Melton East PSP: Integrated Water Management – Issues and Opportunities

REPORT

May 2023

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Alluvium recognises and acknowledges the unique relationship and deep connection to Country shared by Aboriginal and Torres Strait Islander people, as First Peoples and Traditional Owners of Australia. We pay our respects to their Cultures, Country and Elders past and present.

Artwork by Vicki Golding. This piece was commissioned by Alluvium and has told our story of water across Country, from catchment to coast, with people from all cultures learning, understanding, sharing stories, walking to and talking at the meeting places as one nation.

This report has been prepared by Alluvium Consulting Australia Pty Ltd for the Victorian Planning Authority under the contract titled 'Melton East PSP: Integrated Water Management – Issues and Opportunities'.

Authors: Paul Richards, Neha Shetty, Dan O'Halloran
Review: Dan O'Halloran
Approved: Dan O'Halloran

Version: 3 – Final
Date issued: May 2023
Issued to: Rion Casey, Victorian Planning Authority
Citation: Alluvium, 2023, Melton East PSP: Integrated Water Management – Issues and Opportunities, report prepared by Alluvium Consulting Australia for the Victorian Planning Authority, Victoria

Cover image: Kororoit Creek at Leakes Road (Drone Image, Alluvium 2021)

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Abbreviations

Alluvium	Alluvium Consulting Australia Pty Ltd
AHD	Australian Height Datum
ARI	Average Recurrence Interval
ASI	Areas of Strategic Importance (for growling grass frog habitat)
BCS	Biodiversity Conservation Strategy for Melbourne’s Growth Corridors
DELWP	Department of Environment, Land, Water and Planning
DEPI	Department of Environment and Primary Industries (preceded DELWP)
EPA	Environment Protection Authority
EPBC	Environment Protection and Biodiversity Conservation [Act 1999]
EVC	Ecological Vegetation Class
GDE	Groundwater-dependent ecosystem
GGF	Growling grass frog
GWW	Greater Western Water
HWS	Healthy Waterways Strategy 2018-2028
IWM	Integrated Water Management
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
PSP	Precinct Structure Plan
RWP	Recycled Water Plant
RSHS	Regional Stormwater Harvesting Scheme
SDS	Strategic Direction Statements (2018)
SHW	Seasonal Herbaceous Wetland
STP	Sewage Treatment Plant
VPA	Victorian Planning Authority
WSUD	Water Sensitive Urban Design

1 Introduction

The Victorian Planning Authority (VPA) is preparing a Precinct Structure Plan (PSP) for Melton East. The Melton East precinct covers an area of about 1,005 hectares (Ha) east of the Melton main town centre. The precinct is located 30 to 35 km northwest of the Melbourne CBD (Figure 1). It is bound by the Western Freeway to the south, the Melton Highway and Kororoit Creek to the north, and Leakes Road to the east.

