre and the river. This plan highlights assets like the Main St Gardens as major CBD assets, and streetscape vegetation character.

Community Health and Wellbeing Plan - "Well Placed for Wellbeing" (2017-2021)*:* This document is a high-level strategy with broad community backing designed to guide the actions, focus and endeavours of many organisations with an interest in health and wellbeing. The relevance of IWM planning is in contributing to the quality of open space and streetscapes to encourage physical activity, active transport and community engagement.

Bairnsdale sporting facilities plan (2018): this document highlights key reserves and facilities including Bairnsdale City Oval, WORLD (to be the main community sporting precinct in Bairnsdale), West Bairnsdale Oval and Lucknow Recreation Reserve. WORLD in particular, is of interest to this plan as it is in planning itself with 8 new netball courts, hockey and soccer pitches and associated car parks and pavilions with a central swamp wetland body of water.

East Gippsland Water

Urban Water Strategy and Drought Preparedness Plan (2017) and subsequent analysis: A 50-year plan for ensuring future water supply and sewerage management meets growth in urban water demand. The strategy defines water cycle networks, capacities, and vulnerabilities as well as timings and approaches for future works. The plan suggests that additional supply and/or storage is needed in the Mitchell River water supply system that supplies Bairnsdale between 2028 and 2048 depending on climate change and demand. However more recent analysis taking account of the very low river flows encountered during 2019 and assuming a worst case climate change scenario suggests that although there is almost no risk of running out of water, additional storage and/or supply is needed now to ensure the maximum desired frequency of water restrictions is maintained. The timing and volume of additional storage will be confirmed in the development of the new Urban Water Strategy due to be completed in March 2022. The strategy also highlights the following:

- EGW have a clear commitment to IWM, targeting 100% beneficial reuse of recycled water, and supporting local government exploring further IWM opportunities.
- Alternative water projects at the East Gippsland Livestock Exchange and Bairnsdale City Oval are a high priority.
- The community indicated that they were comfortable with the current levels of service related to water restriction frequency..
- EGW supports water efficiency projects and campaigns and are committed to working with and supporting the local Aboriginal community.

East Gippsland Catchment Management Authority

East Gippsland Waterway Strategy (2014-2022): This document provides a framework for improving the health of waterways in the East Gippsland region in support of this vision:

East Gippsland's rivers, estuaries and wetlands are valued and well-managed, so that communities can enjoy the current and future benefits that healthy waterways provide.

The document highlights the importance of the Mitchell River with management of upstream reaches prioritised to maintain its good existing condition. The Lower Mitchell (around Bairnsdale) has rehabilitation targets to address risks to those values. The Mitchell impacts downstream values including contributing flows to the Ramsar listed Gippsland Lakes and fringing wetlands. The river is also a highly valued community asset, used for a range of activities, and the community is engaged in improving the health of the river, including through Landcare and angling clubs.

'Room to Move': A proposal to manage a changing Gippsland Lakes: 'Room to Move' aims to prepare and adapt to the forecast sea level rises across the Gippsland Lakes in order to maintain and protect critical values" (EGCMA) throughout the Gippsland Lakes. This is achieved by providing room for new habitat areas before they are needed and the creation of 'zones of influence' that expand outwards to "allow values to move or be moved as climate change and sea level rise occurs". The program aims to protect environmental, cultural and community infrastructure.

The program's approach is staged across current and a future scenario that aligns with the 'zone of influence' that is expected with projected sea level rise.

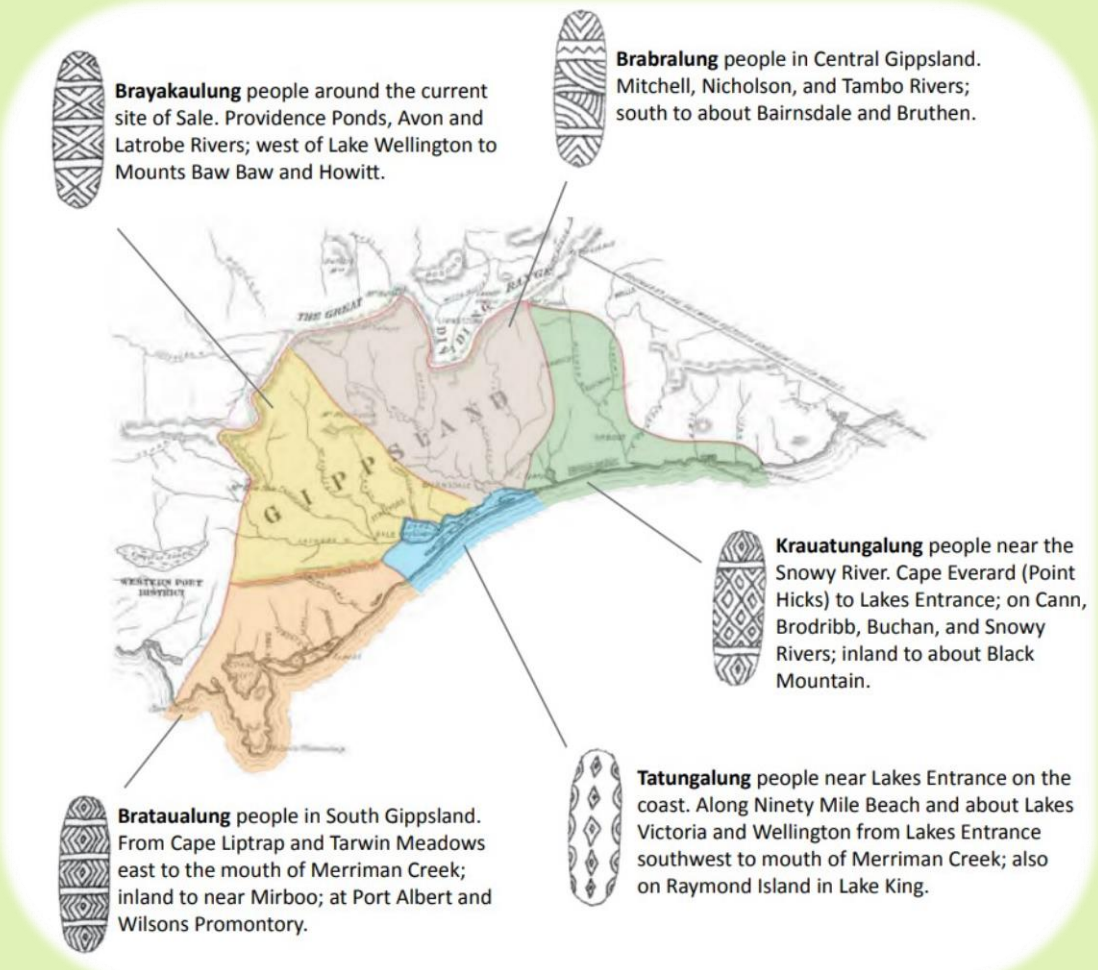
East Gippsland Floodplain Management Strategy (2017): With a vision of*: "Communities, businesses and government agencies are aware of flooding in East Gippsland and are actively taking measures to manage their flood risks to minimise the consequences to life, property, community wellbeing, the economy and the environment."* This vision is supported by four objectives to build a flood resilient community, reduce existing flood risks, avoid future flood risks and manage residual flood risks.

2 Bairnsdale's social and biophysical context

Bairnsdale was established in the 1860's on the Mitchell River and is today the commercial centre of the East Gippsland region. The Aboriginal word for the area, Wy Yung meaning duck, is now the name of a locality north of Bairnsdale. Initially it was gold that brought people to the surrounding areas until it developed as a supply port for the East Gippsland goldfields prior to the railway being established later in the century. Boats navigated the Mitchell River, reaching the ocean via the Gippsland Lakes and Lakes Entrance to transport goods to Melbourne, about 285 km to the west. In more recent years Bairnsdale's proximity to the Gippsland Lakes has seen tourism become a major economic driver in the town and broader region.

The Mitchell River is also an important location to the Gunaikurnai nation, especially Brabuwooloong and the Brayakuloong people of central Gippsland.

The Gunaikurnai have lived in the region for tens of thousands of years. Gunaikurnai are made up of five clans, each cared for their own lands as well as migrating seasonally based on food, water and resources needs.



Gunaikurnai Land and Waters Aboriginal Corporation (gunaikurnai.org.au)

Figure 2. *Gunaikurnai Whole-of-Country Plan (Source: www.gunaikurnai.org)*

2.1 Location

Figure 3 shows Bairnsdale's location on the Mitchell River where the Great Dividing Range and Gippsland Lakes meet. The town is surrounded by unique and valuable natural assets including the Ramsar listed Gippsland Lakes leading to Bass Strait

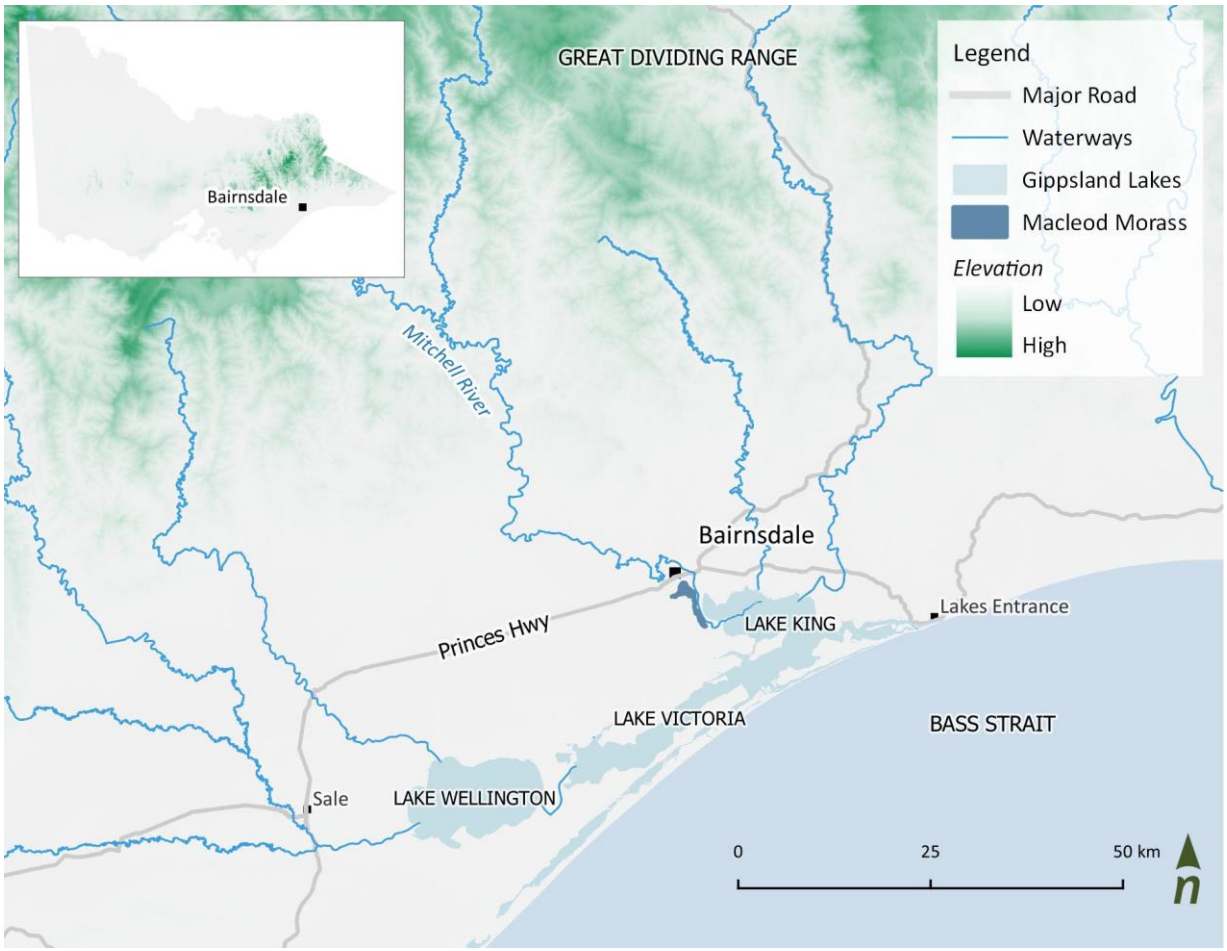


Figure 3. *Bairnsdale location*

Figure 4 highlights the study area for the IWM plan that includes the urban and peri-urban areas of Bairnsdale noting the Mitchell River entering from the west, north-west, the Princes Highway bisecting the town, the Macleod Morass and Gippsland Lakes complex downstream. McGees Gully is also located in this plan. The plan also includes the areas east of the Mitchell River, in East Bairnsdale, where greenfield developments are planned giving rise to IWM opportunities in that part of Bairnsdale.

Key takeaway: What is evident are the number and proximity of waterways, wetlands (like the Morass) and downstream lakes, all of which interact will Bairnsdale's urban water cycle in established and future development areas.

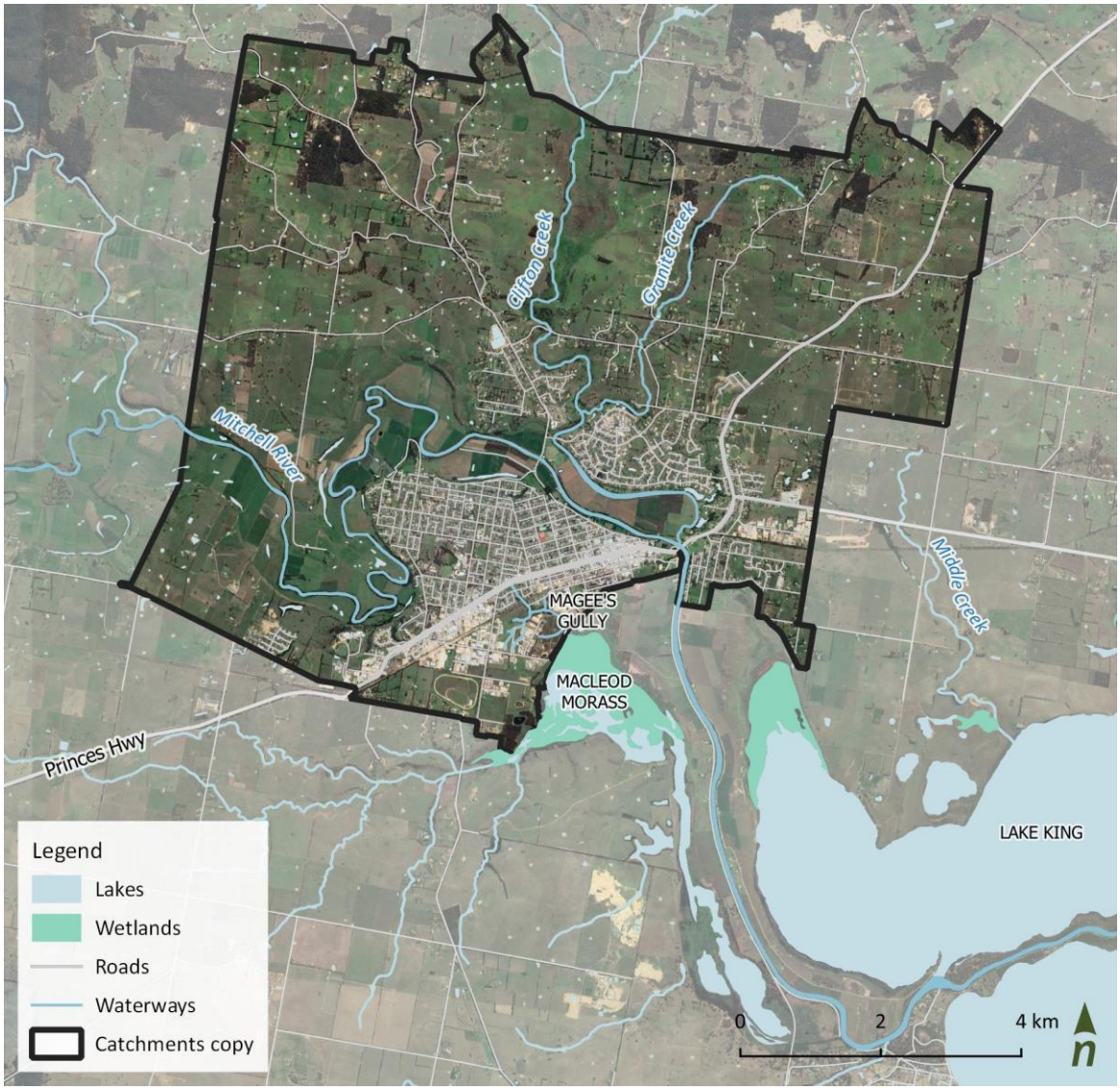


Figure 4. *Bairnsdale IWM Plan project area*

2.2 Population

The 2020 population estimate forecast for Bairnsdale is 17,492 and this is forecast to grow to 22,159 by 2041 (*https://forecast.id.com.au/east-gippsland. – Profile Id*). It is noted that the population forecast for Bairnsdale includes surrounding localities such as Mt Taylor, Bengworden and Goon Nure.

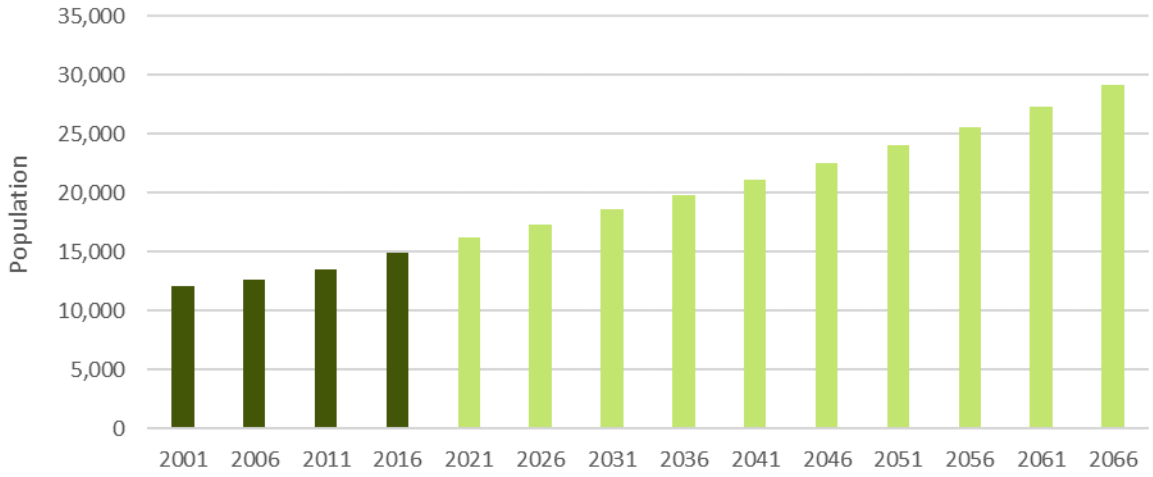


Figure 5. *Population in Bairnsdale (Census record + DEWLP forecast)*

The number of dwellings in Bairnsdale is forecast to grow from 7,612 in 2016 to 9,356 in 2031 and 10,503 in 2041. This represents an average annual growth of 116 dwellings. The average household size is relatively constant, being estimated to adjust from 2.32 to 2.28 by 2031.

Key takeaway: The most direct impact of a rising population is a proportionately increasing growth in potable water demand, for both residential uses, and the industries and activities that employ residents.

2.3 Climate

Temperature in East Gippsland varies depending upon altitude and proximity to the coast. Bairnsdale's climate is relatively mild being near the coast and at proximately sea-level when compared the greater region, averaging a high temperature of 20°C and low of 9°C over the year (http://vro.agriculture.vic.gov.au/).Figure 6 shows average monthly rainfall and temperature measured at Bairnsdale airport.

These figures show:

- relatively consistent and reliable rainfall across the year
- a long-term average annual rainfall of approximately 630 mm, with the more recent period of 2000-2019 illustrating a slight drop in rainfall to about 600 mm annually
- a range of between 400mm to 900 mm of annual rainfall around that long-term average.

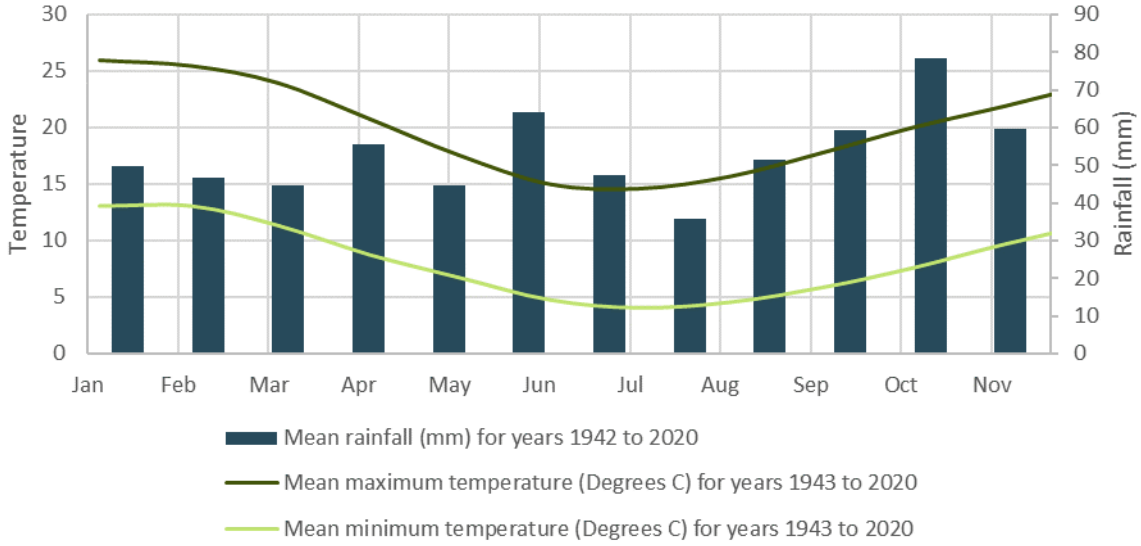


Figure 6. *Monthly average temperature and rainfall at Bairnsdale Airport, 1943-2019 (Bureau of Meteorology)*

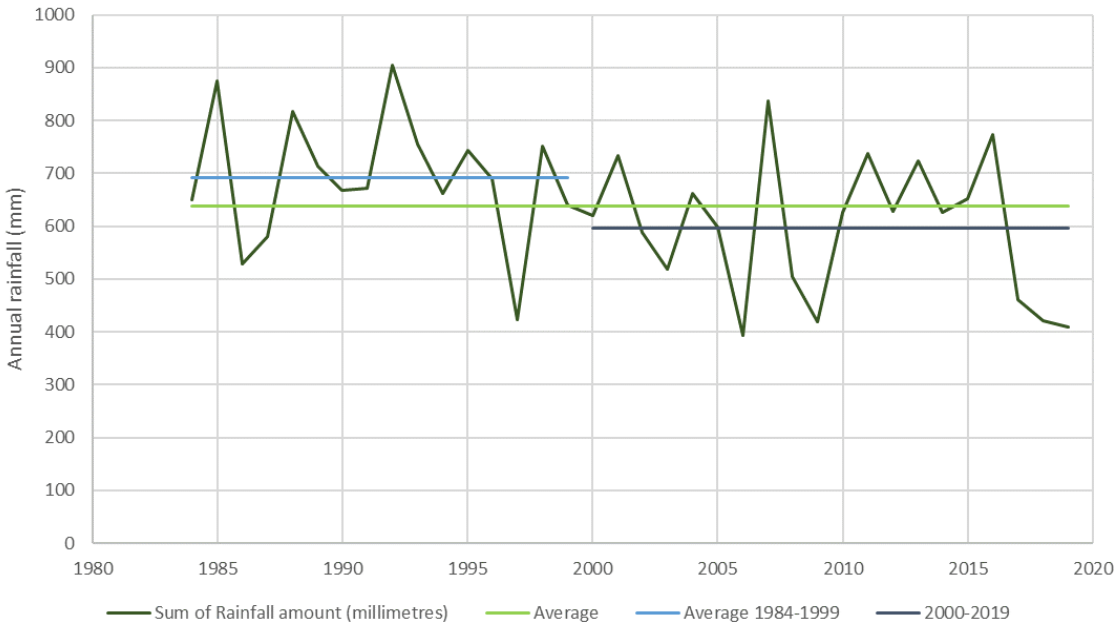


Figure 7. *Yearly Rainfall, Bairnsdale Airport*

Climate change

Climate change is a significant driver behind the preparation of IWM plans in Bairnsdale and across the metropolitan and regional areas of the state. This is due to the impact of climate change on rainfall and temperature and therefore on the reliability of traditional surface water supplies. Reduced ground and surface water flows also impact the health of natural assets like waterways and wetlands. Further, landscape amenity within the town is impacted if open spaces cannot remain green and high temperatures exacerbate the urban heat island effect in central business district (CBD) areas.

DELWP's *Guidelines for Assessing the Impact of Climate Change on Water Supplies (2016)* sets out anticipated changes in temperature, rainfall and runoff in 2040 and 2065 from metropolitan and rural catchments, including the Mitchell River Basin.

The potentially significant reduction in rainfall and runoff over time will impact those factors listed above with a direct bearing on water security and the ecological health and social values associated with waterways, wetlands and lakes.

Table 1. Estimated changes relative to current climate baseline (1974-2014) in the Mitchell River Basin (Source: DELWP, 2016)

	Change relative to baseline	
Criteria	**2040**	**2065**
Temperature change (˚C)	1.3	2.4
Potential evapotranspiration (%)	4.7	7.9
Rainfall. 1975 – 2014 average: 953 mm / year)		
10th percentile (low)	4.3	2.3
50th percentile (medium)	-2.3	-4.8
90th percentile (high)	-9.7	-18.5
Average annual runoff (mm) 183 (1975 – 2014 average)		
10th percentile (low)	10.4	1.5
50th percentile (medium)	-11.0%	-15.6
90th percentile (high)	-26.3%	-44.7

** Please note that the figures below are for the whole Mitchell River Basin and are not specific to Bairnsdale.*

Key takeaway: The reliance of Bairnsdale on the climate dependent Mitchell River system (discussed further below), suggests that the impacts of climate change will directly influence the reliability of this system for supplying water to a growing population as well as impacting upon the health of the region's waterways, wetlands and lakes.

2.4 Land use

Figure 8 below summarises land uses around Bairnsdale and within the project area. The town is surrounded predominantly by farming land as well as low density and rural residential living. Residential areas are located either side of the Mitchell River, with new development areas planned in East Bairnsdale, and specifically east of Clifton Creek. Commercial and industrial land use areas can be observed along Princes Highway, and concentrated between Princes Highway and Macleod Morass.

Key takeaway: This plan highlights

- the proximity of urbanisation to adjacent (e.g. the Mitchell River), and downstream environmental receptors like Macleod Morass and Gippsland Lakes.
- the potential for future urban development, the stormwater and wastewater generated as a result, and the need to implement measures to mitigate those impacts.

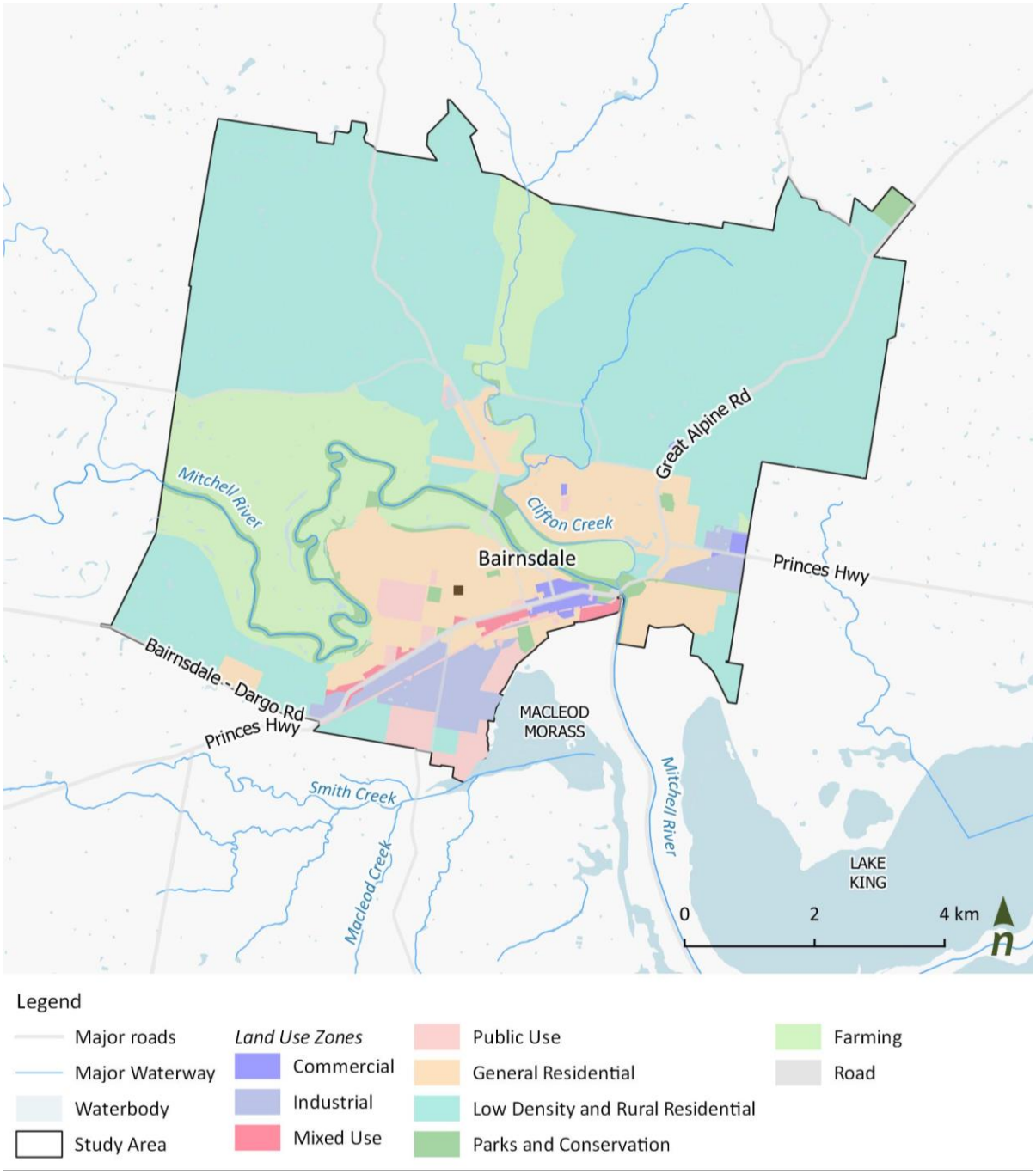


Figure 8. *Land use in and around Bairnsdale*

2.5 Waterways, lakes, and wetlands

Figure 9 highlights the creeks, rivers and lakes surrounding Bairnsdale, however this section focusses on the Gippsland Lakes and Mitchell River.

The Gippsland Lakes

The Gippsland Lakes is a large, complex system of coastal lagoons and fringing wetlands that extends from Sale to Lakes Entrance over approximately 60,000 hectares. Seven major river systems drain to the lakes, including the Mitchell system. Much of the Gippsland Lakes system is recognised as a Wetland of International Importance under the Ramsar Convention (Ramsar, Iran, 1971).

The lakes support a diverse array of ecological values including seagrass beds, vegetation and habitat for local and migratory waterbirds and a diversity of fish species including one of two known populations of the rare Burrunan dolphin (EGCMA, 2018).

In terms of the impact of water quality from Bairnsdale and the upstream catchments, water quality is variable in the short term and largely stable in Victoria and King lakes over the longer term. High rainfall corresponds with larger nutrient loads events that increase the likelihood of algal blooms. These events, while impacting water quality, can provide the phytoplankton that drives food supply for fauna within the system.

Future urban growth and changes in the upstream catchments will continue to impact water quality, as will the impacts of climate change, both through variable rainfall and rising sea levels. Sea level rise has also contributed to increasing salinity levels within the Gippsland Lakes. The 'Room to Move' program noted above, seeks to identify areas where values can be relocated and retained in the event that sea level rise makes current habitats unviable.

While the East Gippsland IWM Forum and this IWM plan considers the impacts of the urban environment on the Gippsland Lakes, the processes that influence its overall health are much more widespread in scope and geography.

Mitchell River

The Mitchell River traverses approximately 120 km from below the Dargo township at the confluence of the Wonnangatta and Dargo Rivers. The upper catchment is largely forested including where it traverses the Alpine and Mitchell River National Parks before entering the floodplain near Lindenow where it has deposited sediment over time to produce valuable agricultural land.

The river enters Jones Bay that is part of Lake King, near Bairnsdale and via silt jetties. The river is also flanked by a number of wetlands including Macleod Morass, Jones Bay. The silt jetties extend 8 km into the lake system. The increasing salinity within the lake system is causing some vegetation on the silt jetties to die off contributing to ongoing erosion.

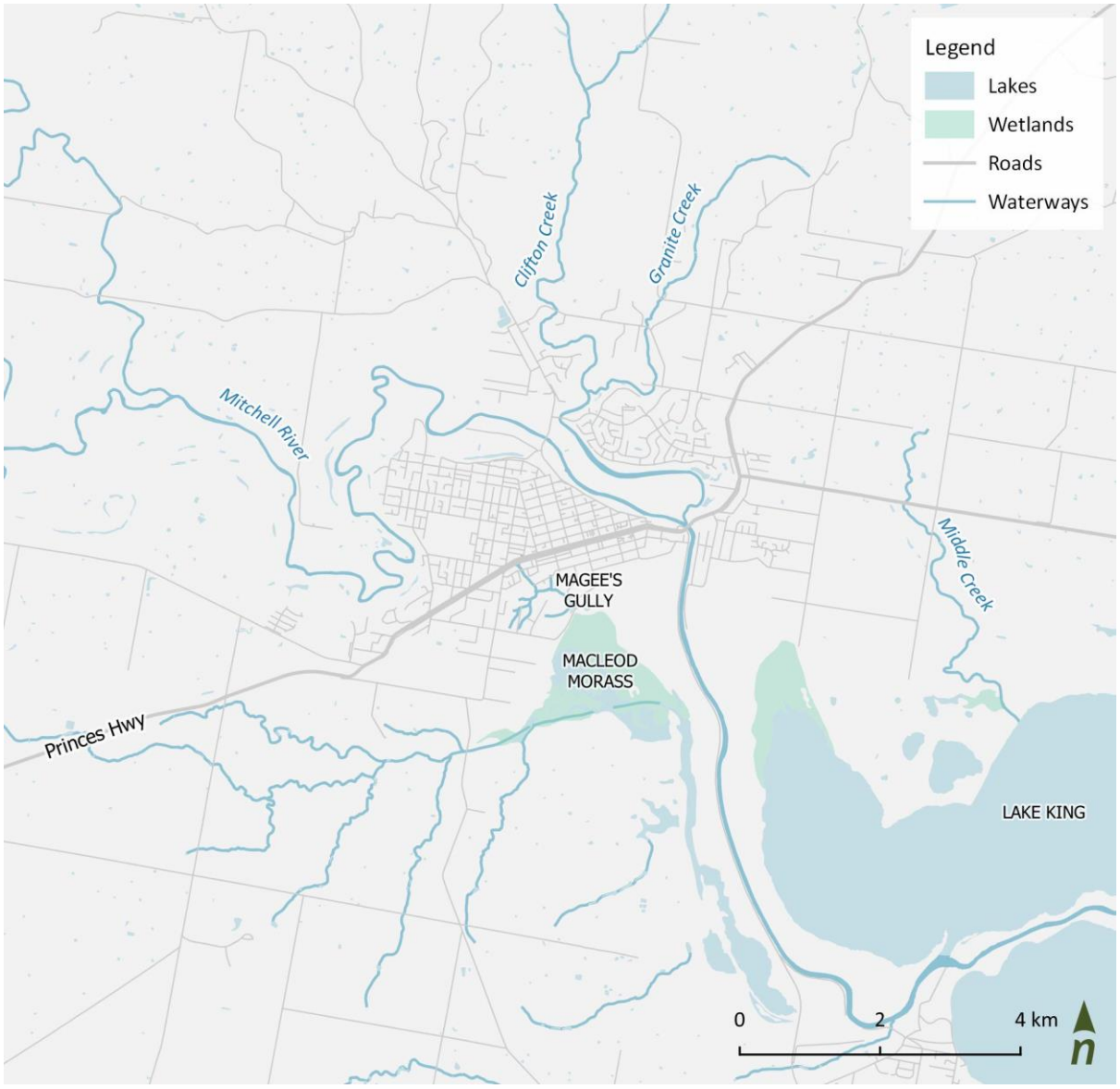


Figure 9. *Waterways, lakes and wetlands in Bairnsdale*

2.6 Flooding

During consultation it was agreed that this IWM plan would not directly address flood risk as this is currently managed through the State Emergency Services in collaboration with stakeholders including EGCMA. Therefore, the following is provided for information. The East Gippsland Flood Management Strategy (EGCMA, 2017) identifies Bairnsdale Central and 'greater' Bairnsdale as having medium and high "risk tiers" respectively. The higher risk rating in the urban area corresponds to the greater likelihood of harm and property damage associated with denser population centres.

The largest flood in the Mitchell was recorded in 1893, with large recent events occurring in 2016 (see Figure 10), 2012 and 2007. Figure 11 shows flood risk areas across the EGCMA region, noting that reaches of the Mitchell River upstream of Bairnsdale correspond to a high flood risk rating.

Figure 10. *Bairnsdale flooding (The Age, 2016)*

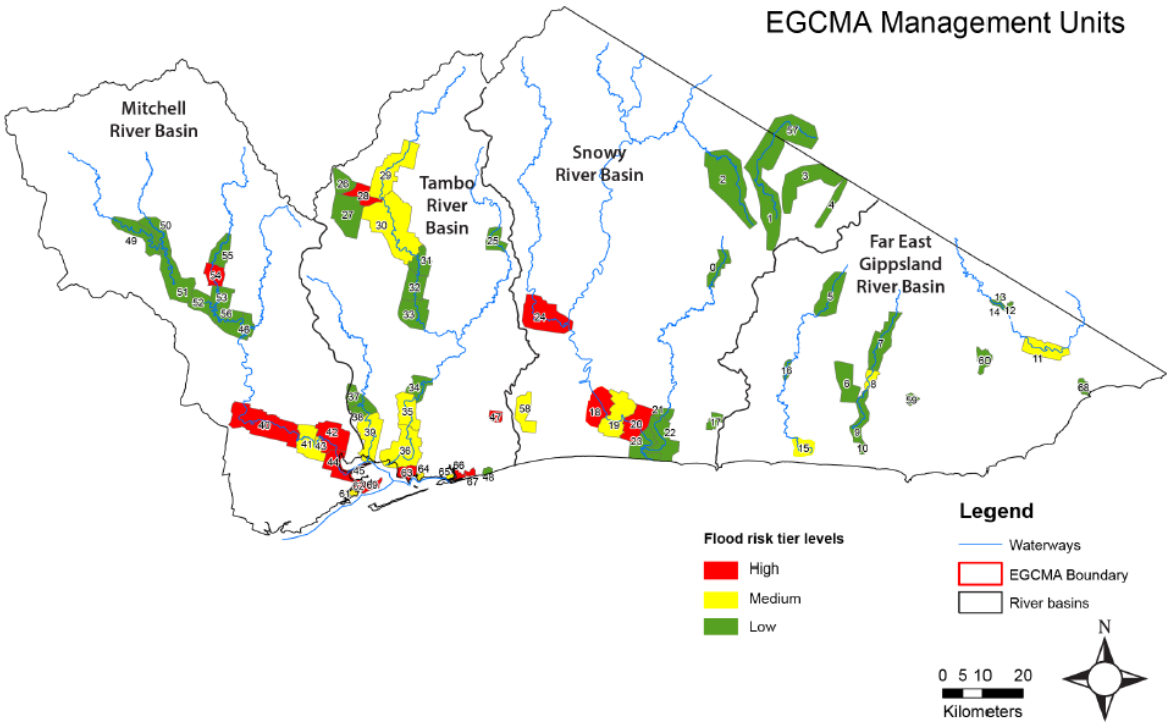


Figure 11. *EGCMA flood management units with flood risk locations (EGCMA 2017)*

2.7 Liveability, health and well being

As well as natural assets and landforms, the IWM plan will consider how it can enhance and support a healthy and resilient population. As noted above, climate change, through drought, heat and flood poses a significant threat to the wellbeing of the Bairnsdale community, not least from the impact upon the reliability of the potable water supply network.

Planned growth in Bairnsdale aims to balance development with the need to connect people to their natural environment, both for relaxation and improved mental health, but also in recognition of how the community value those environmental assets.

Some opportunities that have been identified during the literature review to improve liveability that relate to water management include:

- Enhancing the connection between the Mitchell River and the CBD of Bairnsdale (Reimagining Bairnsdale Masterplan, see Figure 12).
- Connect new development (including residential areas in East Bairnsdale) to waterways and downstream wetlands and lakes.
- Improved connection of the surrounding community to open space and recreation precincts like the Main St Gardens and the planned WORLD sporting precinct (Figure 13). The Main St Garden is referred to as one of the defining, yet underutilised landmarks within Bairnsdale (Reimagining Bairnsdale Masterplan).

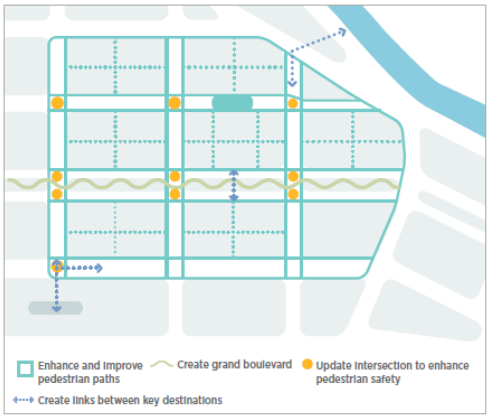


Figure 12. *Reimagining Bairnsdale Masterplan - Enhancing CBD and river connection*

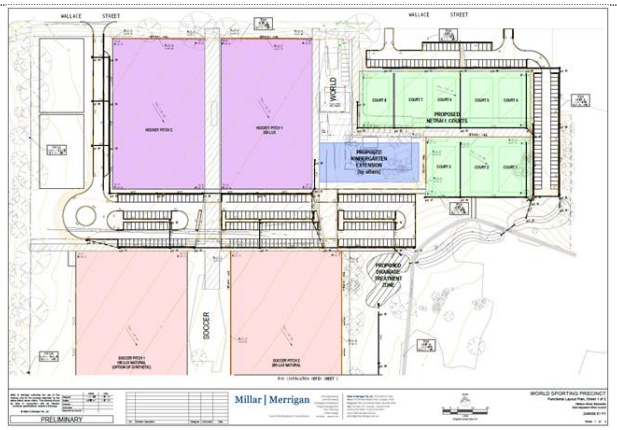


Figure 13. *The WORLD precinct plans*

Key takeaways: The role of IWM in the context of place making includes:

- Ensure improved stormwater quality to improve waterway and wetland health that leads to improved aesthetic and amenity outcomes
- Identifying opportunities to use non-potable water to irrigate, green and cool open spaces
- Using stormwater to passively irrigate trees to improve tree health and in turn provide shade alongside bicycle and walking paths.

Further opportunities for water to enhance liveability in Bairnsdale are discussed below.

3 Bairnsdale's water cycle

The following section investigates Bairnsdale's water cycle under existing conditions and a future influenced by climate change, population growth and urban development. The areas of focus in this investigation include:

- potable water supply
- wastewater and recycled water, and
- stormwater (and pollutants).

By investigating each in turn we identify current and future water cycle issues that are then summarised in Section 3.4 'Water cycle summary' below. Once identified, we will view the issues through the lens of the IWM plan's Vision, Objectives and Outcomes (Section 4), to guide the identification of water cycle opportunities for Bairnsdale (Section 5) that in turn leads to the development of an IWM Action Plan (Section 6).

3.1 Potable water supply

Bairnsdale's water supply is managed by East Gippsland Water (EGW). Supply is via a combination of surface water and groundwater, with surface water drawn from the Mitchell River system, the largest in the EGW network. A schematic is provided in Figure 14.

The Mitchell system provides water to approximately 16,000 residential customers and over 2,200 non-residential customers. The mechanism that enables this supply is via a bulk entitlement that allows for the extraction of 9,208 ML/year (EGW 2017), of which less than half is currently utilised. This water is pumped from the river to the Woodglen storages and water treatment plant at a maximum rate of approximately 30 ML/day prior to being supplied to customers.

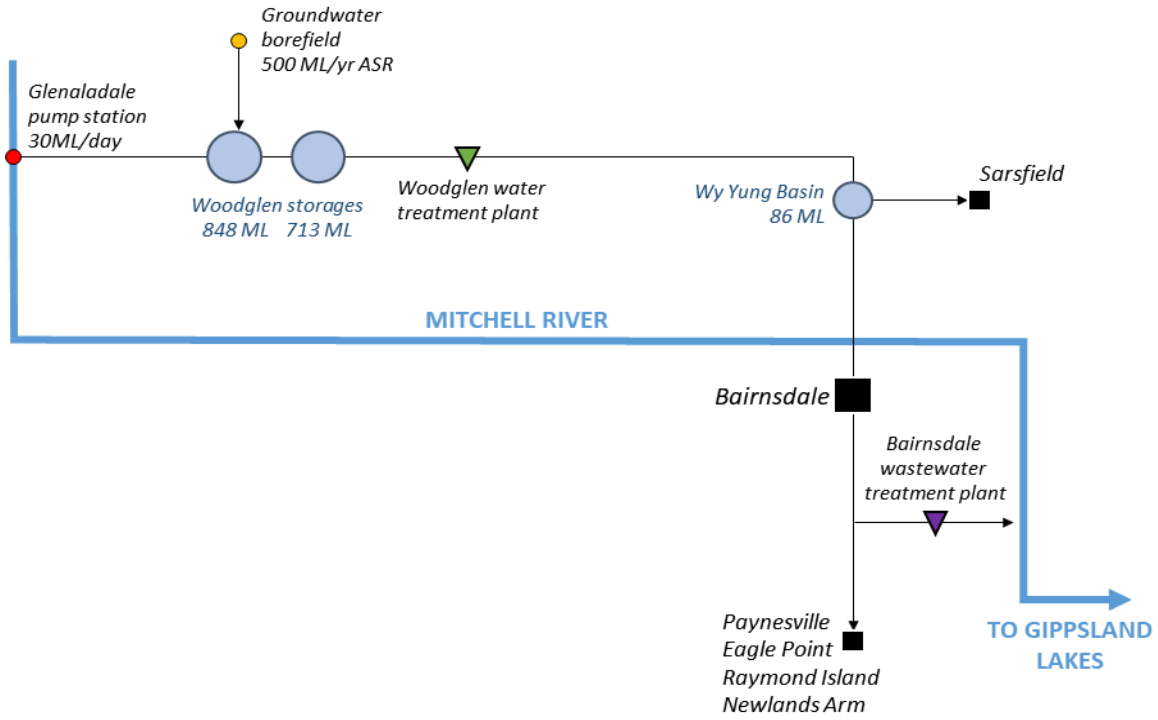


Figure 14. *Mitchell system schematic*

System vulnerability

Future system planning is guided by the Urban Water Strategy and Drought Preparedness Plan 2017 – 2065 (the strategy) (EGW, 2017). This strategy assesses the resilience of water supply systems and the ability of those systems to meet agreed levels of service today and into the future, taking into account factors such as population growth and climate change. It also identifies triggers for system augmentations with development of the 2022 Urban Water Strategy having recently commenced. The strategy also refers to IWM and the opportunities within Bairnsdale to recycle wastewater and reuse stormwater to reduce pressure on those traditional sources.

Given Bairnsdale is predominantly supplied by the Mitchell system, the impact of climate change on that river system will be a critical consideration. The strategy notes that "many of the stream gauges in East Gippsland show a step change reduction in streamflow post-1997". This is supported by the fact that the last 12 months (2018/19) has seen the lowest flows on record (i.e. since 1935) in the Mitchell River.

Future planning will therefore be sensitive to the impacts of climate change on streamflow and water supply and increased demand due to population growth, with projections suggesting potable water demand will rise from 4.1 GL/annum in 2018 to 7.7 GL/annum in 2065.

Figure 15 illustrates what this means for the system. Under a scenario taking into account climate change and population growth, the Mitchell River annual bulk entitlement (all year round component) is likely to be exceeded around 2035. However, in order to comply with target maximum desired frequency of water restrictions, additional storage and or/ supply is required now and into the future. This is likely to require system augmentations including increasing the bulk entitlement available to the town coupled with demand management and the identification of alternative water sources (including recycled water and stormwater).