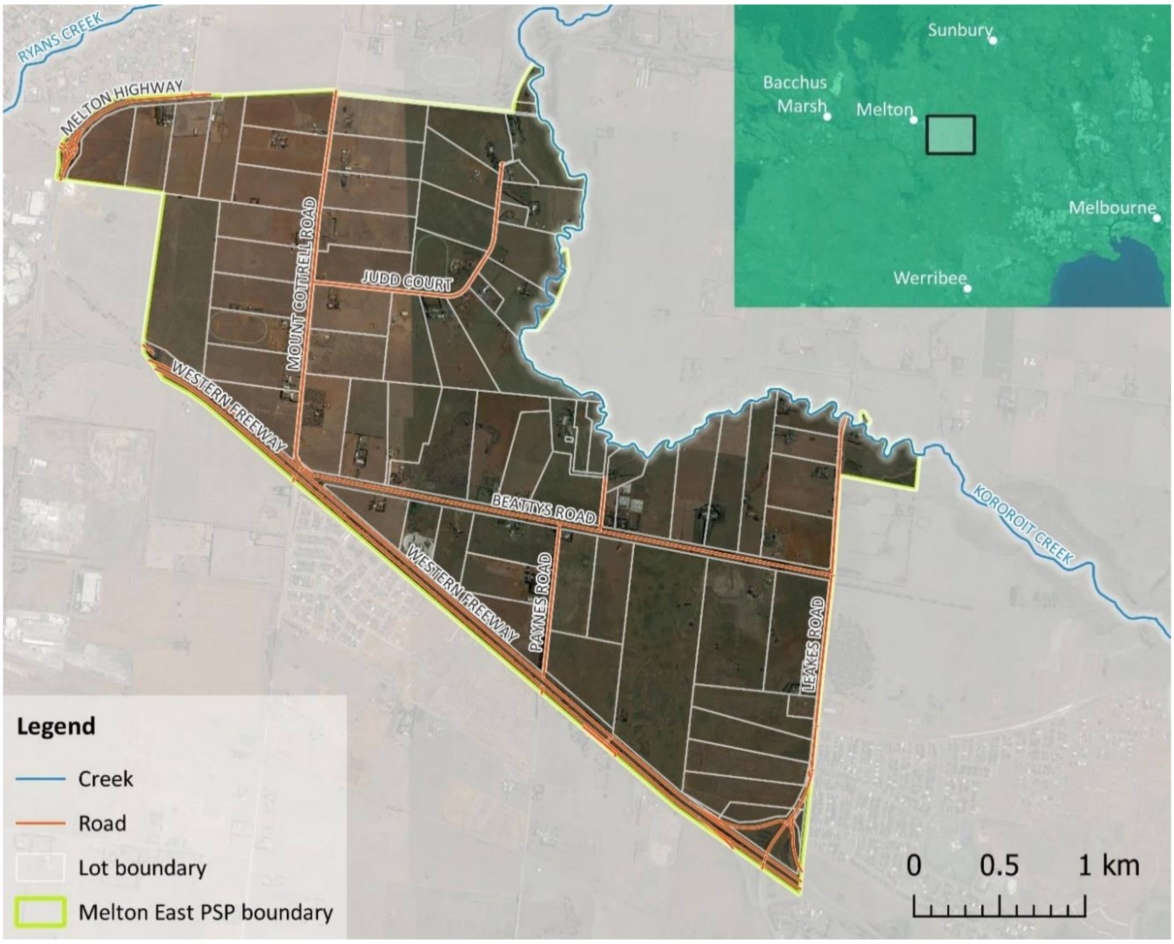

Figure 1. *Melton East precinct overview*

The Melton East PSP is being prepared in line with the VPA's PSP 2.0 co-design process. As part of this process the VPA is collaborating with Melton City Council, Melbourne Water, Greater Western Water, DELWP as well as landowners and other interested stakeholders.

Stakeholders were engaged during the year through three stages. Pitching sessions were held in March 2022, a Vision and Purpose Workshop was held in June and a Co-design Workshop was held in November. These engagement steps provided stakeholders an opportunity to share their vision for the precinct and contribute to the draft place-based plan. The outcomes of this IWM report will contribute to the development of the PSP following the Co-design process.

The co-design process includes two phases of technical studies. The Phase 1 studies are now either complete or nearing completion, including assessments of climate resilience, land capability, Aboriginal cultural impact and values, post contact heritage, utilities, economics, arboriculture, community infrastructure, and landscape and visual impact. The Phase 2 studies, including this IWM Plan are now commencing.

1.1 Integrated Water Management (IWM) issues and opportunities assessment

The aim of IWM is to bring together all elements of the water cycle to contribute to the precinct's vision and achieve positive social, economic and environmental outcomes for the future community. This report assesses the Integrated Water Management (IWM) issues and opportunities for the Melton East as part of the Phase 2 technical studies for the precinct. This process will support the identification of opportunities that are consistent with the site's overarching strategic direction, are supported by the stakeholders and are considered to be technically feasible.

Prior to preparing this Issues and Opportunities report the following preparatory work was undertaken:

- A 'Situational Analysis' report that summarises the bio-physical context of the PSP
- An IWM 'Issues and Opportunities' workshop where a summary of the Situational Analysis was presented, and stakeholders were invited to highlight IWM issues and opportunities they would like to see considered.

Stakeholder contributions are summarised in Section 3 below.