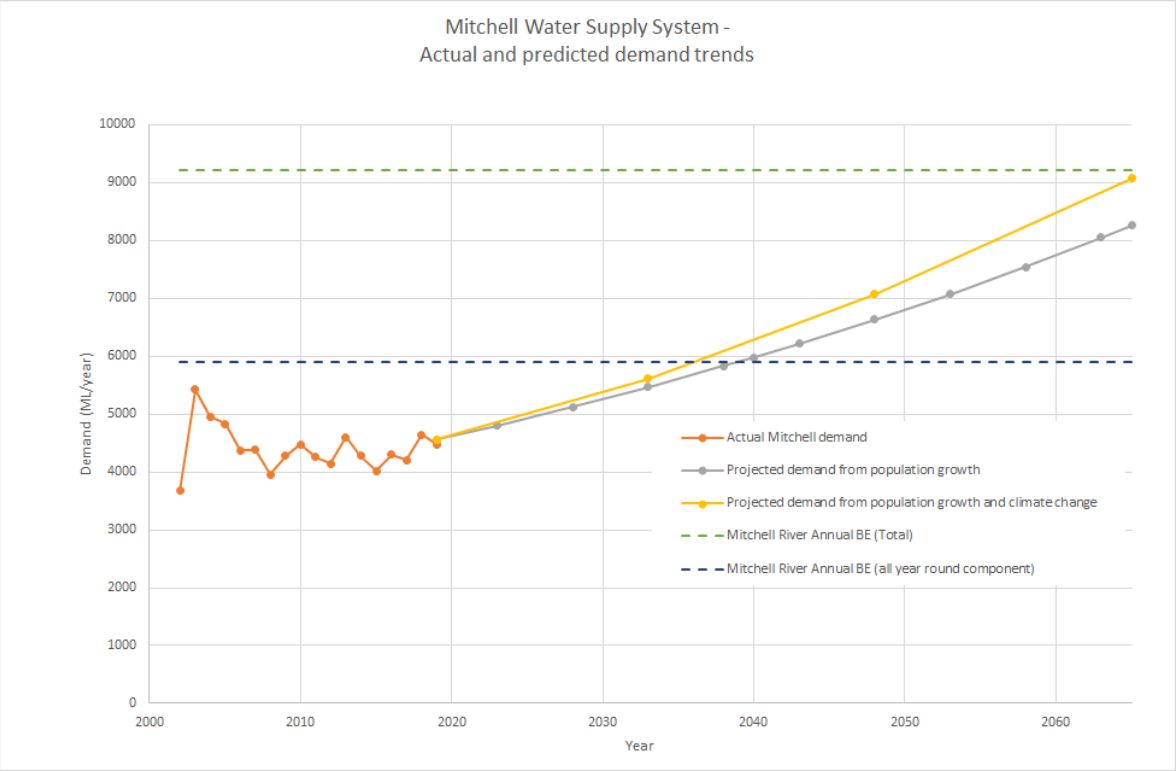


Figure 15. *Mitchell River system supply and demand projections (Courtesy East Gippsland Water)*

Potable water consumption

Figure 16 shows total potable water consumption across Bairnsdale between 2014/15 and 2019/20. Consumption is relatively consistent at about 1.7 – 1.8 GL/year that equates to approximately 182 L /person / day.

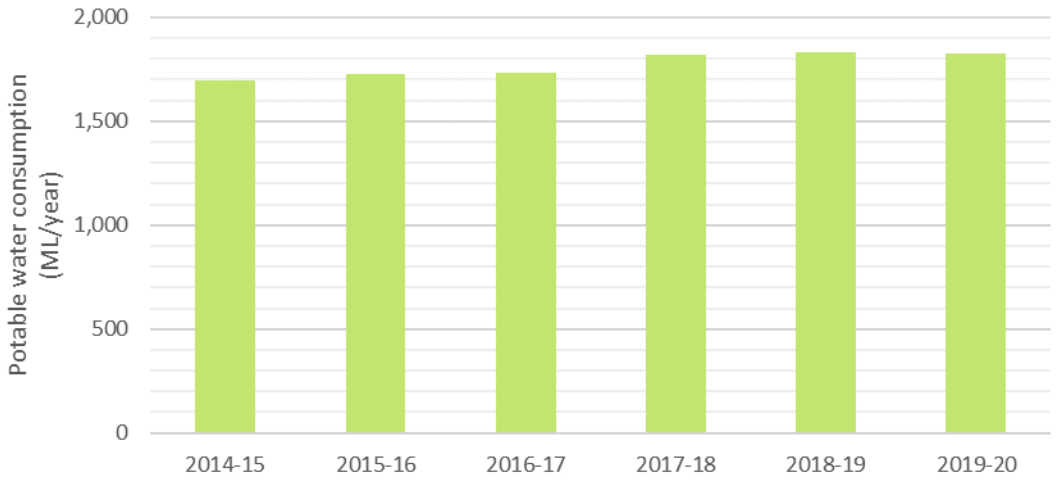


Figure 16. *Annual water use in Bairnsdale and Wy Yung (Source East Gippsland Water)*

Figure 17 shows the Top 10 East Gippsland Shire Council water uses. It can be observed that the top three include the East Gippsland Livestock Exchange, aquatic centre and Main St gardens and these collectively account for 67% of Council's use. This highlights opportunities for efficiency, conservation and the use of alternative water sources, particularly in relation to those high water using activities.

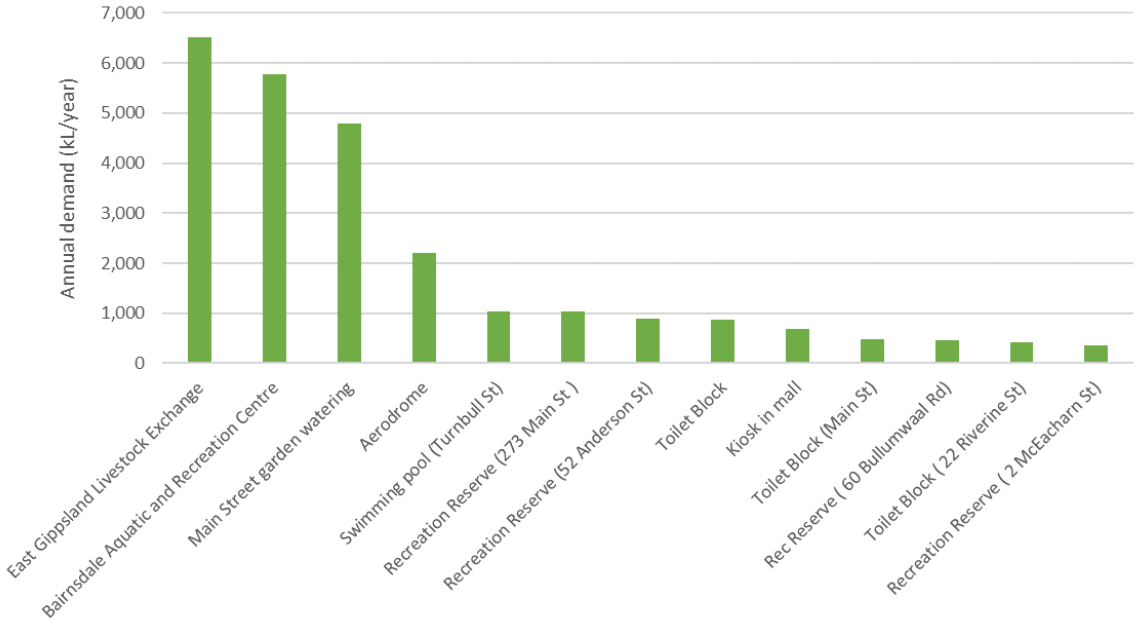


Figure 17. *Top 10 Council end users (2015/16)*

Indeed, EGW and EGSC have worked together to put forward a plan to reduce potable water use at the East Gippsland Livestock Exchange. The following project highlight summarises that work done to date.

Alternative water sources in Bairnsdale: East Gippsland Livestock Exchange

As part of the IWM Forum process the stakeholders to this plan put forward the opportunity to "undertake capital works to supply the East Gippsland Livestock Exchange and adjacent Bairnsdale Oval with Class B treated wastewater to replace the use of reticulated town water". This proposal was made in the context of low streamflow and the prospect of ongoing challenges regarding the reliability of climate dependent potable water supplies.

Based on the demand data above, showing that the East Gippsland Livestock Exchange consumes up to 9 ML per year historically and about 6-7 ML in 2015/16. The proposal included:

- Treatment upgrades
- Reconfiguration of pump and pipe infrastructure to deliver the water
- Reticulation to distribute the water to the East Gippsland Livestock Exchange
- A diversion pit that will divert stormwater to McGees Gully, reducing the risk of overflow of untreated runoff from the East Gippsland Livestock Exchange.

The proposal also includes irrigation of the Bairnsdale City Oval that consumes 7.7 ML/year as well as Peppercorn Oval, taking total irrigation demand to 15.5 ML/year. This was a clear opportunity to reduce potable water demand and make good use of a fit for purpose water source.

The proposal also flagged to potential to extend the recycled water network to other users, including the Main St gardens and industrial precinct, however this is not part of the current proposal.

East Gippsland Water was successful in attaining funding for this initiative and works to extend recycled water to some of the highest water users in Bairnsdale will commence in 2020.

3.2 Wastewater and recycled water use

Figure 18 below illustrates the wastewater collection and conveyance network across Bairnsdale, showing the Bairnsdale wastewater treatment plant (WWTP) at the bottom of the image and upstream of Macleod Morass. There are approximately 7,240 sewer connections in Bairnsdale and the Bairnsdale WWTP treated 1,154 ML of sewage in 2019/20 (servicing Bairnsdale and Nicholson).

Of the 1,154 ML of treated wastewater available in 2019/20 nearly all was directed to the Macleod Morass as environmental flow with a small volume used on the Bairnsdale Racecourse. The recycled water supply to Macleod Morass is viewed as being critical to its ecological health as it balances salinity within the Morass, salinity that is expected to increase over time with rising sea levels.

While recycled water is critical for the health of the Morass, there may be an opportunity to use treated wastewater to substitute potable water in the higher water demand locations, like the East Gippsland Livestock Exchange and Main St gardens.

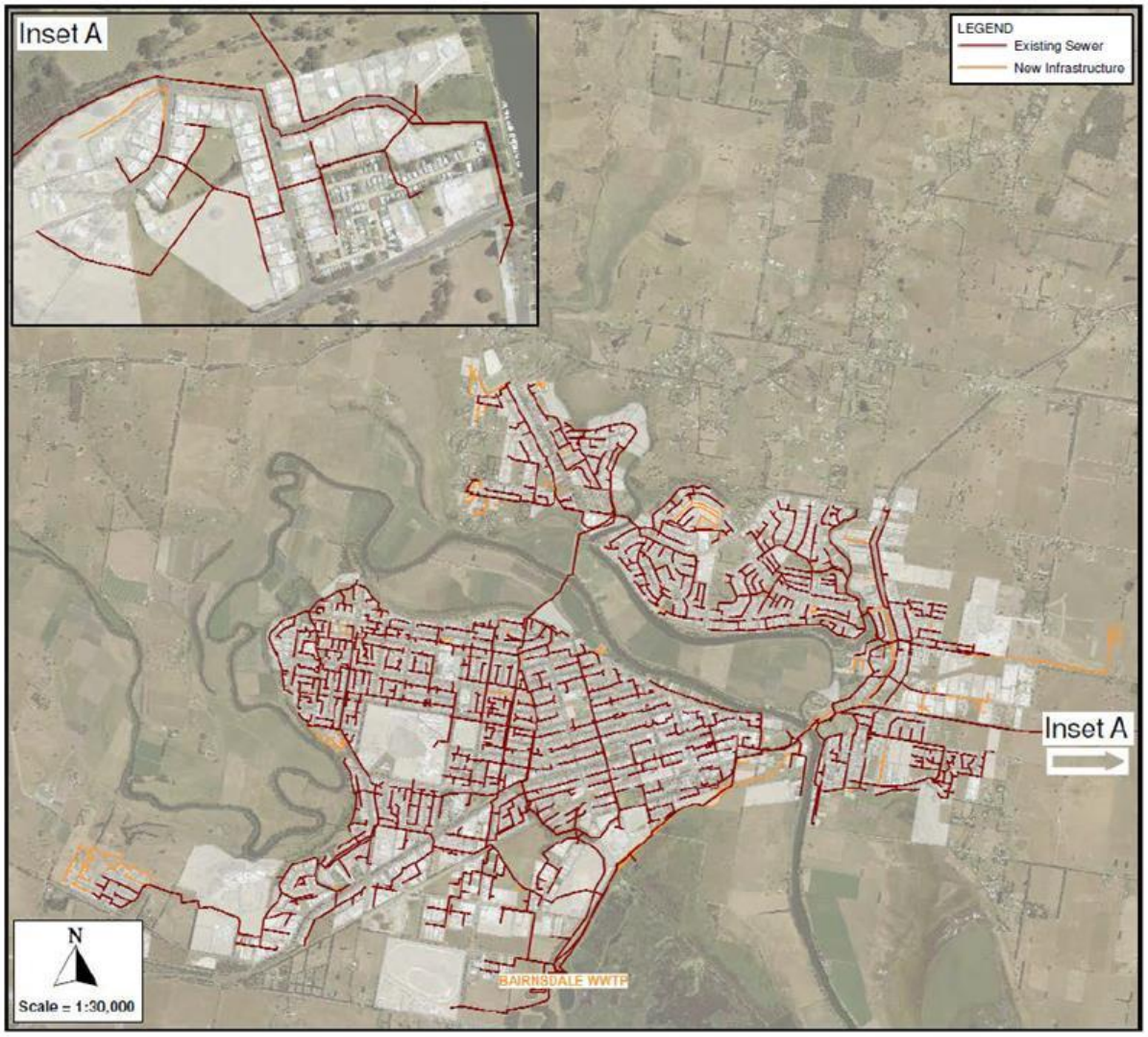


Figure 18. *Bairnsdale township wastewater infrastructure. Inset A shows Nicholson township, which sends sewage to Bairnsdale WWTP for treatment. (source: Bairnsdale Sewer Masterplan Report, EGW 2019).*

3.3 Stormwater and pollutants

Stormwater is generated when rainfall comes into contact with hard, paved surfaces like footpaths, roads and carparks, carrying associated pollutants (including nutrients, grease, oils, heavy metals and litter) to receiving environments. Managing stormwater volume and quality is an important aspect of any IWM Plan as it offers opportunities to reuse those volumes of water for things like irrigation, while reducing the risk of stormwater pollution to environmental assets like the Mitchell River, Macleod Morass and the Gippsland Lakes.

By understanding where the stormwater is generated now and into the future, particularly due to urban development, opportunities for stormwater treatment and harvesting can be pinpointed.

To do this, modelling was undertaken to estimate stormwater volumes and pollutant loads today and into the future. The Model for Urban Stormwater Improvement Conceptualisation (MUSIC) tool was used to generate measures for total nitrogen, total phosphorus, total suspended solids and gross pollutants (litter). The following sections outline the modelling methods and results of the analysis.

Climate conditions

Current climate conditions were based on historical rainfall and potential evapotranspiration (PET) data from Bairnsdale Airport (SILO station #085279), from 1970 – 2020 at a daily timestep. The impact of climate change was modelled by scaling this observed climate data to the median (50th percentile) rainfall and PET changes for 2065, as outlined in Section 2.3.

Urban development

Figure 19 illustrates the projected changes in land uses and the 'impervious fraction' of the surfaces that can be expected due to future urban development. This is based on the existing planning scheme. It can be seen that development is planned in the east and south east of Bairnsdale, thereby increasing stormwater runoff from those catchments.

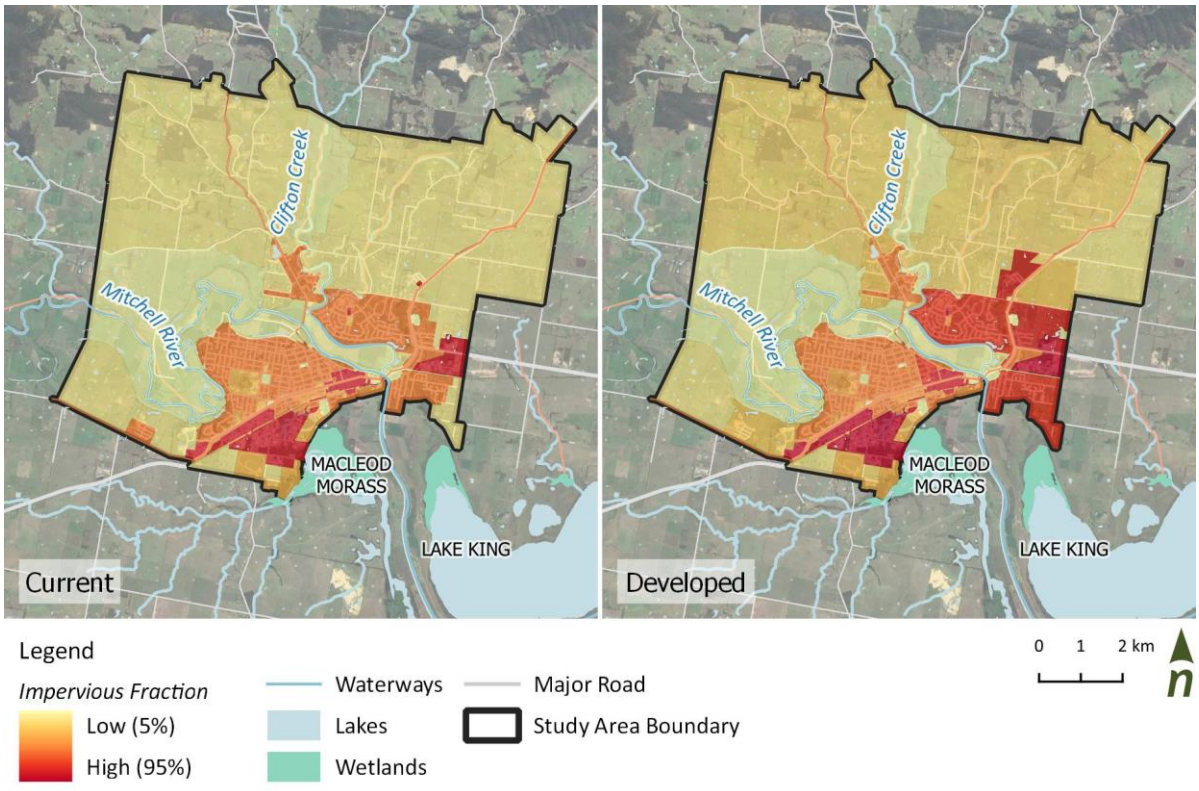


Figure 19. *Land use changes expected from future urban development in Bairnsdale based on the planning scheme.*

Stormwater catchments

Figure 20 shows the stormwater catchments within Bairnsdale's urban area. These have been delineated based on the drainage network, waterways and topography of the urban area.

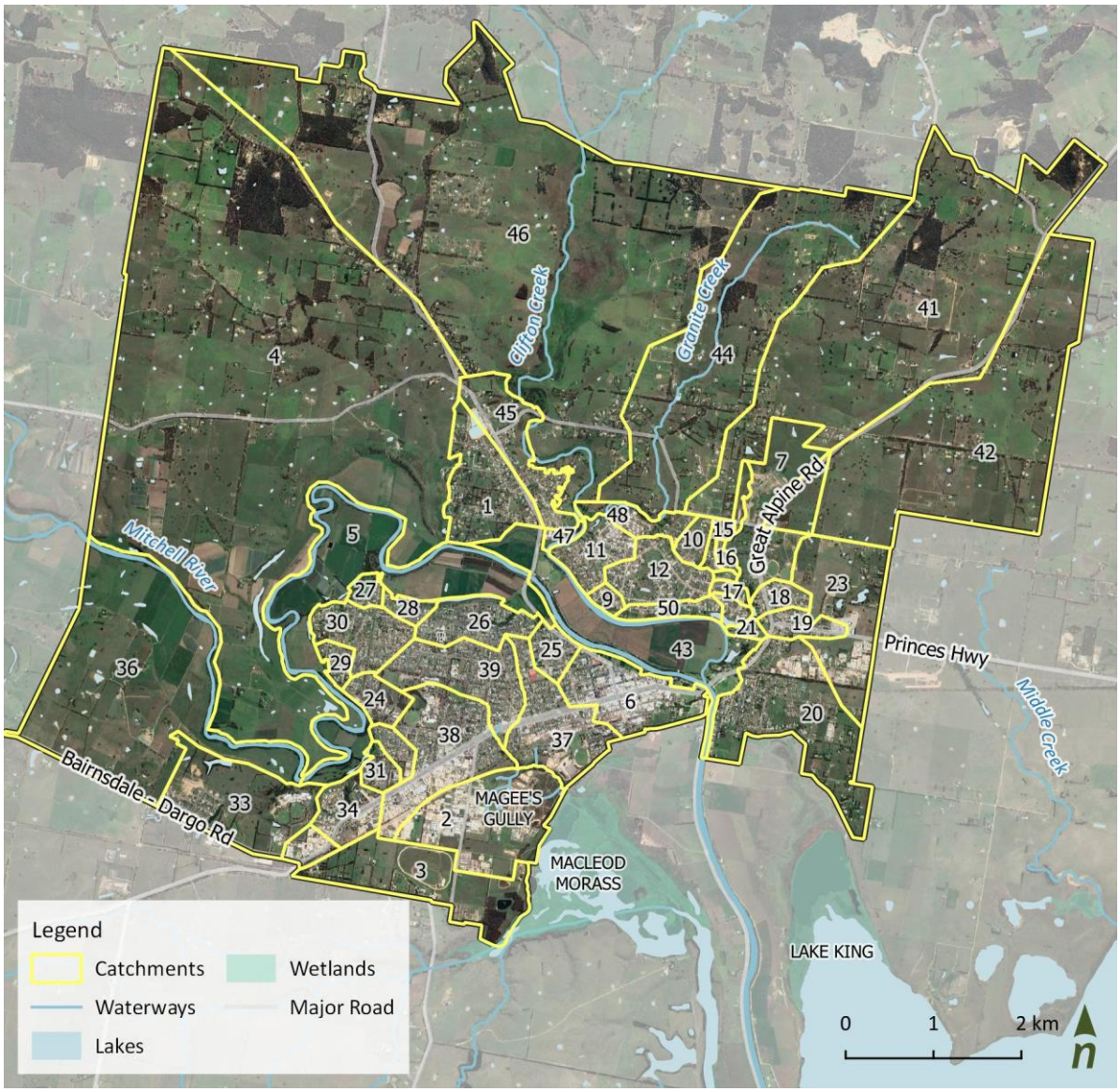


Figure 20. *Stormwater catchments in the Bairnsdale urban area*

Modelling scenarios

Four scenarios were examined, representing a combination of current and future climate and urban development conditions. These are described in Table 2.

Table 2. Water and pollutant balance scenarios

Scenario	Development condition	Climate scenario
Baseline	Existing urban development conditions	Current (historical) climate (2020)
Scenario A	Existing urban development conditions	Future (median climate scenario) climate (2065)
Scenario B	Future (ultimate) urban development conditions	Current (historical) climate (2020)
Scenario C	Future (ultimate) urban development conditions	Future (median climate scenario) climate (2065)

Stormwater modelling results

The modelling results are included in Attachment B with a summary of results in Table 3 and Figure 21 below. The focus is of the modelling results is on how climate and urban development is expected to change the volume of stormwater runoff generated into the future.

In summary, the results suggest:

- The impact of climate only (difference between the baseline and Scenario A) results in a 7% decrease in stormwater runoff due to reduced rainfall and increased evapotranspiration.
- The impact of urban development only (difference between the baseline and Scenario B) drives an 11% increase in stormwater runoff due to an increase in the proportion of impervious area in the catchment.
- The impact of urban development and climate change (difference between the baseline and Scenario C) increases stormwater runoff by 3%.

Stormwater generated from new urban development will need to be treated to best practice to protect the downstream environment. There is also an opportunity to harvest and reuse some of this additional stormwater.

Table 3. Stormwater MUSIC model results

Scenario	Baseline	Scenario A			Scenario B			Scenario C		
Urban development	**Existing**	**Existing**	**Change due to climate**		**Future**	**Change due to development**		**Future**	**Total change**	
Climate	**2020**	**2065**		**%**	**2020**		**%**	**2065**		**%**
Precipitation (mm)	680	650	-30	-4%	680	-	-	650	-30	-4%
PET (mm)	1,100	1,190	90	8%	1,100	-	-	1,190	90	8%
Impervious area (ha)	2,050	2,050	-	-	2,320	270	13%	2,320	270	13%
Rainfall Volume (GL/yr)	54.6	51.9	-3	-5%	54.6	0.0	0%	51.9	-2.6	-5%
Evapotranspiration (GL/yr)	37.5	36.8	-1	-2%	36.3	-1.3	-3%	35.6	-1.9	-5%
Baseflow Out (GL/yr)	4.2	3.2	-1	-24%	4.0	-0.2	-5%	3.1	-1.1	-27%
Stormflow Out (GL/yr)	**12.8**	**11.9**	**-1**	**-7%**	**14.3**	**1.4**	**11%**	**13.3**	**0.4**	**3%**
TSS (tonne)	2,703	2,497	-206	-8%	3,015	311	12%	2,776	73	3%
TP (tonne)	6	6	-1	-9%	7	1	10%	6	-0.1	-1%
TN (tonne)	46	42	-5	-10%	50	4	8%	45	-1	-2%
GP (tonne)	516	494	-22	-4%	569	53	10%	546	30	6%

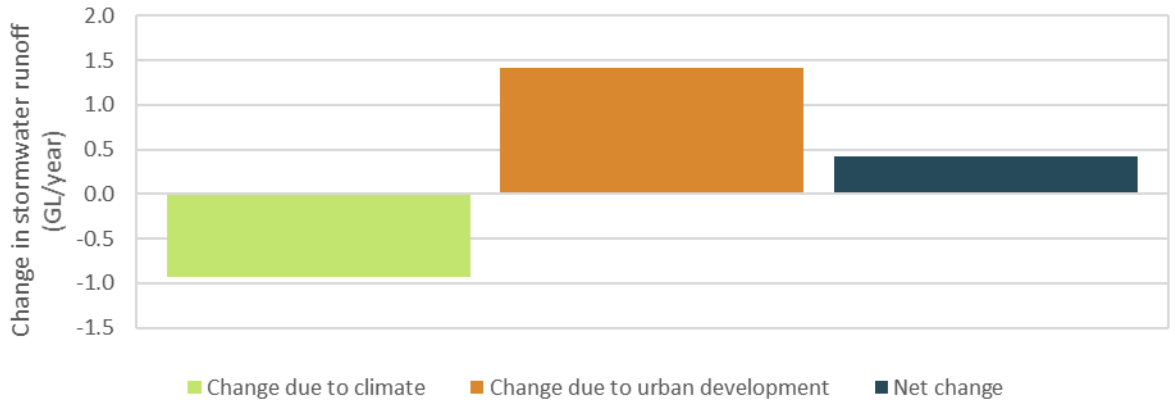


Figure 21. *Net change in stormflow from baseline across the study area, due to climate change and land urban development*

Stormwater runoff by catchment

To pinpoint where these changes are expected, catchments were grouped according to the source of that stormwater (Figure 20). Figure 22 illustrates those groupings based on the relevant urban and peri-urban catchments. Figure 23 describes the changes in stormwater runoff volumes that are expected to be generated due to:

- urban development
- the reduction in run off due to climate change, and
- a net stormwater volume change from the current baseline.

This will assist IWM stakeholders to pinpoint where changes are likely to occur and therefore where to focus their stormwater treatment efforts and identify opportunities for stormwater harvesting.

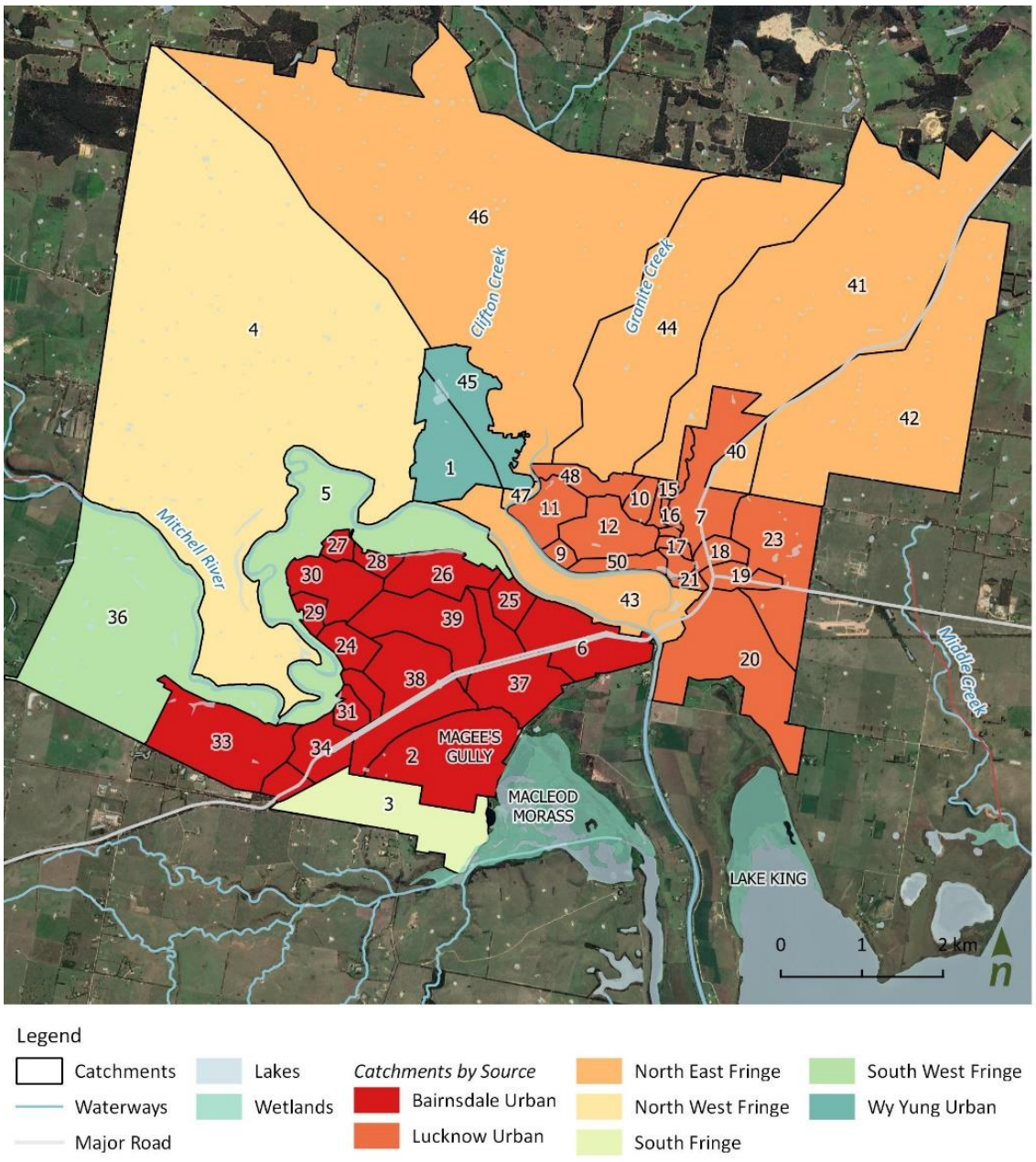


Figure 22. *Bairnsdale urban catchments by source*

What is evident is that he Lucknow Urban area will experience the greatest increase in flow with more modest increases in Bairnsdale Urban and the North East Fringe. This data is set out in greater detail in Table 4.

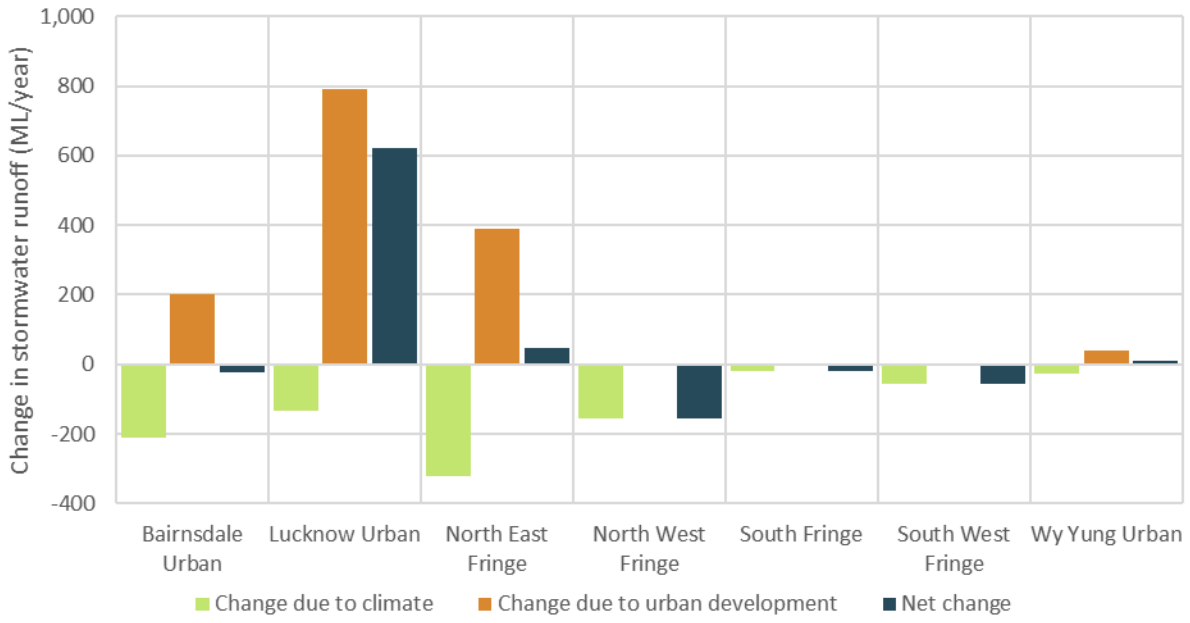


Figure 23. *Change in stormwater runoff from baseline by source, due to climate change and urban development*

Table 4. Change in stormwater runoff from baseline by source, due to climate change and urban development (ML/ year)

Scenario	Baseline	Scenario A			Scenario B			Scenario C		
Urban development	Existing	Existing	Change due to climate		Future	Change due to development		Future	Total change	
Climate	2020	2065	ML	%	2020	ML	%	2065	ML	%
Bairnsdale Urban	3,530	3,318	-212	-6%	3,731	201	6%	3,509	-21	-1%
Lucknow Urban	2,234	2,097	-137	-6%	3,050	816	37%	2,873	639	29%
North East Fringe	4,028	3,706	-322	-8%	4,417	389	10%	4,076	48	1%
North West Fringe	1,759	1,605	-154	-9%	1,759	0	0%	1,605	-154	-9%
South Fringe	282	263	-19	-7%	282	0	0%	263	-19	-7%
South West Fringe	590	533	-57	-10%	590	0	0%	533	-57	-10%
Wy Yung Urban	420	392	-28	-7%	460	40	10%	431	11	3%
Grand Total	**12,843**	**11,914**	**-929**	**-7%**	**14,289**	**1,446**	**11%**	**13,289**	**446**	**3%**

Stormwater runoff by environmental receptor

As well as defining volumes by catchment, Bairnsdale is unique in that the catchments flow to a number of highly valued and sensitive environmental receptors. Figure 24 illustrates the catchments according to where they drain to including:

- Mitchell River
- Clifton Creek
- Macleod Morass and
- Middle Creek.

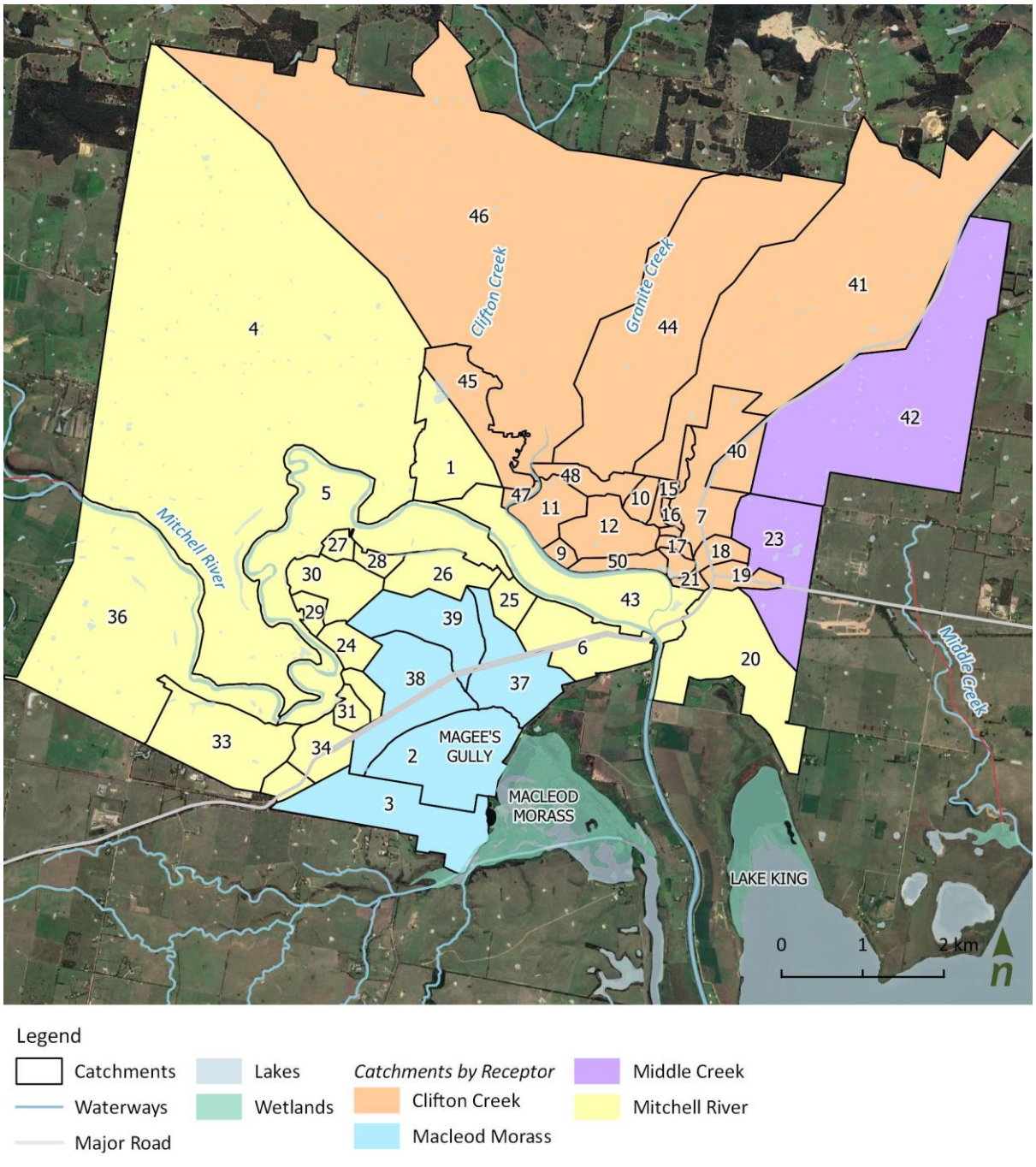


Figure 24. *Bairnsdale stormwater catchments by receptor*

Figure 25 sets out the results of the analysis showing the greatest increase in stormwater runoff will go to Clifton Creek, with a notable increase also observed in Middle Creek. Therefore this result suggests a focus on meeting best practice in those developments drainage to Clifton and Middle Creeks, to ensure their condition and values are protected.

As noted above, the relative consistency of volume across Macleod Morass and the Mitchell River doesn't indicate that doing nothing is a suitable response. This indicates that stormwater will still be reaching those receptors and it will be generated from urban catchments and will require treatment prior to reaching those receptors.

Results for all catchment results have been included in Attachment B.

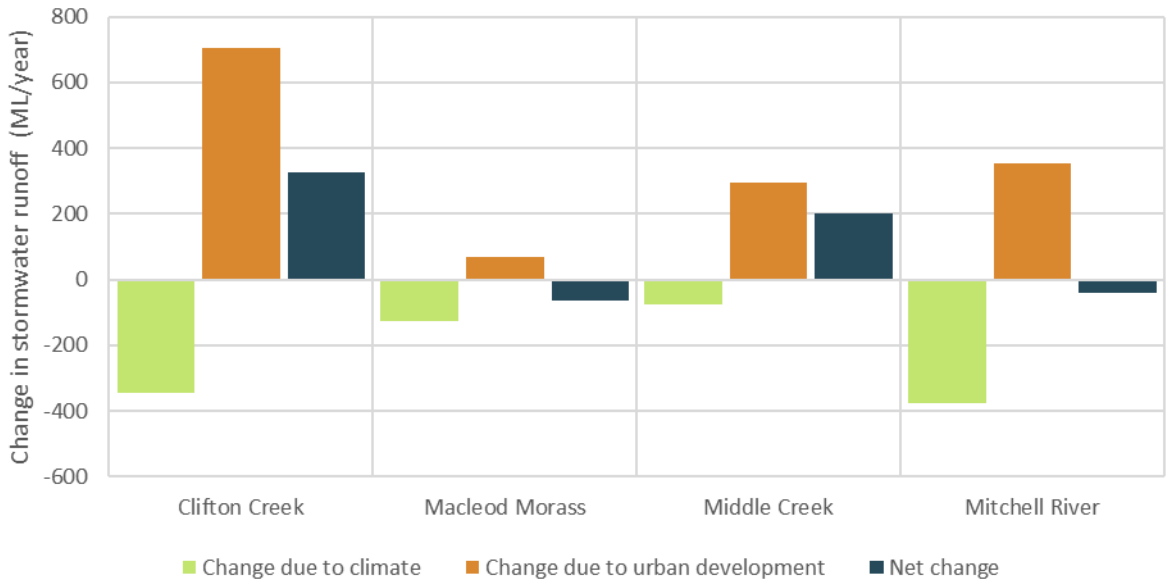


Figure 25. *Change in stormwater runoff from baseline by receptor, due to climate change and urban development*

A detailed breakdown of that data is provided in Table 5.

Table 5. Change in stormwater runoff from baseline by receptor, due to climate change and urban development (ML/ year)

Scenario	Baseline	Scenario A			Scenario B			Scenario C		
Urban development	Existing	Existing	Change due to climate		Future	Change due to development		Future	Total change	
Climate	2020	2065	ML	%	2020	ML	%	2065	ML	%
Clifton Creek	4,729	4,381	-349	-7%	5,460	730	15%	5,075	346	7%
Macleod Morass	2,112	1,985	-127	-6%	2,180	68	3%	2,049	-63	-3%
Middle Creek	1,085	1,008	-78	-7%	1,381	295	27%	1,289	203	19%
Mitchell River	4,916	4,541	-376	-8%	5,269	353	7%	4,876	-40	-1%
Grand Total	**12,843**	**11,914**	**-929**	**-7%**	**14,289**	**1,446**	**11%**	**13,289**	**446**	**3%**

An example where EGSC has also been working to reduce the impact of stormwater on the receiving environment is in the 'Jones Bay Nutrient Stripping' project that is summarised below.

Stormwater treatment in action: Jones Bay nutrient stripping

East Gippsland Shire has completed the Jones Bay nutrient stripping project to improve drainage and stormwater quality in the Lucknow area south of the Princes Highway. This project forms part of the broader Gippsland Lakes Program.

In this location, during prolonged rainfall events, floodwater flowed along McMillan Street with ponding occurring mostly due to the lack of a formal drainage system or defined outlet for the catchment. Overland flows were conveyed east of Phillips Lane towards the Princes Highway culvert, through farms and along a natural drainage line before draining to Middle Creek. There was no clear drainage line where water enters Jones Bay.

This project involved the design and construction of a wetland that:

- Provides a formal drainage path and outlet for the Jones Bay eastern catchment
- Improves local environmental values through the provision of habitat
- Treats stormwater, through the removal of nutrients and sediment to improve the quality of water entering Jones Bay and ultimately the Gippsland Lakes.

Council engaged with Gunaikurnai Land and Waters Aboriginal Corporation (GLaWAC) during wetland construction and landscaping to realise opportunities for culturally relevant plantings and habitat.

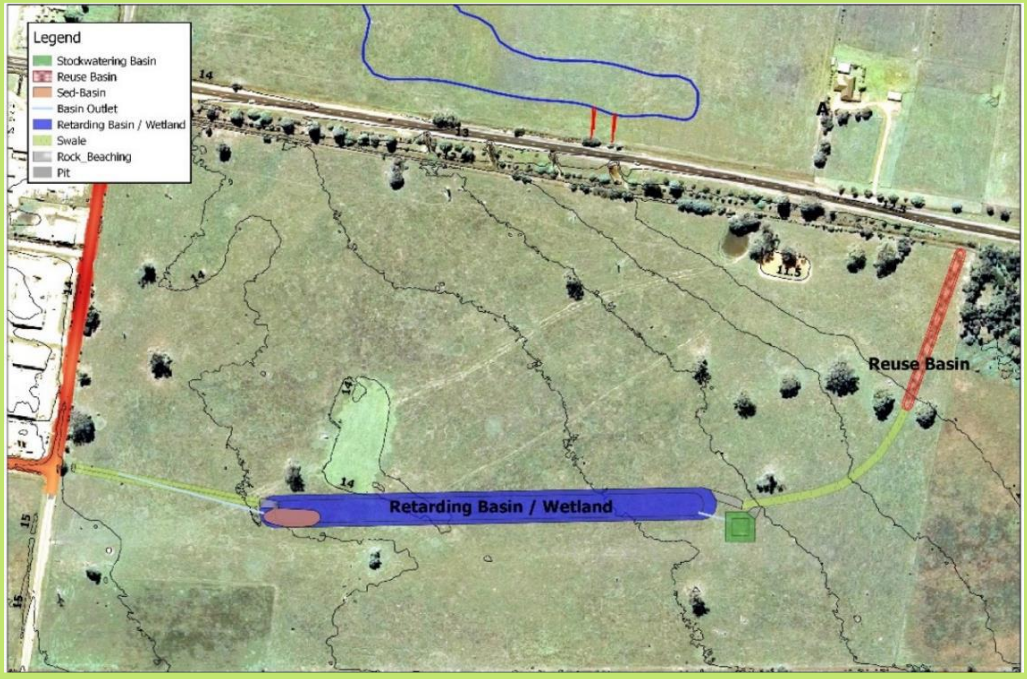


Image courtesy of East Gippsland Shire Council

3.4 Water cycle summary: issues and opportunities

The summary above highlights some of the important water cycle issues and opportunities for Bairnsdale.

Water security

- **Issue:** Long term water security is an issue for Bairnsdale in the context of climate change given the reliance on the climate dependent Mitchell system.
- **Opportunity:** This highlights the need for water use efficiency and identification of alternative, non-potable water sources like recycled wastewater, treated stormwater and rainwater. EGW and Council can work together to identify opportunities in open space and large water using facilities, like hospitals and industrial users.

Council water use

- **Issue:** The East Gippsland Livestock Exchange, Aquatic Centre and open spaces represent the majority of Council's overall potable water usage. New facilities like the proposed WORLD sporting precinct are also likely to be large water users.
- **Opportunity:** A proportion of this demand is unlikely to require potable water, offering an opportunity for the use of recycled water, rainwater or stormwater.
- The WORLS sporting precinct could also integrate potable water demand reduction with stormwater, treatment and harvesting measures.

Recycled water

- **Issue:** Close to 100% of the town's recycled wastewater is reused as environmental flows to Macleod Morass. These flows are important to the health of the Morass as rising sea levels increase salinity.
- **Opportunity:** To identify other uses for recycled water that don't compromise the health of the Morass, but contribute to reduced potable water use and improve amenity in the town e.g. through open space irrigation.

Stormwater and rainwater

- **Issues:** Bairnsdale can expect increased stormwater runoff (11%) and pollutant loads (8 – 12%) associated with urban development. Climate change is likely to reduce this increase to approximately 3%, and pollutant loads will change by between -2% and +6%.
- Bairnsdale drains to internationally recognised wetland and lake system and the water quality exiting Bairnsdale will impact the ecological health and amenity of those areas.
- Stormwater runoff has been broken down by catchment and by receiving environment highlighting that:
    - the Lucknow Urban area will be the source of the greatest increase inflow, with the 'North East Fringe' also generating runoff due to development.
    - Clifton Creek will be the catchment receiving much of the increase in runoff.
- **Opportunities:** Stormwater treatment assets, or water sensitive urban design (WSUD) should be installed in association with new development to treat stormwater and reduce downstream impacts. These requirements are included in the Victorian Planning Provisions and in Council requirements and should be meet by the development industry.
- Additional flows could be harvested from stormwater treatment wetlands for the irrigation of nearby open space, reducing potable water demand and conveyance of pollutant loads.
- Rainwater can be harvested and used without treatment. Opportunities to harvest and reuse rainwater where large roofs are close to demands (e.g. like pools or sporting facilities, should be investigated).

Liveability and amenity

- **Issue:** The Mitchell River is central to the Bairnsdale location and to the community's connection to place and to water. Master planning documents highlight that the connection of the CBD to the Mitchell River could be improved and this is an important planning issue. There are other locations, including the planned WORLD sporting precinct, that will also need to focus on connection to its surrounds.
- **Opportunity:** There is an opportunity for stormwater and recycled water to play a role in greening routes that connect key destinations within the town and to the Mitchell River.
- There is also an opportunity to use these corridors and central spaces to introduce the community to IWM and WSUD, including the reasons behind it and the benefits for the community.

Current and future water balance summary

Figure 26 and Figure 27 provide a summary of the urban balance for Bairnsdale for 2020 and 2065 respectively based on the analysis above and taking into account future projections for growth, urban development and climate change. It should be noted that up to 95% of recycled water is used for environmental purposes, watering Macleod Morass.