1.2 Melton East precinct brief overview

While the strategic and bio-physical context of the Melton East precinct is presented in detail in the Situational Analysis, some key points that will influence the approach to IWM are duplicated here:

- The Melton East precinct is almost entirely within the Kororoit Creek catchment. Kororoit Creek accounts for the entire northeast border of the precinct.
- Mean annual rainfall is approximately 510 mm (based on the nearby Rockbank gauge) and is therefore drier than much of Metropolitan Melbourne (approximately 700 mm).
- The majority of the precinct is Urban Growth Zone with Rural Conservation Zone and Urban Floodway Zone along the length of Kororoit Creek.
- The 13 Ha Kororoit Creek No. 3 wetland is a Seasonal Herbaceous Wetland. It is filled by a 605 Ha catchment that is almost entirely within the precinct as well as being hydrologically disconnected from the waterway.
- The *Biodiversity Conservation Strategy for Melbourne's Growth Corridors (DEPI, 2013)* or BCS, has identified the Kororoit Creek as an important habitat corridor Reaches of the Kororoit Creek within the Melton East precinct are included as a 'conservation area' within the BCS.
- The *Growling Grass Frog Masterplan for Melbourne's Growth Corridors (DELWP, 2017)* highlights the area between Kororoit Creek K36 Streamside Reserve (at the Melton Highway) to Kororoit Creek No. 3 wetland (at Beattys Road) as a '*High priority reach*' for GGF.

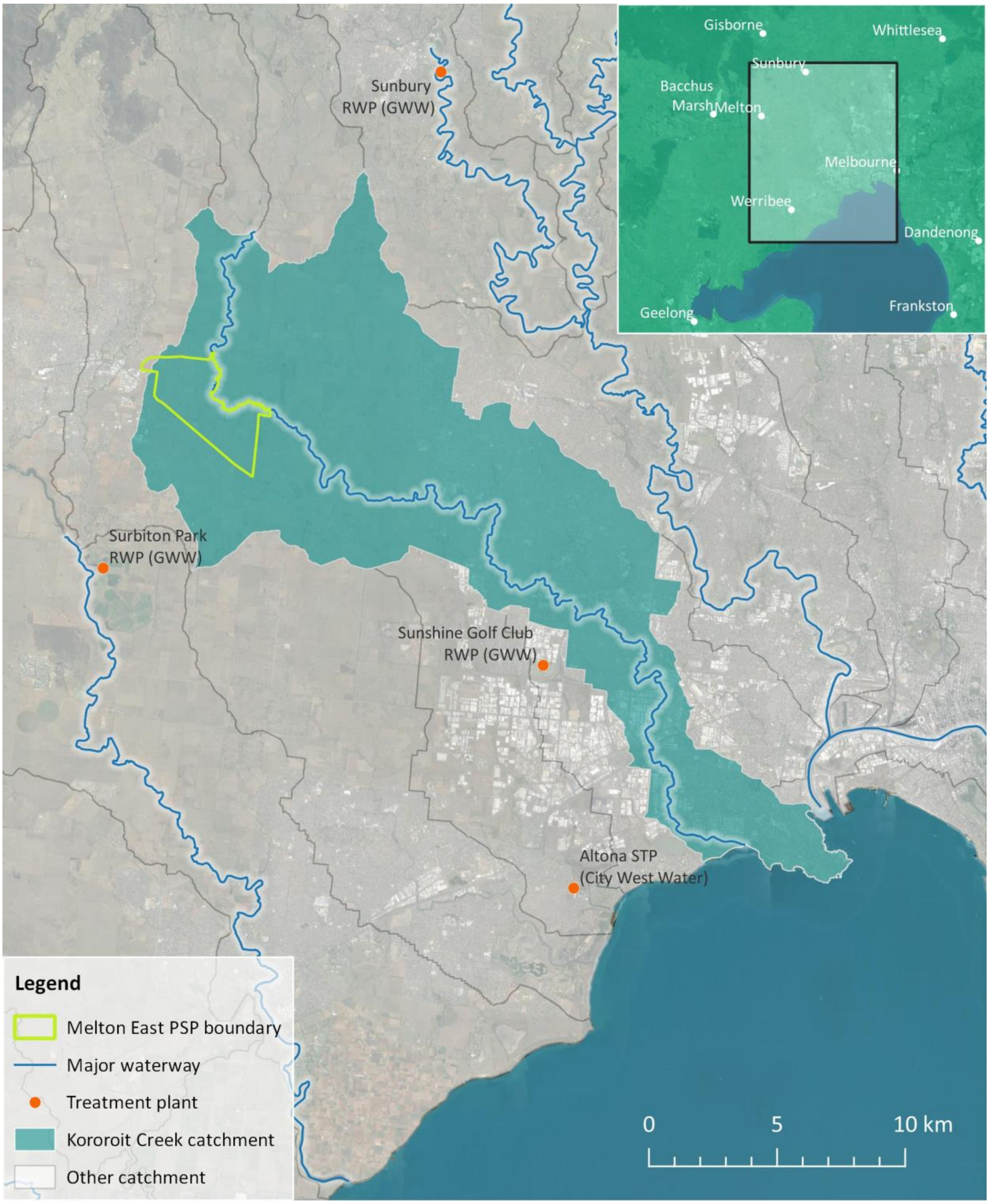

Figure 2. *Regional context of the Kororoit Creek catchment (based on Melbourne Water catchment mapping)*

2 Base case water balance

As part of establishing a context for the identification of IWM opportunities, a base case water balance for the precinct has been completed to:

- Quantify the impact of development on the surrounding environment and water cycle services
- To assess how IWM measures may contribute to the development's objectives and mitigate those impacts.

2.1 Assumptions

To prepare the water balance, the following assumptions have been adopted, with sources noted. Water demand associated with residential use and irrigation has been included. Commercial water use estimates have not been included, given the difficulty in estimating these accurately.

Table 1. Summary of Water Balance Assumptions for Melton East PSP

Description	Number	Source
Lots	11,000	VPA Communications (October 2022)
People per household	3.1	VPA Communications (October 2022)
Estimated total population	34,100	VPA Communications (October 2022)
Potable water use	157 L / person / day	Greater Western Water (2022)
Sewerage generation	85% of potable water use	Greater Western Water (2022)
Average impervious fraction	0.70	Melbourne Water MUSIC Guidelines
Area of open space		
Active open space	6-7 % of total non-development area (Assumed as 6%)	VPA Communications (October 2022)
Passive open space	3-4% of total non-development area (Assumed as 4%)	VPA Communications (October 2022)
Irrigation rates (estimated)		
Active open space	4.9 ML/Ha/year	Clearwater 2012
Passive open space	0 ML / Ha/ year	Assumed no irrigation in the base case

The provision of recycled water is not assumed as part of the bae case as it is not mandated for this area. The potential for Class B to be supplied for irrigation will be the subject of the Issues and Opportunities review below.

2.2 Potable water and sewerage generation

Based on the assumptions above, potable water use and sewage generation estimates are provided in Table 2.

Table 2. Water use and sewage generation

Description	Number / Area	Metric / Assumption	Total (ML/year)
Residential potable water use	34,100 population	487 L / household / day or 157 L / person per day	1,954
Area of active open space	33 Ha	4.9 ML/Ha/year	162
Area of passive open space	22 Ha	0 ML/Ha/year	0
Average annual potable water use (assuming irrigation of active space)			2,116 ML/year
Average annual sewerage generation (assuming 85% of residential potable water use)			~1,800 ML/year

** Exact area of Passive and active open space will change depending on the final NDA of the precinct*

2.3 Household non-potable water use

Non potable water use was estimated based on City West Water's Residential End Use Measurement Study (2019). Table 3 summaries the estimates for toilet, laundry, and irrigation use. These estimates have been confirmed more recently by Greater Western Water (*pers comms*). This is relevant for the assessment of lot scale and communal rainwater harvesting schemes.

Table 3. Non-potable water use estimates

Description	Metric	Per household (kL/year)	Precinct (ML/year)
Toilet	90 L / household /day	33	361
Laundry	34 L / household /day	12	136
Irrigation	72 L / household /day (average)	26	289
Total non-potable water use		72	786

2.4 Stormwater and pollutants

Melbourne Water Drainage Scheme

At the time of writing Melbourne Water are preparing a drainage scheme for the precinct. Drainage schemes specify the location and footprint of water management and treatment assets including retarding basins, stormwater treatment wetlands and constructed waterways. A draft layout provided by VPA (Figure 3) shows the potential location of approximately 11 wetland / retarding basins combined assets and conservation areas.