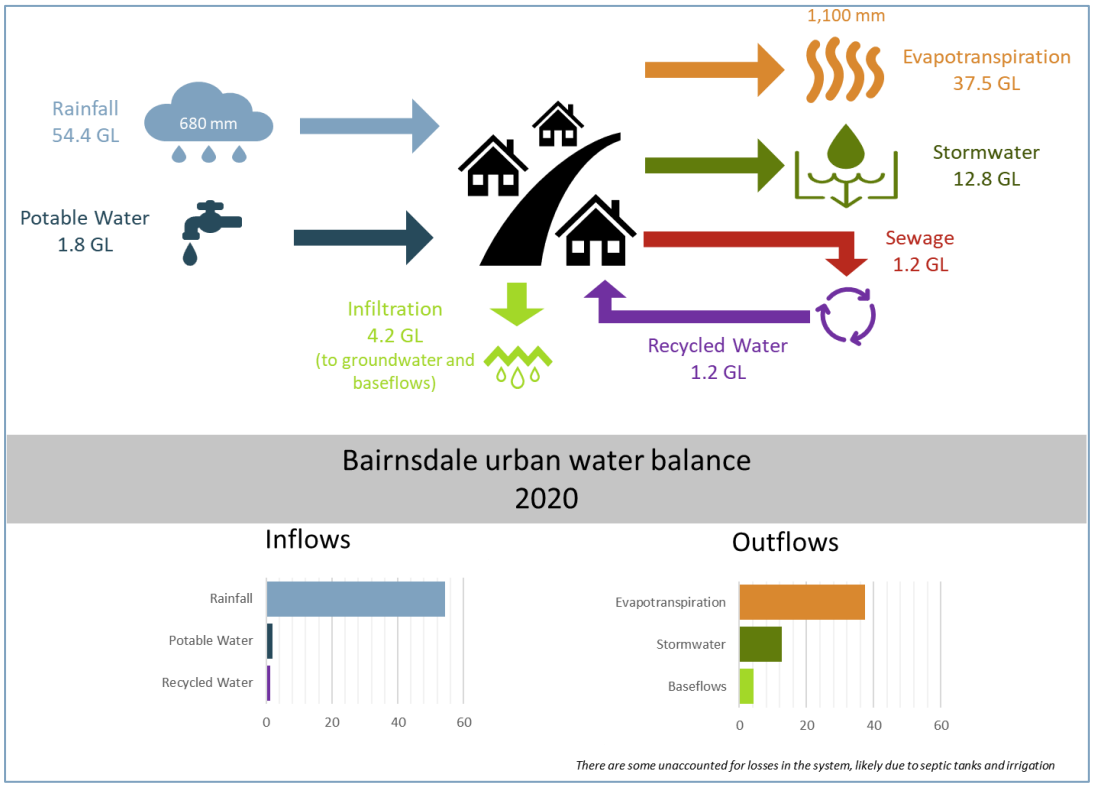


Figure 26. *The Bairnsdale Water Cycle 2020*

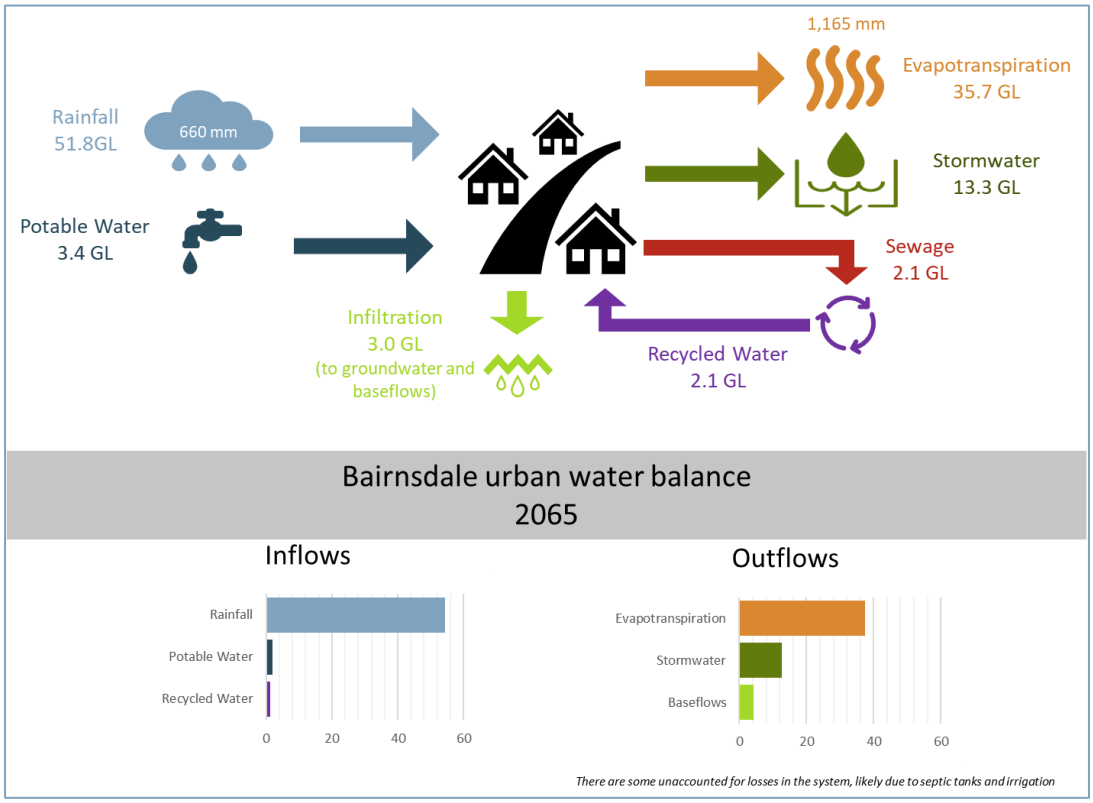


Figure 27. *The Bairnsdale Water Cycle 2065*

4 Vision, objectives and outcomes of the IWM plan

A vision, objectives and outcomes developed for the Bairnsdale IWM plan have been guided by the East Gippsland SDS (2018) and discussions with the East Gippsland IWM Forum Practitioners Group. The purpose of referring to this document is to ensure consistency with other organisations within the region and with other IWM Forums across the State.

While the SDS has well defined objectives and outcomes for the East Gippsland Region Bairnsdale has unique challenges and opportunities. As such, the objectives and outcomes outlined in this plan are unique to Bairnsdale and respond specifically to its urban setting in the context of its environment. They were developed based on an understanding of the broader strategic context, existing IWM actions and opportunities identified and underway in Bairnsdale, and through consultation with stakeholders.

4.1 Vision

The high-level vision for the Bairnsdale IWM plan has been adopted from the East Gippsland SDS (2018):

"Innovative and collaborative water management to maximise the resilience, liveability and economic prosperity of our East Gippsland communities and connected waterways, wetlands and Gippsland Lakes."

This vision emphasises the central role water plays in sustaining community and economy as well as the emphasis on Gippsland's natural values, namely the Gippsland Lakes and the Mitchell River.

4.2 Objectives and outcomes

Through the workshop and engagement process, three over-arching objectives for the Bairnsdale IWM plan were agreed:

1. Reduce reliance on potable water
2. Improve waterway, wetland and lake health through urban stormwater management
3. Enhance connection and understanding of the water cycle in the Bairnsdale community.

These objectives were developed to frame existing IWM opportunities and provide a framework for the identification of new IWM opportunities. Specific outcomes have been set out under each objective that describe an observable or measurable change in condition over a period of time that can be attributed to program actions and serve as a gauge to determine progress towards an objective.

The linkages between the vision, objectives and outcomes are outlined in the plan's program logic (Figure 28).

4.3 Program logic

Program logics are a graphical depiction of the relationships between the vision, objectives, outcomes, opportunities and actions of a program. As a tool they are also helpful in being able to track and evaluate the effectiveness of a program or plan. They are used where the mission and vision are not aimed at achieving a financial benefit and where the amount of money spent on a program may be a poor measure of success. A program logic model provides indicators, in terms of output and outcome measures, as an indication of progress toward the long-term objective.

The program logic approach was used to design the program of actions for the Bairnsdale IWM plan. It sets out and describes the linkages between the high-level strategic direction of the plan with on-the-ground actions and opportunities. Figure 28 provides an overview of the logic for this IWM Plan. This figure includes reference to specific IWM opportunities that are introduced in detail in Section 5.

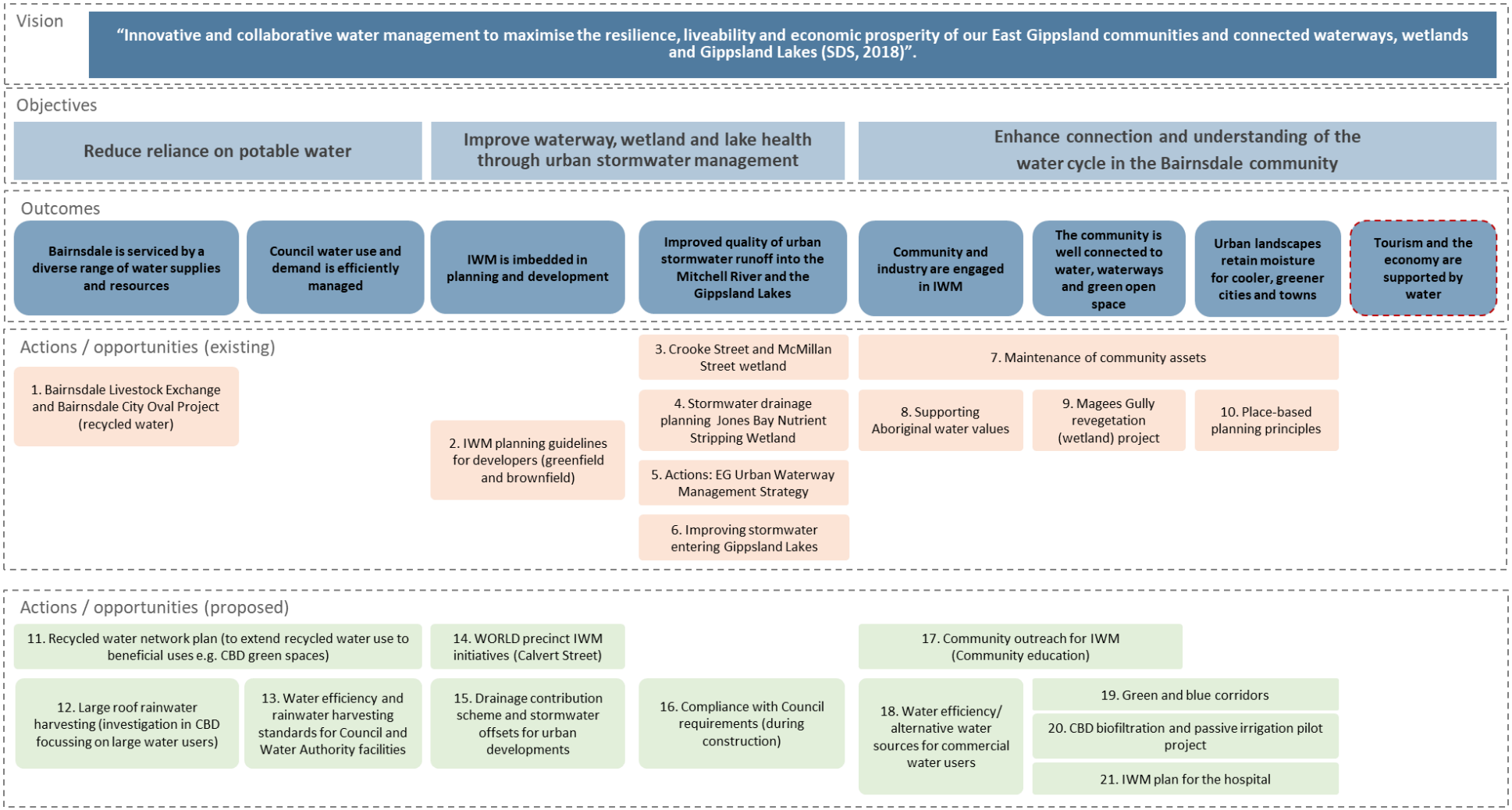


Figure 28. *Bairnsdale IWM plan program logic*

5 IWM opportunities

IWM opportunities are projects and actions designed to lead Bairnsdale towards its IWM objectives and ultimately its vision. These have been divided into existing and new opportunities. Existing IWM opportunities were developed as part of the initial planning for the East Gippsland SDS (2018), some of which are being implemented while many remain relevant.

New opportunities were developed to complement existing opportunities and address gaps. Existing and new IWM opportunities are listed in Table 6 below with each assessed against the East Gippsland IWM Forum outcomes. Figure 29 shows the key IWM sites in Bairnsdale and site-based IWM opportunities.

What follows is a summary of existing and new opportunities and the evaluation and prioritisation of new opportunities.

Table 6. Bairnsdale IWM opportunities list

		East Gippsland IWM Forum outcomes						
Opportunity ID	**IWM Opportunity Name**	Water supply	Wastewater	Flooding	Healthy waterways	Healthy landscapes	Community values	Economic benefit
Existing opportunities								
1	Bairnsdale Livestock Exchange and Bairnsdale City Oval	✓	✓	☐	✓	✓	✓	✓
2	IWM planning guidelines for developers (greenfield and brownfield)	☐	☐	☐	✓	✓	☐	☐
3	Crooke Street and McMillian Street wetland	☐	☐	✓	✓	✓	☐	✓
4	Stormwater drainage planning and Jones Bay Nutrient Stripping Wetland	☐	☐	✓	✓	✓	☐	✓
5	Actions identified in the EGSC's Urban Waterway Strategy	☐	☐	☐	✓	✓	☐	☐
6	Improving water quality of stormwater entering Gippsland Lakes.	☐	☐	☐	✓	☐	☐	☐
7	Maintenance of community assets	✓	☐	☐	☐	✓	✓	☐
8	Supporting Aboriginal water values	☐	☐	☐	☐	✓	✓	☐
9	McGees Gully revegetation project	☐	☐	☐	✓	☐	☐	☐
10	Place-based planning	☐	☐	☐	☐	✓	✓	☐
New opportunities								
11	Recycled water network plan (to extend recycled water use to beneficial uses e.g. CBD green spaces)	✓	✓	☐	✓	✓	☐	✓
12	Large roof rainwater harvesting	✓	☐	☐	✓	☐	☐	✓
13	Water efficiency and rainwater harvesting standards for Council and Water Authority facilities	✓	☐	☐	☐	☐	✓	✓
14	WORLD Sporting Precinct WSUD scoping	✓	☐	☐	✓	✓	✓	☐
15	Drainage contribution scheme and stormwater offsets for urban developments	☐	☐	☐	✓	✓	✓	✓
16	Compliance with existing Council requirements (during construction)	☐	☐	☐	✓	☐	✓	☐
17	Community outreach for IWM	✓	☐	☐	✓	✓	✓	☐
18	Water efficiency for industrial / commercial water users	✓	✓	☐	☐	☐	✓	✓
19	Green and blue corridors	☐	☐	☐	☐	✓	✓	☐
20	CBD biofiltration and passive irrigation pilot project	✓	☐	☐	✓	✓	✓	☐
21	IWM plan for the Hospital	✓	☐	☐	☐	✓	✓	☐

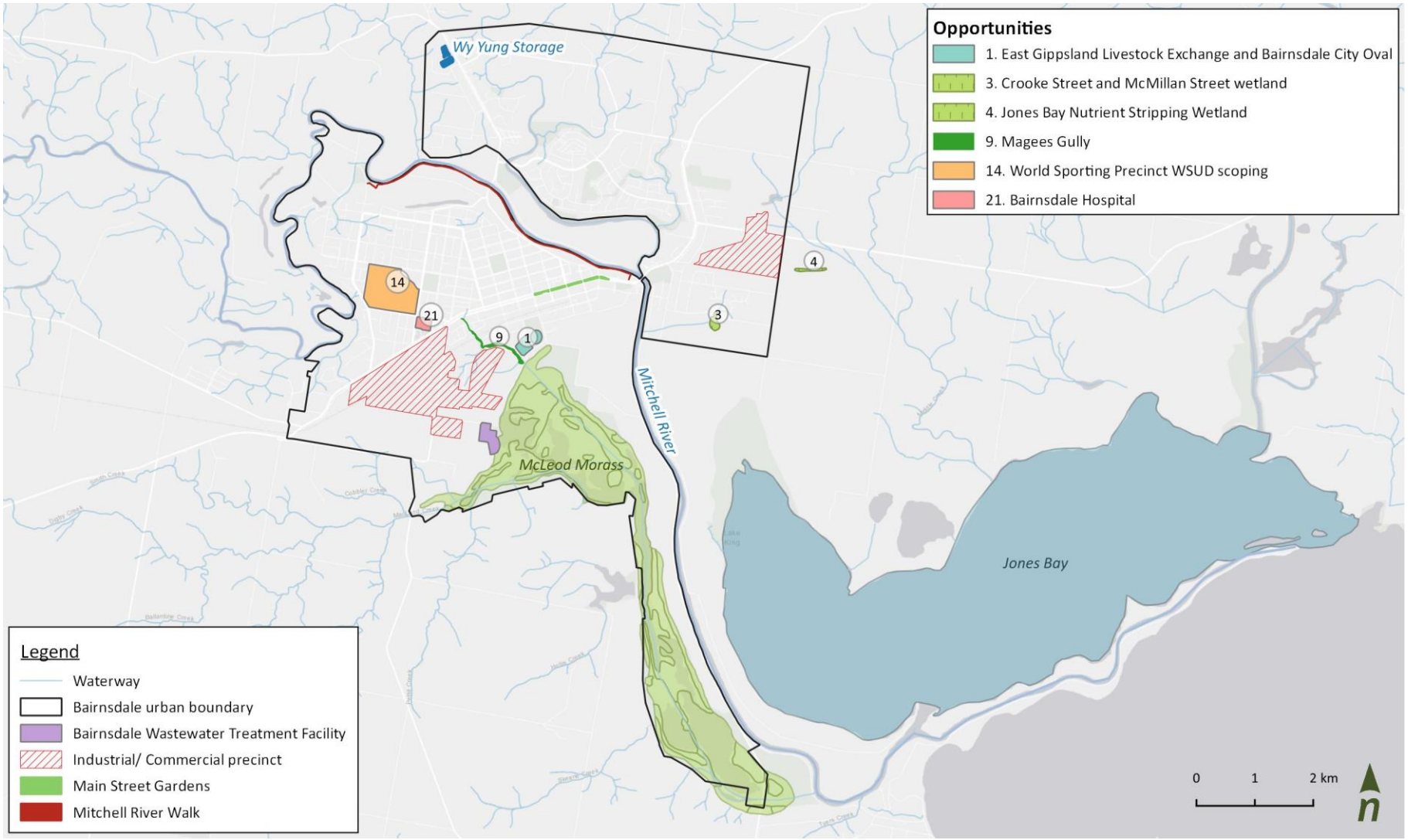


Figure 29. *Key Bairnsdale IWM sites including site-based IWM opportunities*

5.1 Existing opportunities

The following section sets out opportunities that have already been identified by the project stakeholders as part of the IWM Forum process. Each section below provides detail about the opportunity as well as the IWM Forum outcomes that each responds to. This is represented by the symbols at the top right hand corner, with those outcomes that the opportunity responds to indicated in dark green. The symbols correspond to the outcomes shown in Figure 1 and reproduced here:

1. Bairnsdale Livestock Exchange and Bairnsdale City Oval

Background: The East Gippsland Livestock Exchange and the adjacent Bairnsdale City Oval are two of East Gippsland Shire Council's highest water users, representing a significant proportion of Council's water demand at significant cost. The adjacent Peppercorn Oval is also earmarked for irrigation.

Rainwater tanks have recently been installed to supplement demand to the livestock exchange and oval, however, a climate independent source is sought.

In addition, stormwater and wastewater discharge from the Livestock Exchange has been a persistent issue with discharges stored in lagoons before being pumped to the East Gippsland Water Bairnsdale Wastewater Treatment Plant (WWTP) for treatment. Large rainfall events, can result in the lagoons spilling over into the environment, impacting adjacent waterways.

Project description: The opportunity includes additional treatment at the Bairnsdale WWTP and re-configuration the recycled water network to supply Class B water to the Sale yards and City Oval to replace potable water use.

The project also considers extending the network beyond the Livestock Exchange to other non-potable demands including the Main Street Precinct for irrigation and the West Bairnsdale Industrial Precinct.

To manage inflows into the WWTP, a diversion pit upstream of the plant will divert stormwater towards McGees Gully and wastewater toward the Bairnsdale WWTP. This will reduce flows to the treatment plant, reducing the risk of overflows into McGees Gully and Macleod Morass.

Type	*Capital works project*
Status	*Project underway, funding awarded*
Timeframe	*Completion within 2 years of funding agreement*
Scale	*Bairnsdale urban catchment and the Gippsland Lakes*

2. **IWM planning guidelines for developers (greenfield and brownfield)**	
Background: The East Gippsland SDS identified the opportunity to embed IWM principles into relevant planning and guideline documents to influence developers and land and water managers. To date, the Urban Waterway Guidelines have been developed and are including in the East Gippsland Planning Scheme as a reference document (Clause 43.04 Development Plan Overlay Schedule 9). **Description:** Identify planning documents, guidelines and policies to be updated with IWM principles. The aim will to be bring IWM principles to both greenfield and brownfield developments, with an emphasis on greenfield developments.	**Type** *Policy update* **Status** *Underway* **Timeframe** *Medium term* **Scale** *Bairnsdale urban catchment and greenfield areas*

3. **Crooke Street and McMillian Street wetland**	
Background: Stormwater from the Crooke Street and McMillan Street region of East Bairnsdale currently discharges into Jones Bay. The industrial developments earmarked for this region are expected to increase stormwater volumes and associated pollutant loads. **Description:** EGSC has commissioned the design of a wetland to receive and treat stormwater, reducing nutrient loads going to the Gippsland Lakes. At the time of writing, the project is at the detailed design stage. This project serves as a possible test case to considering funding mechanisms, including an offset scheme, whereby developers could contribute to the cost of the Crooke St wetland in place of installing WSUD assets within their own developments.	**Type** *Capital works project* **Status** *Detailed design stage. Construction not yet funded.* **Timeframe** *Short term* **Scale** *Bairnsdale urban catchment and the Gippsland Lakes*

4.	**Stormwater drainage planning and Jones Bay Nutrient Stripping Wetland**	

Background:

A lack of a formal drainage system or outlet system results in flash flooding and ponding along McMillan Street and Phillips Lane in East Bairnsdale. Overland flows sheet to the east across rural farmland along a natural drainage line and a series of small ponds to Middle Creek and eventually to Jones Bay.

Description:

The opportunity is to construct a retarding basin / wetland that would address drainage issues while treating the stormwater runoff prior to discharge into Jones Bay. The project is led by East Gippsland Shire Council and advanced from detailed design work associated with proposed road upgrades in Hadfield and McMillan Streets, Lucknow. See image below.

Type	*Capital works project*
Status	*Project underway Funding received via the Gippsland Lake Coordinating Committee.*
Timeframe	*TBC*
Scale	*Bairnsdale urban catchment and the Gippsland Lakes*

5.	**Actions identified in the EGSC's Urban Waterway Strategy**	

Background: EGSC's Urban Waterway Strategy (2013) identifies actions for Council to improve the health of priority waterways that are under their management responsibility such as McGees Gully and Goose Gully. Actions include revegetation and weed control works, monitoring erosion and sedimentation and encouraging the use of rainwater tanks within the catchment to reduce runoff.

Description: The Urban Waterway Strategy outlines key management principles that are to be adopted and reinforced including:

1. Supplement vegetation management with habitat creation
2. Avoid the creation of new barriers across waterways
3. Maintain a core habitat corridor within a wider multi-use corridor
4. Manage channel form as a dynamic system (i.e. don't insist on a completely stable uniform channel)
5. Ensure sufficient access is catered for to enable maintenance of reserves
6. Enable community access and provide passive educational resources and infrastructure
7. Minimise the direct pipe connectedness of hard surfaces to waterways

Type	*Waterway management*
Status	*Ongoing*
Timeframe	*Ongoing*
Scale	*Bairnsdale urban catchment and waterways*

6. **Improving water quality of stormwater entering Gippsland Lakes.**	
Background: Stormwater quality is a major issue that has been identified in the Gippsland Lakes Ramsar Strategy. This strategy includes Macleod Morass and is overseen by the Gippsland Lakes Ministerial Council. There is a need to better understand ecological drivers and include waterway management outcomes into subdivisional and new growth area planning requirements to protect downstream waterways and bays. **Description:** Identify priority sites for IWM interventions, both capital and capacity building e.g. • Greenfield development (residential and industrial) • Existing industrial / commercial sites • Residential land use This existing opportunity aligns with the objective of this IWM plan: *Urban stormwater management maintains and improves waterway, wetland and lake health.* This objective will be use to identify and bring together stormwater management opportunities in Bairnsdale.	**Type** *Prioritisation* **Status** *Ongoing as part of other projects* **Timeframe** *Ongoing* **Scale** *Bairnsdale urban catchment and the Gippsland Lakes*

7. **Maintenance of community assets**	
Background: The East Gippsland SDS has noted that community assets such as public gardens, sporting grounds, pools and public toilets – are significant users of potable water. Keeping public open spaces green is critical to liveability, aids in urban cooling and keeps the community connected to water. This requires the identification of efficiency measures and alternative water supply options to ensure that high priority community assets can be supplied with potable water during dry periods. **Description:** EGSC and EGW are progressing this opportunity by discussing what assets should be exempt from water restrictions due to their community importance. There is a by-law requirement for a "water use plan" for assets that are exempted. For this IWM plan, the opportunity is to: • Identify priority community assets and their potable water consumption • Assess opportunities for alternative water supply i.e. roof water and stormwater harvesting, pool backwash for irrigation, recycled water. • Summarise water use planning requirements.	**Type** *Prioritisation* **Status** *Project underway* **Timeframe** *Ongoing* **Scale** *Bairnsdale urban area*

8. Supporting Aboriginal water values

Background: The East Gippsland IWM Forum provides the opportunity to acknowledge and develop Aboriginal values for water, include Aboriginal values in water planning, support Aboriginal access to water for economic development and build capacity to increase Aboriginal participation in water management.

Description: The East Gippsland and West Gippsland CMAs along with the Gunaikurnai Land and Waters Aboriginal Corporation (GLaWAC) are currently in the planning stages of the "Aboriginal Water project" to gather information.

With regard to this IWM plan, the opportunity is to:

- Providing support for GLaWAC's "Ninde Yan Yarning" (Our Water Talking) project collating culturally significant stories on Aboriginal cultural connection to water across Gippsland
- Develop a consistent approach to engagement with GLaWAC, minimising their time commitment and maximising the use of outputs GLaWAC has contributed to already.
- Use priorities from the Gunaikurnai Whole-of-Country Plan and reflect these across the other opportunities.
- Support GLaWAC in the use of Mitchell River licence allocation of 2GL/year for cultural purposes.

NB: At the time of writing the 2 GL/year allocation had been confirmed by the State Government of Victoria

Type	*Engagement plan*
Status	*13 TO partnership have been established.* *4 objectives outlined*
Timeframe	*Ongoing*
Scale	*Region-wide*

9. Magees Gully revegetation project

Background: McGees Gully is a natural waterway running through West Bairnsdale and draining to Macleod Morass near the Bairnsdale Livestock Exchange. The Gully serves as an important corridor connecting the Bairnsdale township to Macleod Morass. There is currently a community led initiative to help improve the environmental and recreational amenity of McGees Gully through re-vegetation and formalising the pathway along the waterway.

Description: This opportunity is to develop a program of works to improve the amenity of the interface between McGees Gully, the Bairnsdale Livestock Exchange and Macleod Morass, respond to traditional owner water values and review funding options. This work would supplement the recently installed Aboriginal artwork at the Dalmahoy Sewer Pump Station and the current EGCMA funded project to restore the Magee's Gully waterway.

This project would facilitate collaboration between a variety of stakeholders including the East Gippsland Shire Council, the EPA, community groups and traditional owners.

McGees Gully also serves as an example to support waterway rehabilitation and maintenance work as per the EGSC Urban Waterway Management Strategy actions (Opportunity #5).

Type	*Program of works*
Status	*Community led re-vegetation works underway*
Timeframe	TBC
Scale	*McGees Gully and surrounds*

10. **Place-based planning**	

Background: Local government place-based planning processes are currently being undertaken across the region. They provide the opportunity for IWM principles to be embedded into the planning of local communities.

EGSC is currently undertaking place-based planning processes for Omeo and Cann River and they will used as a template to embed IWM principles into other community plans. The planning process includes structured public consultation and there is an opportunity to leverage this existing engagement to educate the community on the aims and benefits of IWM.

Description: Bairnsdale is yet to undergo its place-based planning process. When it does, the experiences of Omeo and Cann River can be considered and the objectives and outcomes in this IWM Plan are to be reflected in the place-based planning process for Bairnsdale.

Of most relevance is the IWM objective The Bairnsdale community are well-informed and connected to water as this objective reflects the role of water in the community. The outcomes that fall under this objective include:

- *Community and industry are engaged in IWM*
- *The community is well connected to water, waterways and green open space*
- *Urban landscapes retain moisture for cooler, greener cities and towns*
- *Tourism and the economy are supported by water*

Type	*Planning and policy*
Status	*Place-based planning has commenced for the region.* *Bairnsdale TBA*
Timeframe	*TBC*
Scale	*Bairnsdale*

5.2 New opportunities

11. Recycled water network plan (to extend recycled water use to beneficial uses e.g. CBD green spaces)

Background: Greater than 95% of recycled wastewater generated at the WWTP is released as environmental water to Macleod Morass to manage saline intrusion. The remainder is used for irrigation of the Bairnsdale Racecourse. Broadening the use of recycled water throughout Bairnsdale would reduce reliance on potable water supplies, improving the town's resilience and water security, particularly during dry times. Recycled water is climate independent, a relatively reliable source that is suitable quality (i.e. Class B) for irrigation of open spaces and gardens.

The value of recycled water as an alternative water source will need to be weighed against its vital role in maintaining the health of Macleod Morass.

Description: The opportunity is to develop a plan for the extension of the recycled water network to meet additional irrigation demands that are aimed at greening Bairnsdale (e.g. including the Main St Gardens), meeting industrial end uses and irrigation of other open spaces.

Stages: This project will build on the recently funded extension of the recycled water network to the Bairnsdale Saleyards and Bairnsdale City Oval/Peppercorn Oval (currently funded project). Therefore the stages of this program could include:

- Stage 1: Bairnsdale Saleyards and Bairnsdale City Oval/Peppercorn Oval
- Stage 2: extension of pipework from Bairnsdale City Oval to main street gardens
- Stage 3a: extension of pipework along main street to public toilets
- Stage 3b: extension of pipework to West Bairnsdale Oval on Anderson St.

Type	*Concept design*
Timeframe	*Medium term*
Scale	*Township*

12. Large roof rainwater harvesting

Background: Large roof areas provide an opportunity to harvest rainwater for re-use onsite or nearby. Rainwater is a relatively high-quality source that is able to be re-used in a variety of contexts without further treatment including toilets, laundry, irrigation, and pool use, reducing reliance on potable water. Commercial / industrial areas and sporting facilities typically have large roof areas.

Large roof areas also contribute to peak stormwater flows during high rainfall events. The ability to retain and store this water in the landscape can reduce the risk of localised flash flooding and subsequent damage to infrastructure and waterways.

Description: The opportunity is to undertake a spatial investigation of large roof areas throughout Bairnsdale to assess rainwater harvesting potential. In parallel, identify high water users that could benefit from an alternative water supply and their proximity to large roof areas.

Additional components to this project include:

- Analysis of rainwater harvesting potential
- Conceptual design of the capture, storage and transfer infrastructure required including costs.
- A cost-benefit analysis to determine the economic feasibility considering upfront capital cost against ongoing cost savings for purchasing water as well as the benefits to the environment and value of improved resilience and water security.
- Explore institutional and governance arrangements required for implementation such as beneficiary cost sharing, financial incentives, risk and liability, ongoing maintenance and ownership of infrastructure.

Type	*Desktop study*
Timeframe	*Long term*
Scale	*Township*

13. Water efficiency and rainwater harvesting standards for Council and Water Authority facilities

Background: Council and Water Authorities can lead the way by implementing IWM in their own facilities and buildings. There is an opportunity to improve water efficiency, the use of alternative water sources and WSUD assets in facilities that receive many visitors and for 'water smart design' to become 'business as usual' in Council and Water Authority buildings and facilities.

Description: The opportunity is to:

- Require water efficiency, alternative water and WSUD standards in new buildings and precincts.
- To audit existing buildings and facilities and upgrade fixtures and appliances to reduce water consumption.
- Use signage to inform users as to the source of water, or the efficiency measures that have been implemented to increase community awareness of water smart behaviour.
- Develop a program for water audits of existing buildings.

Type	*Policy*
Timeframe	*Long term*
Scale	*Council and Water authority facilities*

14. WORLD Sporting Precinct WSUD scoping

Background: The WORLD Sporting Precinct will be the key regional sporting hub for East Gippsland communities. The precinct will contain a variety of sporting facilities including 2 x hockey pitches, 2 x soccer pitches and 8 netball courts with associated pavilions and car parks. The federal government has recently announced $5.3m of funding out of the $10.7m value of the project.

Description: There is an opportunity to ensure that the precinct is water sensitive by investigating WSUD and alternative water source opportunities to be integrated into the precinct's design.

Components to this opportunity could include the investigation of:

- post-development stormwater generation and the capacity of the proposed wetland to treat that stormwater before release downstream
- the potential for stormwater to be treated and reused onsite
- the environmental values of the swamp and the potential for upgrading the swamp into a constructed wetland
- WSUD interventions including in car parks
- providing rainwater to pavilion toilets.
- stormwater harvesting and irrigation beyond WORLD, including along key pathways that will connect people to WORLD (e.g. surrounding schools).
- cost estimate for a concept that makes optimal use of the available rainwater and stormwater.
- The potential for use of Class B treated wastewater for irrigation of playing fields building on the experience of the currently planned irrigation scheme at the Bairnsdale City Oval/Peppercorn Oval on MacArthur Street.

Type	*Opportunities assessment*
Timeframe	*Short term* *WORLD Precinct underway*
Scale	*Building/ precinct*

15. Drainage contribution scheme and stormwater offsets for urban developments

Background: The drainage scheme identifies drainage and WSUD infrastructure requirements and specifies the development industry's contributions to recoup the cost of that infrastructure. A stormwater offset scheme can allow developers to allocate their contribution toward equivalent stormwater treatment works elsewhere in the catchment.

The scale of development in regional areas (relative to metropolitan centres), means that there is generally a smaller amount of funds generated from such schemes. As such, it will be important to consider smaller scale projects or a broader application so that could be used most effectively.

Description: Development of a contribution and offset scheme for Bairnsdale at a catchment and sub-catchment scale to fund works to protect the Gippsland Lakes. The scheme would require meaningful engagement between Council, EGW and developers to ensure strong collaboration.

Additional components to this project include:

- identifying the preferred stormwater treatment option
- propose governance arrangements around cost sharing, asset ownership and ongoing monitoring and maintenance
- economic analysis to determine suitable contribution value for developers
- undertake capacity building activities to ensure construction and maintenance of required infrastructure are understood and performed appropriately.

The scheme would contribute to stormwater treatment for greenfield development in East Bairnsdale and consider any changes to best practice / EPA requirements, Urban Waterway Guidelines, building on past experience in stakeholder contributions for WSUD (e.g. East Bairnsdale Wetlands), as well as existing schemes across Victoria (e.g. Kingston City Council, City of Greater Geelong).

It would be framed around supporting funding mechanisms through drainage contribution or nitrogen offset schemes i.e. where it's impractical to manage stormwater onsite a developer can pay into a fund based on the amount of stormwater that will be generated. A key issue for offset programs in regional areas is making sure that the contributions are sufficient to cover project costs within a reasonable timeframe. It could be worth having a range of catchment and sub-catchment scale opportunities available so that if there are limited funds there are smaller treatment projects that can be implemented (and vice-versa).

Type	*Policy*
Timeframe	*Long term*
Scale	*Bairnsdale urban growth area*

16. Compliance with existing Council requirements (during construction)

Background: While there are existing planning requirements around meeting best practice environmental management requirements for water quality, enforcing those requirements is resource intensive, it is difficult to change entrenched behaviour and there is pressure to allow development to proceed unimpeded. It also requires engagement and education for the construction industry.

Description: This opportunity is to provide education around compliance requirements and their benefits in the context of new builds and developments (e.g. WORLD precinct, and East Bairnsdale / Lucknow PSP). This will include the aim of minimising stormwater pollution (and particularly sediment loads) during construction. The aim is to take a proactive rather than reactive approach to compliance, so that all contractors understand the requirements and that they will be enforced.

Type	*Policy update*
Timeframe	*Short to medium term*
Scale	*Bairnsdale urban growth area*

17. Community outreach for IWM

Background: The successful implementation of IWM initiatives requires community support. One of the objectives of the IWM Plan is to ensure that the "community are well informed and connected to water". This includes an awareness of the importance of water issues in Bairnsdale, the impact of climate on water security and the impact of water management on the valued elements of the town's landscape.

Description: This opportunity is to build on existing programs and add outreach activities to IWM planning and construction activities. The aim isn't to create a new program, rather introduce the community to the IWM planning and infrastructure work being undertaken by Council so that the community appreciates why this is being undertaken. Examples may include:

- Supporting the existing water in schools program (adding IWM elements to that content)
- Promote water related aspects of new development works through information and signage (e.g. in the WORLD precinct, new residential developments, pathways, revegetation works, on all toilets flushed with rainwater etc)
- Invite community to asset openings (e.g. wetland opening, have a BBQ, a speaker to explain the wetland function and importance)
- Promote and be present at events (e.g. National Water Week, the opening of IWM assets)
- Initiate low cost pilots that are visible and educational (link with opportunity #20)
- Involve and engage with existing community and environmental groups (Friends of Groups like the McGees Gully group, Rotary, Gippsland Lakes groups).

Type	*Education and awareness program*
Timeframe	*Medium to long term*
Scale	*Township*

18. Water efficiency for industrial / commercial water users

Background: Commercial and industrial operations are a major water user in Bairnsdale. There is limited information on what the major components of this water use is and whether there are opportunities for efficiency or the use of non-potable supply options. There are water efficiency programs with financial incentive to save water, however it is not always clear on how consumption reductions can be achieved.

Description: Identify industrial water use behaviour to better understand industrial water use patterns (including end use, quality and reliability requirements). Propose a range of measures to reduce potable demand including water efficiency measures or alternative water sources. For example, if a major component of water use could be serviced with low-quality water, such as washing vehicles or outdoor surfaces, then measures could focus on alternative water sources such as rainwater, however if a major component of water use requires a potable quality of water, then measures would be focused on improving efficiency and reducing waste. Additional components to this project include:

- An education and awareness program around industrial water uses and measures to reduce water waste
- Develop a business case for industry to engage in IWM
- Understand how industrial users may link to broader water supply schemes (e.g. an extension of the recycled water network).

This opportunity will link to opportunity #11 and #12 regarding alternative water supplies.

Type	*Education and awareness program*
Timeframe	*Medium to long term*
Scale	*Township*

19. Green and blue corridors

Background: A key theme of this IWM plan is to enhance connection between the CBD and the Mitchell River via pathways that are green and shaded to encourage their use, particularly during summer. This also encourages walking and cycling that contributes to the improved health and wellbeing of the community.

Description: The opportunity is to ensure that improvements to the urban landscape, as flagged within existing Master Planning documents (for the CBD, WORLD precinct and McGees Gully) incorporate WSUD initiatives such as passive irrigation of trees with stormwater, gardens using stormwater and path runoff to ensure that these corridors are healthy, shaded and green.

The approach should be associated with internal pathways (e.g. within WORLD, that connect sports grounds with Bairnsdale Secondary College), thoroughfares in new developments (including connections between schools, shops etc) as well as potentially being extended to residential streets as part of the tree planting and replacement program, to ensure that new trees are well irrigated.

Type	*Planning*
Timeframe	*Medium to long term*
Scale	*Township*

20. CBD biofiltration and passive irrigation pilot project

Background: While the easiest way to install WSUD interventions is in the greenfield setting, during construction, there is also value in retrofitting urban streets to increase the visibility and understanding of WSUD assets (e.g. such as street-scale biofiltration systems and passive street-tree irrigation). A pilot street-scale WSUD asset can help to engage the community about the connection between the urban landscape and the environment and of the role of WSUD and IWM.

Description: To develop, design and construct a trial pilot WSUD asset primarily for community engagement and capacity building of Council staff on construction and maintenance. The pilot would also be an opportunity to gauge community perceptions and refine design components to suit the local environment and context. Additional components to this project include:

- locations and timing where and when biofiltration and passive irrigation systems could be trialled e.g. combine with programmed CBD roadworks where possible.
- Capacity building of Council staff on construction and maintenance
- Investigation of plant species suitable and resilient to the local environment that may also have cultural value.

Type	*Design and construct*
Timeframe	*Medium to long term*
Scale	*Township*

21. IWM plan for the Hospital

Background: The Bairnsdale Regional Health Service is one of Bairnsdale's highest potable water users. While hospital operations are critical and opportunities to reduce demand may be limited, there is the potential for water-saving interventions to improve water use efficiency.

Many hospitals are also beginning to consider the role of water and green open spaces in patient recovery and mental health. The Queensland Children's Hospital has healing gardens overlooking the Brisbane River, while Singapore's Khoo Teck Puat Hospital has plants integrated into its architecture. Additionally, Melbourne Water is currently investigating options to 're-imagine' Stony Creek in Melbourne's West to connect to the adjacent Sunshine Hospital, providing place where patients and the community can interact with nature.

Description: Prepare an IWM plan for the hospital that investigate water use throughout the hospital and identify IWM opportunities. The IWM plan would consider the hospital's existing objectives and examine the role of water in contributing to these objectives. It would also consider how the hospital interacts with the broader environment and map connections between the hospital to waterways and green space such as McGees Gully. IWM plan for the entire hospital that looks at water use, efficiency, alternative water, as well as connection to waterways and greening for patients and staff.

Type	*Concept design*
Timeframe	*Short term*
Scale	*Building / precinct*

5.3 Opportunity review and evaluation

As the existing IWM opportunities are either ongoing, underway or the responsibility of other organisations, only the new IWM opportunities were reviewed and evaluated for this plan. New IWM opportunities were evaluated and prioritised in two stages:

Stage 1 Evaluation

Each opportunity was evaluated in a workshop setting against a qualitative assessment framework based on the Preliminary Assessment Method (PAM) developed by DELWP. The PAM criteria included benefits, risks, cost, urgency and impact. Each was assessed against a simple low, medium and high rating.

The following table provides a summary of the evaluation criteria and guidance regarding option evaluation.

Table 7. Evaluation criteria, description and scoring guide

Criteria	Description	Guidance
Benefits	Looking for multiple benefit opportunities across the range of Bairnsdale IWM outcomes	H: > 3 IWM outcomes
		M: 2-3 IWM outcomes
		L: 1 IWM outcome
Risks	Considering social, environmental and economic risks: - Social: a controversial project will be high risk / community engagement and education will serve to reduce that risk - Environmental risk: where the opportunity impacts the environment negatively - Economic: this speaks to technical feasibility, whether it is conventional and if there are recognised suppliers and examples?	H: High consequence / medium to high likelihood (high complexity and few comparable examples)
		M: Medium consequence / medium likelihood (challenging, but there are existing examples to learn from)
		L: Low consequence / Low to medium likelihood (industry standard / covered in documents like the Infrastructure Design Manual (IDM))
Cost	This is based on an opinion of likely cost and is based on the scale and complexity of the opportunity	H: Larger capital assets (wetland, stormwater harvesting scheme, physical pathways supporting connection) (>$150k of capital works)
		M: Require external support (e.g. additional design or planning work) and minor capital works (e.g. standalone WSUD assets like passive irrigation, street-scale biofilter, medium to larger rainwater harvesting schemes) ($50 - 150k of capital or design works)
		L: Opportunities that are largely internal, or agency driven e.g. policy development / community engagement ($0-50k of internal resource or time)
Urgency	This refers to timing and whether delay may result in a lost opportunity. Therefore, opportunity will be lost if not actioned in ?? months / years.	H: <18 months
		M: 18 months - 4 years
		L: > 4 years, or timing isn't relevant
Impact	This speaks to the physical and temporal impact of the opportunity. Will it change the way Bairnsdale looks in 10 years, or is the impact confined to a certain location	H: Bairnsdale wide impact
		M: Precinct wide impact
		L: Lot or street-scale impact

The results of this stage are set out in Table 8 (with a guide to the evaluation criteria provided in Table 7). The results ordered the opportunities based on those criteria.

Table 8. Evaluation outcomes

Opportunity ID	Opportunity Name	East Gippsland SDS Outcomes							Preliminary Assessment					PAM Score
		Water supply	Wastewater	Flooding	Healthy waterways	Healthy landscapes	Community values	Economic benefit	Benefits	Risks	Cost	Urgency	Impact	
11	Community outreach for IWM	✓			✓	✓	✓		H	L	L	L	H	8
17	Compliance with existing Council requirements (during construction)				✓		✓		M	L	L	H	M	8
21	IWM plan for the Hospital	✓				✓	✓		M	L	L	H	M	8
4	WORLD Sporting Precinct	✓			✓	✓	✓		H	M	H	H	H	7
19	Green and blue corridors					✓	✓		M	L	M	M	H	7
13	Water efficiency for industrial / commercial water users	✓	✓				✓	✓	H	L	M	L	M	6
14	Recycled water network plan (to extend recycled water use to beneficial uses e.g. CBD green spaces)	✓	✓		✓	✓		✓	H	M	H	M	H	6
20	CBD biofiltration and passive irrigation pilot project	✓			✓	✓	✓		H	L	M	L	M	6
15	Large roof rainwater harvesting	✓			✓			✓	M	L	M	L	M	5
18	Drainage contribution scheme and stormwater offsets for urban developments				✓	✓	✓	✓	H	M	M	L	M	5
16	Water efficiency and rainwater harvesting standards for Council and Water Authority facilities	✓					✓	✓	M	L	M	L	L	4

Stage 2 Prioritisation

In the second stage attendees were asked to reflect on the discussions that led to the outcomes in the opportunity evaluation stage and then identify those opportunities that they believe should be prioritised for this plan. Some of the factors that weighed into this assessment included:

- Where an opportunity's cost was assessed as high, with the benefit similarly high, is it reasonable to prioritise that opportunity on the basis that the benefit is likely to outweigh that cost (e.g. in the case of 5. WORLD sporting precinct and 14. Recycled water network plan where infrastructure is required and costs are likely to be high). The risk in the original evaluation is that potentially high-cost items that could have a great impact are not prioritised.
- Are there opportunities that may be lost if not acted upon quickly (e.g. 5. WORLD sporting precinct is being planned at the time of developing this plan).
- Are there opportunities that while important, can be implemented over the timeframe of this plan without necessarily being urgent (e.g. 11. Community outreach for IWM and 17 Compliance with existing Council requirements).

Weighing these considerations, participants were asked for their final prioritised opportunities for the purposes of developing the IWM Action Plan (see Section 6 below). It is important to note that all opportunities are presented within the action plan, however this prioritisation step defined the order in which they are presented.

The prioritised ranking is presented in Figure 30 below. It shows that participants believe that the WORLD sporting precinct and Recycled water network plan are the highest priorities to progress.

The Action Plan below is presented in this order.

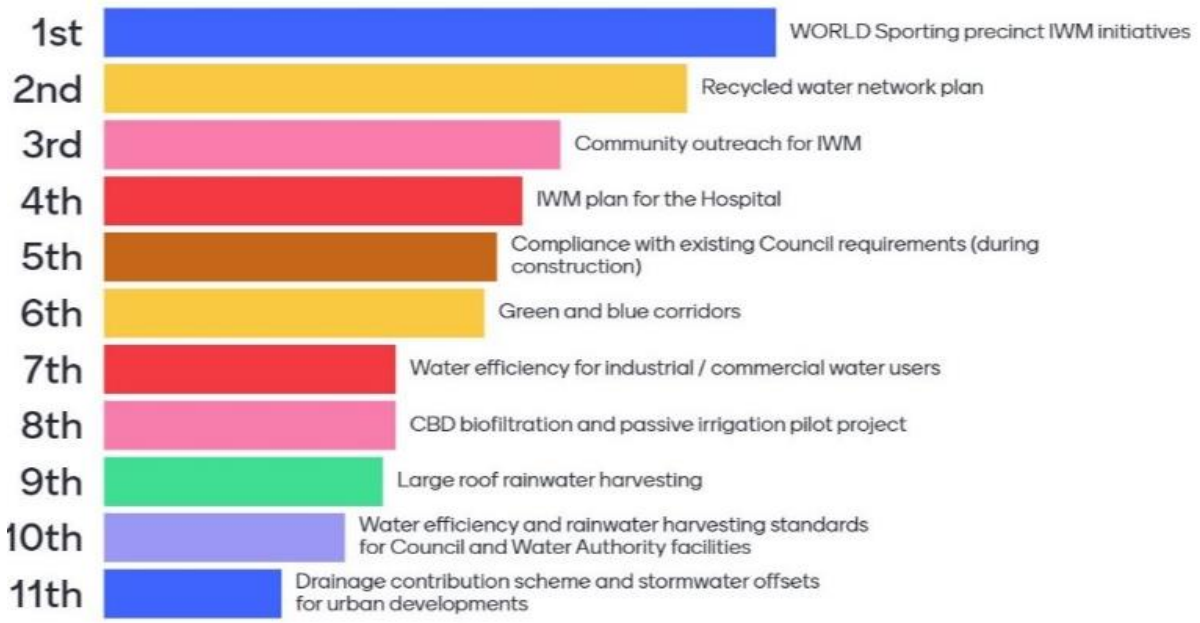


Figure 30. *New IWM opportunities: prioritised order based on workshop ranking*

6 Action plan

The action plan outlines the detailed tasks, timing, priority and responsibilities required to progress these opportunities. The opportunities are in a prioritised order as per the as per the workshop rankings (Figure 30).

1. WORLD Sporting Precinct WSUD opportunities

Action	Sub actions / Description	Timing	Priority	Responsibility
Desktop hydrologic investigation	Undertake a desktop review of the WSUD opportunities across the WORLD precinct • Review key drainage pathways, drainage infrastructure and discharge points • Review existing swamp / wetland asset condition and capacity to understand potential treatment performance and potential to expand it to incorporate changes to support stormwater harvesting (e.g. additional storage and a harvesting offtake at the outlet)	2021	Very High	EGSC

Opportunity development	• Summarise IWM opportunities under the following categories:
	  ○ Locations for catchment WSUD (e.g. in car parks)
	  ○ Potential for rainwater harvesting based on roof areas (e.g. pavilion) and proximity to appropriate demands (e.g. toilets)
	  ○ Based on the wetland / swamp assessment define (in terms of irrigation capacity) the potential for the wetland / swamp to provide stormwater for additional irrigation
	• Based on the above, identify stormwater irrigation opportunities within the precinct and beyond
	• Investigate recycled water opportunities for the irrigation of precinct sports fields.
	•
		2021	Very High	EGSC

Opportunity short list	Clearly define each opportunity to understand scale e.g. • WSUD covering all car park catchments • Rainwater harvesting for pavilion toilets • Stormwater harvesting for precinct uses and beyond precinct uses (i.e. green and blue links beyond WORLD) • Passive street tree irrigation within the precinct and connected pathways Undertake a qualitative assessment of the opportunities considering the following: • Water saved and pollutants reduced • Ability to incorporate into existing plans (or the ability to adjust designs to keep the opportunity open into the future) • Likely cost based on scale and complexity • Risk Based on this assessment prioritise opportunities for further design and analysis	2021	Very High	EGSC
Concept and feasibility	Undertake concept design and a feasibility assessment for priority proposals. Engage closely with the relevant WORLD planners to incorporate these opportunities into existing plans Review priorities at the completion of that work based on estimated costs, available budget, timelines and benefits	2021	High	EGSC
Detailed design	Undertake detailed design in collaboration with the WORLD precinct designers	2021	High	EGSC

2. Recycled water network plan (to extend recycled water use to beneficial uses e.g. CBD green spaces)

Action	Sub actions / Description	Timing	Priority	Responsibility
Concept development	Prepare a concept design for the extension of Bairnsdale's recycled water network, that builds on the approved extension to Bairnsdale Saleyards and Bairnsdale City Oval/Peppercorn Oval, that we will refer to as Stage 1. New concept to include: • Stage 2: extension of pipework from Bairnsdale City Oval to main street gardens • Stage 3a: extension of pipework along main street to public toilets • Stage 3b: extension of pipework to West Bairnsdale Oval on Anderson St. The concept will quantify Class B recycled water available and corresponding demands at each of the locations set out above. Estimate infrastructure requirements (including any additional treatment, piping, pump stations and storage) to extend the recycled water network to nominated sites. Engage with EGCMA to assess the opportunity cost of removing proportions of recycled water from being used as environmental flows to Macleod Morass. Prepare a cost estimate and benefit summary based on the above analysis, breaking the concept into stages as necessary.	2021	High	EGW With EGSC and EGCMA

Detailed planning	Assuming the proposed concept is supported, commence to detailed planning phase, including:
	• Negotiations between EGW and EGSC to confirm lease and land availability arrangements for the preferred sites and alignments
	• Establish an MoU between EGW and EGSC for collaboration in the design and construction (if required) of recycled water infrastructure
	• Define the project in terms of Stages proposed above to facilitate capital investment planning
	• Functional and detailed design of:
	  ○ the recycled water reticulation network
	  ○ pumping and treatment infrastructure
	  ○ additional storage (if required)
	  ○ additional irrigation network within open spaces (if required)
	• Complete supporting tasks including geotechnical review, survey and soil testing to assess land capability and the potential impact of recycled water salinity concentrations on soil
		2022/23	High	EGW
				With EGSC and EGCMA

Construction	Construction of key assets including: • recycled water network extension • pump and treatment 'kiosk' or station • storage • additional irrigation network Commissioning and operation.	2024/25	High	EGW With EGSC and EGCMA

3. Community outreach for IWM

Action	Sub actions / Description	Timing	Priority	Responsibility
Introduction	The aim of the program is to inform the Bairnsdale community of the water cycle work that Council and EGSC are undertaking. The intent is that this isn't a separate program but will occur in parallel with planned infrastructure works. This will require the support of the communications team rather than requiring them to develop an entire standalone program.	2022	High	EGCS With EGW

Community outreach program preparation	Prepare a community outreach program for IWM that will define the following:
	• **Aim**
	  ○ to grow the community's understanding of the urban water cycle, including source and security of water supply, the impact of climate change, types of water sources and the connection between the urban environment and the health of our waterways, lakes and wetlands
	  ○ to encourage active collaboration between EGW, EGSC and EGCMA
	• **Audience**: the Bairnsdale community
	• **Partnerships:** the plan should engage existing community groups and programs such as Friends of groups, Rotary and Schools water education programs and National Water Week as well as seeking interest from unaffiliated members of the community
	• **Outcomes**: of the program will be:
	  ○ to increase community awareness of why Council and EGW undertake water cycle projects
	  ○ to motivate individuals e.g. to install efficient fixtures, rainwater tanks, have shorter showers
	  ○ to invite Community support for Council and EGW IWM projects
	  ○ promote the water-related aspects of new infrastructure or development (e.g. WORLD Precinct, WSUD in residential developments, re-vegetation programs, building retrofits)
	Draft content and output: preparation of a program and material that could form the basis of ongoing community engagement
		2022	High	EGW
				EGSC

Community outreach program implementation	Implement the community outreach program in parallel with planned works: • Council communications to be present at key project milestones, from planning to operation • Informally gauge level of water literacy within the community • Prepare supporting educational materials (physical and online) that can be viewed on location, in Council offices and online that explains why works are being undertaken • Where possible, invite community to participate e.g. in planting days, naming competitions or through public art on water facilities • Monitoring and evaluate awareness on an informal basis through these events and the presence of Council and EGW staff on site, and through their interactions with the community. Where possible, leverage partnerships to understand additional communication approaches and opportunities through bills, and other community surveys and communications	2022 - 2025	High	EGW EGSC

4. IWM plan for Bairnsdale Hospital

Action	Sub actions / Description	Timing	Priority	Responsibility
Objectives setting	Engage with Bairnsdale Hospital and confirm issues, constraints and key priorities for IWM at the Bairnsdale Hospital. Review the Bairnsdale Hospital strategic documents or master plans. Confirm project objectives for the hospital. These should build from the objectives of this IWM Plan and any Bairnsdale Hospital strategic plans. This may include: • Reduce reliance on potable water at the Bairnsdale Hospital. • Improve efficiency of potable water use at the Bairnsdale Hospital. • Provide patients and staff with access to waterways and green space for relaxation and respite. • Increase shading around the Bairnsdale Hospital to mitigate the impacts of urban heat.	2023	Medium / High	EGW with EGSC
Opportunities and constraints	Develop a long list of IWM opportunities. Identify constraints. E.g. Proposed works cannot disrupt emergency operations of the hospital. Define suitable criteria to determine theoretically feasible opportunities and assess them against the project objectives. Use these criteria to prioritise opportunities.	2023	Medium / High	EGW with EGSC
Opportunity shortlist	Undertake more detailed analysis of the long list IWM opportunities for the hospital to understand their technical feasibility. Identify key criteria with which to prioritise opportunities including likely cost, level of disruption, water savings, amenity and liveability benefits, health benefits, ecological benefits. Prioritise opportunities for further concept development.	2023	Medium / High	EGW with EGSC
Concept options	Develop concept options for prioritised opportunities. There are a range of possible options possible, some examples include: • Bioretention or infiltration assets on hospital grounds • Rainwater harvesting • Shadeways over key outdoor walking paths surrounding the hospital • Gardens for patients and staff Engage with hospital staff and patients on concept options for feedback to refine designs.	2024	Medium / High	EGW with EGSC
Implementation	Explore potential funding streams for prioritised opportunities Develop implementation plan for prioritised opportunities	2025	Medium / High	EGW with EGSC

5. Compliance with existing Council requirements (during construction)

Action	Sub actions / Description	Timing	Priority	Responsibility
Identify and agree key issues	• Review, update where required existing planning requirements around stormwater management during construction • Collaborate within Council departments and the EGCMA to identify the key behavioural and performance issues that need to be addressed • Consider the 'carrots' and 'sticks' that are available to encourage or penalise behaviour including stop work orders • Identify whether additional incentives or penalties need to be considered	2023 (or earlier to align with construction timeframes)	Medium	EGSC

Developer / Construction industry outreach	• Develop information material for land developers that highlights the key issues and Council's renewed dedication to addressing construction phase stormwater pollution issues. Clearly set out the expectations and the incentives or penalties that relate to meeting / contravening these requirements.
	• Distribute material pre-emptively, or as part of other Council approval documentation
	• Develop an induction process for onsite construction staff and contractors that
	  ○ highlights the reason for stormwater quality measures e.g. highlight the impact on recreational activities or other impacts that may speak to construction contractors
	  ○ clearly sets out construction site expectations in terms of practices
	  ○ sets out expectations around inspection regime and protocols
	• Investigate the potential for a construction industry member, who has respect in that industry and may be passionate about the Gippsland Lakes, to partner in presenting this information
	• Make stormwater quality measures during construction a key requirement of all Council and EGW contracts within Bairnsdale and its associated catchments
		2023	Medium	EGSC

Resourcing	• Investigate the need for additional resources to implement and enfo0rce these expectations given the amount of development being undertaken • Seek additional funding for a part time or shared position to support the inspection of construction sites and activities • Investigate potential to share role with other Councils and EGW • Investigate funding support from IWM stakeholders and DELWP (this may be for a defined period, e.g. over 1-3 years when most development activities are expected to occur)	2024 -	Medium	EGSC

6. Green and blue corridors

Action	Sub actions / Description	Timing	Priority	Responsibility
Objectives setting	Agree the objectives of this opportunity with internal Council stakeholders to guide and develop ideas. These should be based on the objectives of this IWM Plan and may include: • Improving connectivity between the Bairnsdale's urban centre and natural assets • Ensuring waterway corridors are healthy and aesthetically pleasing • Waterway corridors are accessible, with formalised walking / cycling paths or viewing areas that are preferably shaded • Ensure a minimum canopy cover percentage for highly trafficked pathways, particularly where they link school, aged care, childcare and other community facilities to surrounding recreational and commercial areas	2024	Medium	EGSC
Desktop investigation	Conduct a desktop investigation that identifies potential opportunities for enhancing green and blue corridors across Bairnsdale. This will include: • Spatial analysis of waterways, walking and cycling path networks, open spaces, natural spaces community and commercial hubs • Identify links across corridors, overlap or gaps where additional connections could be made • Highlight ecological, social and indigenous values along these linkages • Document existing or proposed projects, assets or developments that could contribute to improved connections across Bairnsdale • Cross reference this with relevant Masterplanning documentation that highlights connection to the Mitchell River as a key issue.	2024		
Opportunity development	From the desktop investigation described above, develop a list of opportunities that correspond with the objectives of the project including passive irrigation of trees, WSUD in car parks and around paved surfaces, irrigation using rainwater, treated stormwater or recycled wastewater. Identify where these opportunities can leverage off planned or existing infrastructure, works or projects e.g. integrating passive street trees with road renewal or the WORLD car parks? Identify any major constraints or barriers to implementation.	2024		
Opportunity shortlist	Undertake more detailed analysis of the long list opportunities to assess their feasibility as standalone projects but also in terms of being integrated with planned works (for example: are the timelines suitable to add or change the proposed design to incorporate green / blue pathway ideas). Identify criteria with which to prioritise opportunities including cost, timing, numbers of pedestrians that frequent certain pathways, amenity and liveability benefits. Prioritise opportunities to progress to concept development.	2024		
Design	Prepare concept through to detailed designs for the highest priority opportunities Prioritise those where there is a critical timing element.	2025		

7. Water efficiency for industrial / commercial water users

Action	Sub actions / Description	Timing	Priority	Responsibility
Identify users	Based on existing data identify highest industrial and commercial water users Undertake a desktop assessment of the key uses of water if that information is available.	2025 (ongoing)		
Industry engagement and site audit	Beginning with the highest water users, engage with major industries (1-2 per year) to: • Inform the site staff of the context of the audit and the benefits of reducing water use, waste generation and the alternatives that are available. • Understand specific water uses on site, volume and quality requirements • Understand the nature of waste streams and whether these activities are impacting trade waste and wastewater treatment downstream • Identify functions and activities that are contributing most to usage and waste and if any internal metering is available to estimate water usage for specific activities • Identify also if water efficiency measures have been put in place in recent years (to flag if this may be worth investigating) Based on the outcomes of an onsite audit: • Identify water efficiency opportunities • Identify where alternative water sources may be appropriate • Estimate the potential volume of water saved and the economic benefit of that to the operator • Identify where sources like roofwater and stormwater can be used to green the location or the facility, providing irrigation water to create green spaces and shade that improve worker environments and mental health.	2025 - 2030 (1 site per year for 5 years)	Medium	EGW
Audit summary document	Prepare an audit summary for the site that provides information on: • Identified opportunities for improved efficiency through updated fittings, fixtures and appliances • Opportunities to harvest and use alternative sources of water, such as rainwater, prioritising high water using, large roof buildings (like sheds and factories). • Match fit-for-purpose water sources with end use • Combine with tips around water conservation Identify key criteria by which to prioritise opportunities including the levelized cost of the water saved based on the capital costs to implement and the volume of water conserved Provide a prioritised list of opportunities based on levelized cost. Identify any funding support or incentive opportunities for the organisation. Undertake 1-2 audits per year for 5 years and then reassess high water user list.	2025 - 2030 (1 site per year for 5 years)		

8. CBD biofiltration and passive irrigation pilot project

Action	Sub actions / Description	Timing	Priority	Responsibility
Identify potential pilot sites	Review potential sites within the CBD for a pilot WSUD and passive irrigation project Identify locations that have high foot traffic, requires amenity or aesthetic uplift, would benefit from greening, shade and canopy 'Piggy back' with a planned infrastructure works e.g. road or water main renewal, to reduce cost and disturbance. Consult with local business community to inform them of the proposed works and understand their preferences e.g. combining with seating area, outdoor dining etc	2025	Medium / Low	EGSC
Design	Prepare concept design for passive irrigation asset and confirm location and integration in the landscape. Upon confirmation proceed with functional and detailed design Ideally use the survey and geotechnical information associated with the 'piggy back' project or undertake independent survey Complete detailed design and use that process as an opportunity to inform and educate internal engineering and maintenance team as to the intent and function of the asset/s Inform the maintenance department as to how to maintain these assets at the design stage and receive any feedback that may influence the design Prepare a cost estimate as part of the design and receive approval for capital works.	2025		
Community engagement	Prepare communication information that highlights the purpose of the trial and the function of the proposed asset Post this on an information board on site	2026		
Construction and launch	Construction of asset including earthworks and planting Investigate if a school group would like to assist with planting and use that as a promotional or media opportunity Maintain a presence for one or two Saturdays to inform passers by about WSUD. Gain any feedback or insights as to community reflections as possible Ensure permanent signage is established on site that describes purpose and function.	2027		

9. Large roof rainwater harvesting

Action	Sub actions / Description	Timing	Priority	Responsibility
Desktop investigation	Conduct a desktop investigation to identify large scale rainwater harvesting opportunities. This will include: • Spatial analysis of urban areas to identify and classify large roofs areas • Identify high water users within proximity of those large roof areas (e.g. open space or industry). • Assess the nature of end uses (where possible) and suitability of rainwater to meet that demand (i.e. quality and reliability)	2025	Medium / Low	EGSC with EGW
Opportunity long list	Based on the desktop investigation, develop a long list of rainwater harvesting opportunities Define criteria to prioritise feasible opportunities e.g. distance of roof from demand, if rainwater is fit for purpose use, current water consumption (and therefore cost), private vs public land ownership, space available for storage, feasibility of installing network infrastructure etc	2025		
Opportunity shortlist	Based on those criteria, generate a prioritised short list Develop water balance models for high priority opportunities to understand the volume of water saved and storage required. Note associated costs and benefits such as: • Is this a high-value open space? • Would rainwater harvesting improve downstream drainage, waterway condition or localised flooding? • Can businesses contribute to providing rainwater storage in lieu of other IWM requirements? Identify key criteria with which to prioritise opportunities including water saved, likely cost (H/M/L), complexity and community benefit.	2026		
Institutional and governance arrangements	Explore institutional and governance arrangements required for implementation such as: • Beneficiary cost sharing • Financial incentives • Risk and liability • Ongoing maintenance and ownership of infrastructure.	2026		
Design	Prepare concept designs for the highest priority opportunities Progress supported opportunities (~ 3) to detailed design Promote highest priority project and gain support for a pilot	2026		
Construction	Construction of designed assets including: • Guttering and piping • Transfer and irrigation network • Pump station • Tanks and storages	2027 -2030	High	

10. Water efficiency and rainwater harvesting standards for Council and Water Authority facilities

Action	Sub actions / Description	Timing	Priority	Responsibility
Approval to prepare policy	Introduce EGW and EGSC executive to this policy and its intent to: *reduce the water footprint and impact of Council and Water Authority buildings through improved efficiency, reduced potable water use and reduced impact on downstream assets and the natural environment*	2026	Low	EGCS with EGW
Develop draft policy	Develop a draft policy that defines water efficiency and rainwater harvesting targets and requirements for new and established buildings Refer to State Government and industry leading documents as examples to: • Define water efficiency and usage targets on a per person or per m^2 basis potentially referring to Green Star or other recognised industry water use standards • Propose requirements for the use of rainwater for toilet flushing and garden irrigation in all new buildings, with retrofits investigated for existing buildings • Propose treatment of rainwater overflows via WSUD to reduce or eliminate runoff from site. In the design phase, new buildings to define the volume of rainwater storage required considering roof catchment area and demand. Ensure also that roof guttering and downpipes drain the largest proportion of roof catchment possible to one or more rainwater tank locations.	2026		
Policy approval	Engage with relevant internal stakeholders and seek feedback on the draft policy Initiate policy approval process ensuring the ongoing responsibilities are clear and assigned to relevant departments Make draft policy available for inspection online and internally Review and update policy as required. Inform Council staff of key policy aims and practical implications through ~ 1 page summary document	2027		
Audit existing facilities	For existing buildings: • Undertake audits of the highest water consuming facilities • Identify and prioritise efficiency opportunities to meet agreed benchmarks • Identify opportunities to retrofit existing facilities with rainwater tanks, prioritising high consuming, large roof buildings (like recreation centres). Ensure that these opportunities consider internal plumbing of rainwater.	2028		

11. Drainage contribution through a stormwater offsets scheme for urban developments

Action	Sub actions / Description	Timing	Priority	Responsibility
Form project working group	Form a project working group between EGSC, EGW, EGCMA and DELWP to agree upon the aims and terms of reference for this action *Proposed aim: to agree a mechanism that allows developers to contribute to centralised stormwater quality assets within their catchment, in lieu of smaller, decentralised assets.*	2026	Low	EGSC with EGW, EGCMA and DELWP
Desktop review	Desktop review of existing offset and drainage contribution schemes in other regions and states. Review those schemes and assess their applicability in the Bairnsdale context Work with DELWP to understand their (proposed) guidance on setting up offset schemes. Potentially offer a partnership with DELWP to 'road test' this guidance in Bairnsdale. Between agency stakeholders, agree upon an offset methodology to be further investigated within respective organisations and the development industry.	2026		
Stakeholder engagement	Engage with agency executive to introduce and seek support for the offset scheme Engage with the land development industry and gauge their support for the scheme, taking on feedback and suggestions to improve the scheme or facilitate greater buy in.	2027		
Case study / Pilot program	Nominate a location, precinct or catchment within which the offset scheme will be trialled. Consider those catchments and receiving waters highlighted within the IWM Plan as being likely to generate / receive the highest volumes of stormwater in future. Undertake design of stormwater treatment works and establish the basis for the cost contribution (e.g. cost per kg of nitrogen) upon which to base to offset and contribution scheme.	2027 - 2030		
Policy development	Based on the outcomes of the case study, and the process that was followed, prepare an offsets policy that can apply to future development and redevelopment areas.	2030		

7 Costing estimates for priority opportunities

Cost estimates or ranges have been developed for five of the higher priority opportunities where it was agreed that this would be of benefit in progressing an opportunity with partner agencies. Cost estimates were therefore provided where design or construction works would be required. Opportunities requiring changes to policies or standards are likely to be able to be addressed internally, and as such cost estimates were not seen as critical at this stage.

The provided costs estimates below are based on the scope of tasks outlined in the Action plan above (Section 6).

As these opportunities have not been conceptualised there is significant uncertainty around their scope. For that reason we have provided a range of costs (high and low), and where appropriate, unit rates. These estimates can therefore be used primarily for the purposes of guiding decision-making, prioritising opportunities, establishing cost sharing agreements and identifying future funding opportunities. The costs will be refined as the understanding of the opportunities scope evolves.

7.1 WORLD Sporting Precinct

The scope of costs corresponds with the Action Plan. It includes desktop hydrologic analysis and review of existing work including establishing catchments and drainage lines. Identifying and developing IWM opportunities within the site that would include WSUD, rainwater and stormwater harvesting and recycled water reuse and greening.

The process would identify a long list that would be shortened based on what is possible and cost effective in the context of the existing design and works. At the completion of this process, a list of opportunities to proceed to concept design would be nominated and these have been costed on a 'per opportunity' basis for concept and detailed design. The lower and upper range reflects the potential for a range of opportunities in terms of scales and complexity.

Task	Cost estimate		Comment
	lower	upper	
Desktop hydrologic investigation			
Spatial analysis	$2,000	$4,000	
Desktop hydrological analysis	$3,000	$6,000	
Sub total	**$5,000**	**$10,000**	
Opportunities development			
Develop opportunities long list	$5,000	$7,000	
Identify constraints	$3,000	$5,000	
Define criteria to assess opportunities for feasibility	$1,500	$3,000	
Sub total	**$9,500**	**$15,000**	
Opportunity shortlist			
Detailed analysis of opportunities (assume 6 opportunities)	$8,000	$12,000	
Assess opportunities against key criteria	$3,000	$6,000	
Develop opportunity shortlist	$3,000	$6,000	
Sub total	**$14,000**	**$24,000**	
TOTAL	**$28,500**	**$49,000**	

Concept and feasibility			
Develop concept deign from prioritised shortlist	$5,000	$10,000	Per concept design, depending on level of detail and complexity
Engage with stakeholders for feedback and identify priorities	$3,000	$5,000	Includes workshop
Sub total	**$8,000**	**$15,000**	
Detailed design			
Detailed design and documentation	**$8,000**	**$20,000**	Per detailed design, depending on level of detail and complexity
TOTAL	**$16,000**	**$35,000**	

Some of the capital assets that may be proposed include WSUD assets such as wetlands, biofiltration assets and tree pits. Some guidance around capital cost is available from Melbourne Water's website, however these costs may vary given the time since these costs were published, and that these assets would be constructed in regional rather than Metropolitan Victoria.
(https://www.melbournewater.com.au/sites/default/files/Life%20Cycle%20Costing%20-%20WSUD.pdf)

Capital cost unit rates		
Item	**Unit**	**Rate**
Wetland		
< 500 m^2	per m^2	$150
500 to 10,000 m^2	per m^2	$100
> 10,000 m^2	per m^2	$75
Sediment basin		
< 250 m^2	per m^2	$250
250 to 1,000 m^2	per m^2	$200
> 1,000 m^2	per m^2	$150
On-street raingardens		
< 50 m^2	per m^2	$2,000
50 to 250 m^2	per m^2	$1,000
> 250 m^2	per m^2	$500
Bioretention basin		
< 100 m^2	per m^2	$1,000
100 to 500 m^2	per m^2	$350
> 500 m^2	per m^2	$250
Tree pit		
< 10 m^2 total	per m^2	$8,000
10 to 50 m^2 total	per m^2	$5,000
> 50 m^2 total	per m^2	$1,000
Grass swales and buffer strips		
Seeded – no subsoil drain	per m^2	$15
Seeded – subsoil drain	per m^2	$25
Turfed – no subsoil drain	per m^2	$20
Turfed – subsoil drain	per m^2	$35
Native grasses established	per m^2	$60
Vegetated swales and bioretention swales	per m^2	$150
Gross Pollutant traps	per m^2	$250,000
< 300 L/s	per asset	$50,000
300 to 2000 L/s	per asset	$150,000
> 2000 L/s	per asset	$250,000

7.2 Recycled water network plan

This includes preparation of a concept design for the extension of Bairnsdale's recycled water network according to the stages set out above, including:

- Stage 1: Bairnsdale Saleyards and Bairnsdale City Oval/Peppercorn Oval (complete)
- Stage 2: extension of pipework from Bairnsdale City Oval to main street gardens
- Stage 3a: extension of pipework along main street to public toilets
- Stage 3b: extension of pipework to West Bairnsdale Oval on Anderson St.

The concept will quantify Class B recycled water available and corresponding demands at each location, estimate infrastructure requirements (including any additional treatment, piping, pump stations and storage) to extend the recycled water network to nominated sites and prepare a cost estimate and benefit summary.

Recycled water network plan			
	Cost estimate		Comment
Task	lower	upper	
Concept development			
Prepare concept design all stages	$10,000	$20,000	
Prepare detailed cost estimate	$5,000	$7,500	
Sub total	**$15,000**	**$27,500**	
Detailed planning			
Planning and negotiations	$3,000	$5,000	Engagement with East Gippsland Water
Cultural Heritage	$20,000	$30,000	
Acid sulphate soils management	$7,000	$12,000	
EPA approvals	$20,000	$30,000	
Survey	$5,000	$10,000	
Geotechnical	$5,000	$15,000	
Functional and detailed design	$20,000	$30,000	
Sub total	**$80,000**	**$132,000**	
TOTAL	**$95,000**	**$159,500**	

Capital cost estimate

Capital cost unit rates estimates			
Item	**Unit**	**Rate**	**Comment**
Water supply pipe PVC 90mm	Linear m	$180 - $250	Includes excavation / Assumes relatively small diameter pipe (<225)
Pump station	Item	$5000 - $15000	Per pump station

Infrastructure cost estimate	**Length / number (approx.)**	**Rate**	**Cost (Low)**	**Cost (Low)**
Stage 2 - Bairnsdale City Oval to main street gardens (From the oval to Main St, plus between Wood St and Victoria St)	~2,600m	$180 - 250	$468,000	$650,000
Stage 3a - Main street to public toilets	Included in above length			
Stage 3b – West Bairnsdale Oval on Anderson St	~1,000	$180 – 250	$180,000	$250,000
Pump stations				
Two pump stations	2		$10,000	$30,000
	SUB-TOTAL		**$658,000**	**$930,000**
Design	**10%**		**$65,800**	**$93,000**
Contingency	**50%**		**$329,000**	**$465,000**
	TOTAL		**$1,052,800**	**$1,488,000**

Other items

- Project supervision
- Interconnection of treated wastewater supply to existing reticulation for garden watering and toilet flushing
- Traffic management

7.3 IWM plan for Bairnsdale Hospital

This opportunity involves the prepare an IWM plan for the hospital that would investigate water use, efficiency and alternative water use options. The IWM plan would consider the hospital's operations and how water could contribute to operational objectives. The plan could also consider how the hospital interacts with its surrounds by mapping connections between the hospital, waterways and green spaces such as McGees Gully.

IWM Plan for Bairnsdale Hospital			
	Cost estimate		
Task	lower	upper	Comment
Objectives setting			
Engage with hospital staff and stakeholders	$3,000	$5,000	Includes workshop
Strategic background review	$1,000	$2,500	
Confirm project objectives	$1,000	$2,000	
Sub total	**$5,000**	**$9,500**	
Opportunities and constraints			
Develop opportunities long list	$3,000	$5,000	
Identify constraints	$1,500	$3,000	
Define criteria to assess opportunities for feasibility	$1,500	$3,000	
Sub total	**$6,000**	**$11,000**	
Opportunity shortlist			
Detailed analysis of opportunities	$5,000	$10,000	
Assess opportunities against key criteria	$3,000	$5,000	
Develop opportunity shortlist	$1,500	$3,000	
Sub total	**$9,000**	**$18,000**	
Concept options			
Develop concept options from prioritised shortlist	$5,000	$10,000	Per concept design, depending on level of detail and complexity
Engage with Hospital staff and stakeholders for feedback	$3,000	$5,000	Includes workshop
Sub total	**$8,000**	**$15,000**	
Implementation			
Explore potential funding streams	$1,500	$3,000	
Develop implementation plan	$1,500	$3,000	
Sub total	**$3,000**	**$6,000**	
TOTAL	**$31,000**	**$59,500**	

7.4 Green and blue corridors

This opportunity responds to opportunities identified in Master Planning documents (for the CBD, WORLD precinct and McGees Gully) and opportunities to green the landscape around and connecting to new projects, like World sporting precinct. It suggests looking into WSUD initiatives such as passive irrigation of trees, the use of recycled water, stormwater or rainwater (off nearby roofs) for irrigation to ensure heavily commuted corridors are healthy, shaded and green. The approach should also be applied to connecting paths between popular locations like WORLD and the Bairnsdale Secondary College as well as potentially being extended to residential streets once the concept has been proven.

Green and blue corridors			
	Cost estimate		
Task	lower	upper	Comment
Objectives setting			
Engage with council staff and stakeholders	$2,000	$4,000	
Strategic background review	$1,000	$2,000	
Confirm project objectives	$3,000	$5,000	Includes workshop
Sub total	**$6,000**	**$11,000**	
Desktop investigation			
Spatial analysis	$2,000	$3,000	
Identify community and ecological linkages and corridors	$2,000	$4,000	
Sub total	**$4,000**	**$7,000**	
Opportunity development			
Develop opportunities long list	$3,000	$6,000	
Alignment with existing infrastructure, planned works	$2,000	$3,000	
Identify constraints	$1,500	$3,000	
Sub total	**$6,500**	**$12,000**	
Opportunity shortlist			
Detailed analysis of opportunities	$7,500	$12,000	
Assess opportunities against key criteria	$3,000	$5,000	
Develop opportunity shortlist	$1,500	$3,000	
Sub total	**$12,000**	**$20,000**	
Concept options			
Develop concept options from prioritised shortlist	$3,000	$7,500	Per concept design, depending on level of detail and complexity
Engage with council staff and stakeholders for feedback	$3,000	$5,000	Includes workshop
Sub total	**$6,000**	**$12,500**	
TOTAL	**$34,500**	**$62,500**	

7.5 Large roof rainwater harvesting

The opportunity is a spatial investigation of large roof areas throughout Bairnsdale to assess their rainwater harvesting potential. The aim would be to align this to large high water users to reduce both potable water use and stormwater runoff. The investigation would assess rainwater harvesting potential and develop concept designs that can be implemented over time. It could also explore institutional and governance arrangements required for implementation such as beneficiary cost sharing, financial incentives, risk and liability, ongoing maintenance and ownership of infrastructure (e.g. where the rainwater from one roof is used by another party). Ideally, rainwater harvesting would be an aspect of all designs for large roof buildings. This looks at retrofitting opportunities.

Large roof rainwater harvesting			
	Cost estimate		
Task	**lower**	**upper**	**Comment**
Desktop investigation			
Spatial analysis	$1,500	$3,000	
Water use assessment	$3,000	$5,000	
Sub total	**$4,500**	**$8,000**	
Opportunities long list			
Develop opportunities long list	$1,000	$3,000	
Define criteria to assess opportunities for feasibility	$1,000	$2,000	
Sub total	**$2,000**	**$5,000**	
Opportunity shortlist			
Develop water balance model (per site)	$1,000	$2,500	
Cost-benefit analysis (per site)	$1,500	$3,000	
Identify key criteria and prioritise	$1,000	$2,000	
Explore governance/ ownership arrangements	$1,000	$2,000	
Sub total	**$4,500**	**$9,500**	
Design			
Prepare concept designs for highest priority opportunities (per concept)	$3,000	$6,000	
Progress top priorities to detailed design	$3,000	$7,500	Likely to require input from a plumber in addition to this
Promote highest priority project for pilot	$0	$0	
Sub total	**$6,000**	**$13,500**	
TOTAL	**$17,000**	**$36,000**	

Capital cost unit rates (rainwater tanks)			
Item	**Unit**	**Rate**	**Comment**
Water supply pipe PVC 90mm	Linear m	$100 - $200	Assuming construction of a small diameter main from tank to end use / predominantly private property Therefore this is less than installing mains in roadways as per 7.2.
Pump / pump station	Item	$1,000 - $5,000	Smaller pumps assumed than public, municipal projects
Storage tank (capital cost)			
10,000 L	Item	$2,000	Source: https://heritagetanks.com.au/water-tank-prices/ Does not include delivery
25,000 L		$3,500	
55,000 L		$6,500	
110,000 L		$8,500	

8 Monitoring, evaluation, reporting and improvement (MERI) framework

A Monitoring, Evaluation, Reporting and Improvement (MERI) framework is a conceptual model designed to support East Gippsland Water to monitor the progress of this IWM Plan. This provides a basis for learning, improvement and accountability.

The framework supports the development of milestones and metrics by which to assess the progress of this plan over time. The aim is for the timing and commitments set out in the MERI to be a focal point for internal; conversation, review and updating future plans and actions. It supports transparency for all parties to learn through reflection and discussion.

For this project we will design the MERI against the program logic described in Section 4.3 above. The program logic outlines the linkages between the vision, objectives, outcomes and actions of the IWM plan, which are defined in Table 9.

Table 9. MERI definitions and relationships

Framework level	Definition
Vision	A statement of the overall vision for the region and for Bairnsdale (as per the SDS)
Objectives	A specific result that the plan aims to achieve within a given timeframe
Outcomes	A measurable change in condition observed as a result of an action. Outcomes can be qualitative or quantitative targets, and the outcome achieved when the target is reached.
Actions	Prioritised projects/ opportunities that • lead to a change in condition • inform planning, investment, prioritisation and decision-making These are summarised within the action plan above and include internal initiatives such as policy or program development, through to design and construction

Guiding principles
The following principles will guide the development of the MERI framework

- Aligned to the vision, objectives and outcomes of this IWM plan
- Be clear, concise and simple to use
- Be realistic to what can be achieved and measured.

8.1 Monitoring

Monitoring determines whether the actions have been achieved or suitably progressed based on the timelines expressed in the action plan. This will be understood by monitoring the progress against the action plan.

- *Monitoring asset condition* describes measuring changes in the state of and trends in the condition of assets and will generally correspond to whether asset design or construction milestones have been reached. This will correspond to annual review.
- *Monitoring plan performance* describes changes in people, organisations, institutions, practices and technologies that create an environment that is conducive to improving internal capacity. This will correspond to regular (e.g. every 3-5 year) check ins or reviews on how programs are performing based on requested feedback.

For the purposes of this plan, we will be predominantly concerned with monitoring program performance as against completion of design works and growth in organisational and community capacity and understanding along with a general awareness of council's water related projects and activities.

Performance indicators and measures

Performance indicators are measurable metrics that are reported for accountability, transparency, progress and achievement. Potential performance indicators and measures for the Bairnsdale IWM Plan are shown in Table 10.

For many of these indicators a quantitative target for measuring progress or success may be developed e.g.

- "on track" = >5
- "attention required" = 1-4
- "off track" = <1

It is assumed that these measures will be adopted where data is not available, and the assessment relies on feedback, interviews and other qualitative data. These assessments are best developed through internal collaboration to be reviewed annually. It is anticipated that potential indicators and measures will be further refined on consideration of the resourcing (budget, personnel) allocated to evaluation on an annual basis.

Table 10 outlines the key evaluation questions, proposed frequency of data collection and possible indicators.

Table 10. MERI Plan (KEQs, potential performance indicators and measures)

Evaluation Question type	Evaluation Question	Potential performance indicators / measures	Data source/s	Review frequency
Achievement / effectiveness	**KEQ1. How well is the program being implemented?**			
	Is the Program being implemented as intended?	Completion of planned deliverables Review meeting on action items implemented (On track / attention required / off track)	Internal administrative data Internal stakeholder information	Annual
		Capability and capacity: Community events held / Number of attendees / Informal feedback from attendees	Administrative data Interviews and feedback	Annual
	What factors are helping or hindering implementation? How could the program be improved?	Qualitative identification of improvement opportunities	Internal stakeholder information	Annual
Reflection and learning (effectiveness and impact)	**KEQ2. To what extent did the Program achieve its intended outcomes?**			
	Embed IWM into policies, practices and management processes. Build IWM capacity and knowledge within Council and the community (including through the incorporation and sharing of aboriginal water values)? Demonstrate leadership in IWM both in the community and with organisational peers?	Rate the degree to which the plan reflects the needs of key internal stakeholders Quantitative ranking of satisfaction with plan outputs Referencing of plan outputs in other documentation – i.e. website, Sustainability Strategy, IWM Forum	Internal stakeholder information and feedback Document review Event (or post event) surveys	Every 3 years
Reflection and learning (effectiveness and impact)	**KEQ 3: How well is the Program meeting expectations?**			
	How aligned are we with Gippsland IWM Forum outcomes? How are plan outputs being used/applied? Which plan outputs are most useful? Are there any unexpected or unintended outcomes?	Rating based on review (On track / attention required / off track)	Internal stakeholder information and feedback Document review Event (or post event) surveys	Every 3 years

	KEQ4. What lessons can be learnt about improving Program effectiveness?			
	What environmental impacts have resulted from the plan?	Rating based on reflection on environmental issues e.g. - Efficient use of potable water / Use of non-potable water - Reduced stormwater pollution / WSUD asset performance	Data based on design Visual inspection of asset performance	Every 3 years
	What social impacts have resulted from the plan?	Improved management of water for social benefit - Increase in community water literacy - Traditional owner knowledge is incorporated into projects and programs	Data based on survey and feedback Document review (where do these elements appear)	
	What economic impacts have resulted from the plan?	Improved management of water to support economic values - Improved urban liveability outcomes (e.g. green streetscapes and open spaces) - Urban development aligns with plan outcomes reducing council retrofits and required upgrade to developer assets	Internal stakeholder information and feedback Community and visitor feedback Asset inspection	
	What could be improved to maximise efficiency and effectiveness plan implementation	Level of satisfaction with plan implementation and governance	- Internal survey and feedback	

8.2 Evaluation

To improve program design and delivery, re-orient investment during the life of the program if required, and fulfil accountability requirements, evaluations should be conducted throughout the life of a program to inform decision points and enable learning to be collated at program completion.

Key evaluation questions

Key evaluation questions provide high-level guidance on what the evaluation is trying to address and help to shape the development of indicators and evaluation methods. To keep the assessment relatively easy to implement, the MERI framework will focus on the following questions:

- How well is the program being implemented? Why / Why not?
- To what extent did the Program achieve its intended outcomes? If not, why?
- How well is the Program meeting expectations?
- What lessons can be learnt about improving Program effectiveness?

Table 11. Key evaluation questions

Question type (evaluation category)	Key evaluation question	Relationship to the Program Logic	Frequency of review	Who will be asked this question?
Achievement **Reflection and learning** **(Effectiveness)**	**How well is the program being implemented?** Is the Program being implemented as intended? What factors are helping or hindering implementation? How could the program be improved?	Opportunities (projects, policies and programs)	Every year	• Sustainability • Communication • Built & Natural Environment • Infrastructure development
Reflection and learning **(Effectiveness and impact)**	**To what extent did the Program achieve its intended outcomes?** Embed IWM into policies, practices and management processes. Build IWM capacity and knowledge within Council and the community (including through the incorporation and sharing of aboriginal water values)? Demonstrate leadership in IWM both in the community and with organisational peers?	Objectives	Every 3rd year	• Sustainability • Communication • Built & Natural Environment • Infrastructure development
Reflection and learning **(effectiveness and impact)**	**How well is the Program meeting expectations?** How aligned are we with Gippsland IWM Forum outcomes? How are plan outputs being used/applied? Which plan outputs are most useful? Are there any unexpected or unintended outcomes?	Activities and outcomes		
Reflection and learning **(efficiency)**	**What lessons can be learnt about improving Program effectiveness?** Are the identified combination of projects, programs and policies achieving the desired outcomes across social, environmental and economic impacts? What has, or should change and why?	Inputs, opportunities		

8.3 Reporting and improvement

Reporting can occur at all levels of management, and within any timeframe depending on the intention and audience. The purpose of reporting is to communicate progress and performance on outcomes; challenges and learnings; and accountability and transparency to stakeholders, the community and within council. It will be important for Council to report on the progress of the IWM Plan, both to indicate achievement internally and to share this work with the community. For the purposes of this plan the following reporting regime will be adopted:

Table 12. MERI reporting summary

When	Report name / type	Audience	Focus of the report	Improvement process that the report will inform
Annual	Action reporting – consider incorporating into existing reporting processes	Council and community	Reporting on asset related actions and achievements and learning in implementation Demonstrate accountability	Improvements to individual action plans and delivery processes
Every third year	Review of the IWM plan performance	Council	Consider emerging social, environmental and economic trends to enable change and adaptation to policy positions at the state or national level Review the progress of longer-term programs, such as the incorporation of Traditional Owner knowledge into water related plans and policies.	Improvements to individual action plans and delivery processes
Every ten years	Fully review and update plan at nine years with new plan agreed by ten years (2030).	Council and funding partners (DELWP)	To fully revise the achievements of the previous plan, review the current context and the impact that has on planning and to re-engage with stakeholders to identify and prioritise opportunities and actions	Revision and improvements to overall plan

9 References

Australian Government (2009), NRM MERI Framework

DELWP (2016), Guidelines for Assessing the Impact of Climate Change on Water Supplies in Victoria

East Gippsland Catchment Management Authority (2017), East Gippsland Floodplain Management Strategy

East Gippsland Catchment Management Authority (2018), Gippsland Lakes Environment Report 2018

East Gippsland Catchment Management Authority (XXXX), Room to Move - A proposal to manage a changing Gippsland Lakes

East Gippsland Shire Council (2013), Urban Waterway Management Strategy

East Gippsland Shire Council (2013), Urban Waterway Guidelines

East Gippsland Shire Council (2009), Bairnsdale Growth Strategy: Building a Better Bairnsdale

East Gippsland Shire Council (2019), Council Plan 2017 – 2021 (Revised 2019)

East Gippsland Shire Council (XXXX), Re-Imagining Bairnsdale Masterplan

East Gippsland Shire Council (2003), Urban Stormwater Management Plan

East Gippsland Shire Council (2015), Howitt Park Master Plan

East Gippsland Shire Council (XXXX), Well Placed for Wellbeing (2017-2021)

East Gippsland Shire Council (2014), Environmental Sustainability Strategy 2014 – 2017

East Gippsland Shire Council (2014), Sustainable Water Use Plan

East Gippsland Shire Council (2018), Bairnsdale Sporting Facilities Plan (Volumes 1 – 4)

East Gippsland Water (2019), Annual Report 2018-19

East Gippsland Water (2018), Annual Report 2017-18

East Gippsland Water (2019), Bairnsdale Sewer Masterplan Report

East Gippsland Water (2017), Urban Water Strategy and Preparedness Plan

East Gippsland Water (2017), Bairnsdale and Paynesville Water Network Master Plan

IWM Forum (2018), East Gippsland Strategic Directions Statement

Rotary Club of Mitchell River (XXXX), McGees Gully community pathway to Macleod Morass

Attachment A
East Gippsland SDS Outcomes and Objectives

Outcomes					
Safe, secure and affordable supplies	**Effective and affordable wastewater systems**	**Reduced flood risks**	**Healthy and valued waterways and Gippsland Lakes**	**Healthy and valued urban landscapes**	**Community values are reflected in place-based planning**	**Jobs, economic growth and innovation**
Objectives					
A diverse range of water supplies and resources	Meets public health and environmental standards	Appropriate levels of flood protection in urban areas	Waterway health is maintained and improved	Active and passive recreation supported by water	Diverse urban landscapes that reflect local conditions and community values	Jobs and economic growth supported by water
Water quality meets regulatory standards and community expectations	Effective sewerage systems	Community and property resilient to local flood risk	Health of Gippsland Lakes and other marine environments is maintained and improved	Improved connectivity and access for active transport links	Empowered and engaged community	Innovative planning and operation
Efficiently managed water and demand	Optimised onsite domestic systems			Urban landscapes retain moisture for cooler, greener cities and towns	Local water related risks and issues understood and managed	Strong governance, collaboration and performance
Secure water supply for industry and economy	Waste-to-resource opportunities are maximised			Waterways and coastal environments accessible as valuable open space		Seek to identify economic pathways to support traditional owner groups
Water available to maintain valued green community assets				Aboriginal cultural values associated with waterways protected		

Figure A 1. *East Gippsland IWM Forum SDS Outcomes and Objectives*

Attachment B
Stormwater Modelling Inputs

Impervious fraction inputs

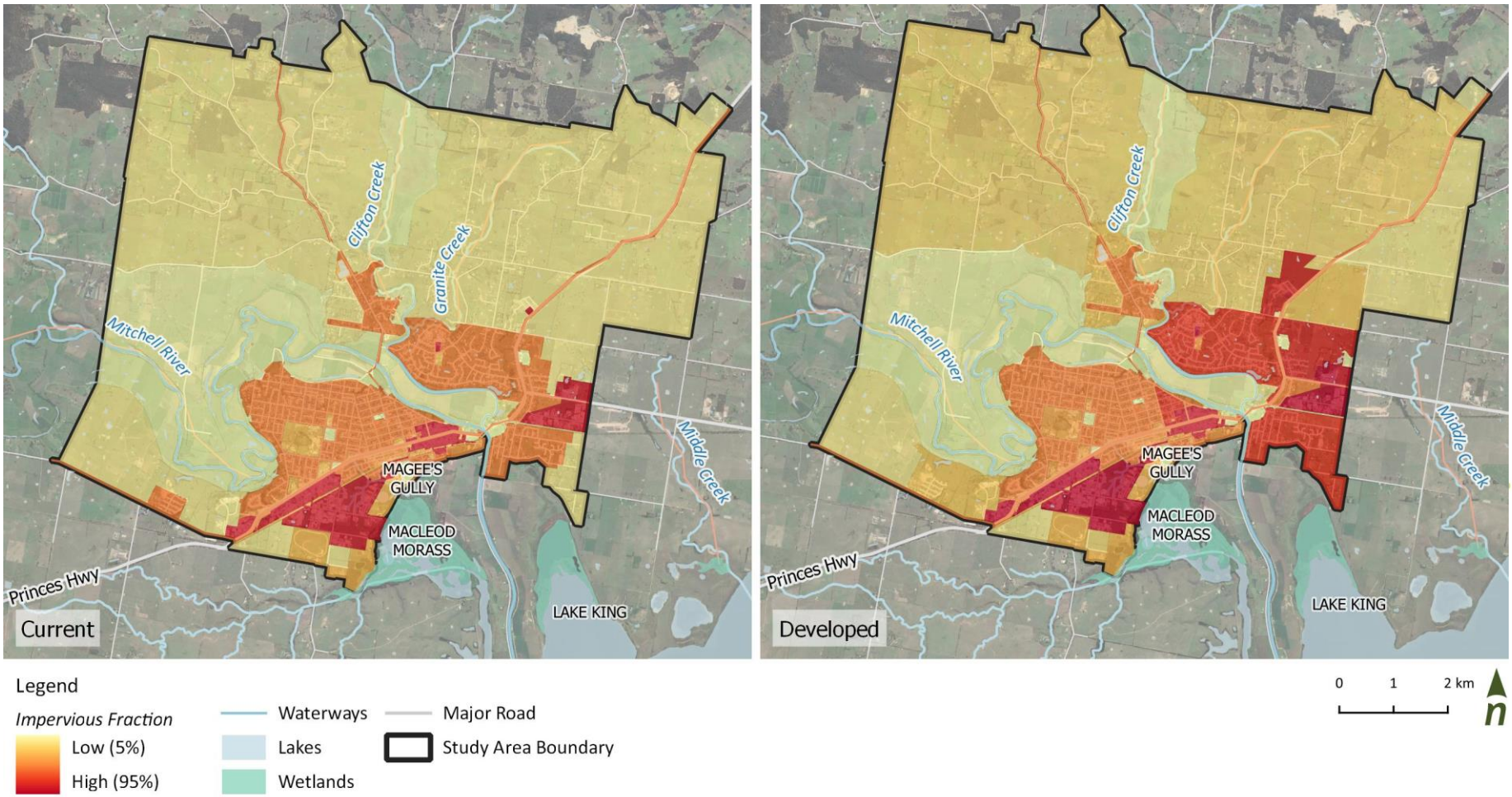


Figure B. *Current land use impervious fractions*

Model inputs summary

Urban development	Climate	Area (ha)	Impervious area (ha)	Rainfall (mm/year)	PET (mm/year)
Existing	2020	7,995	2,050	680	1,100
Existing	2065	7,995	2,050	650	1,190
Future	2020	7,995	2,320	680	1,100
Future	2065	7,995	2,320	650	1,190

Table B 1. *MUSIC model inputs*