For the purposes of assessing stormwater harvesting, it is assumed that 6 of the 11 wetlands would be suitable for a harvesting scheme. These are the larger wetland systems while smaller treatment assets have been excluded. Figure 4 shows the location of proposed wetlands by Melbourne Water within the Melton East Precinct.

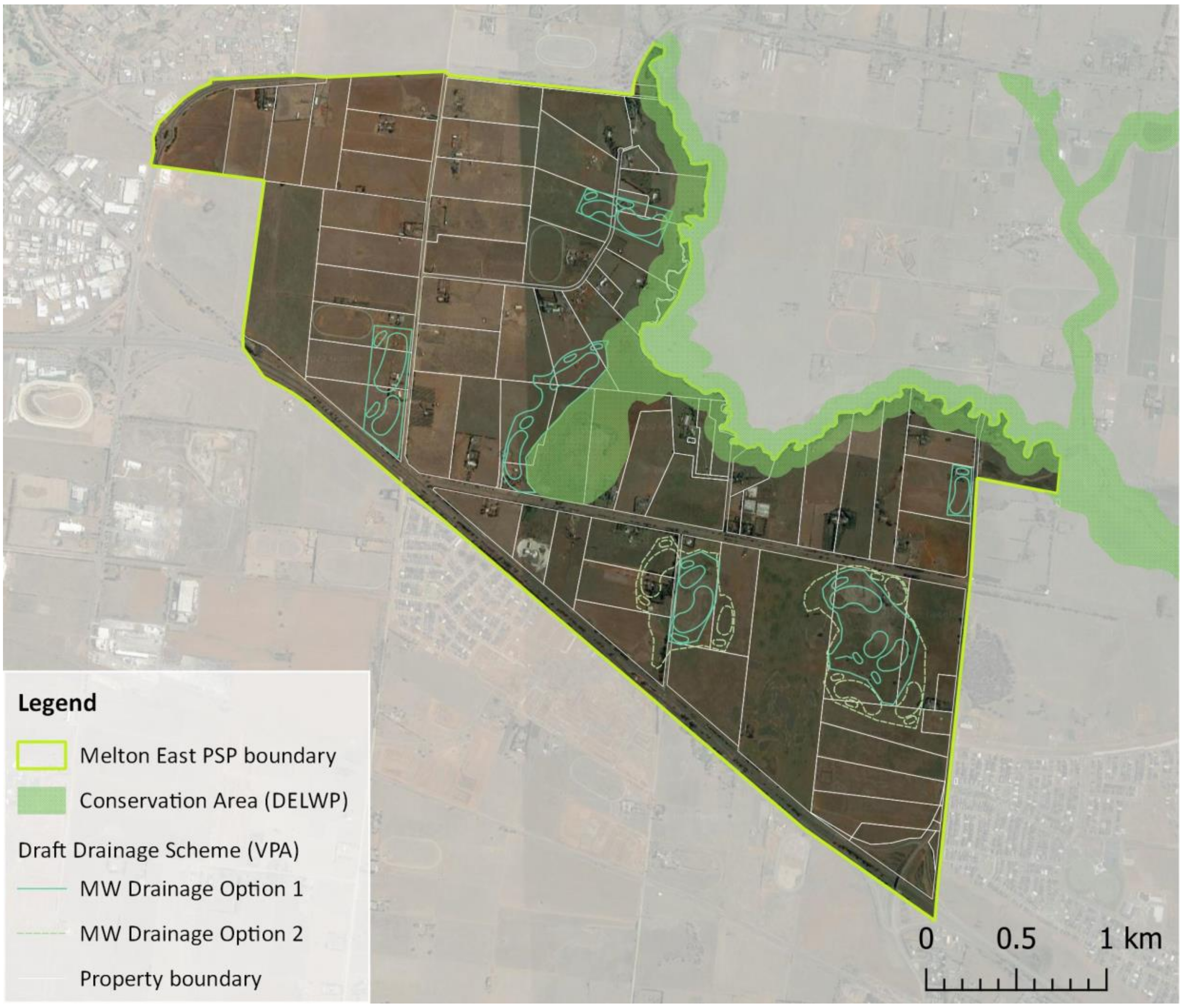

Figure 3. *Melton East PSP draft drainage scheme layout (Courtesy of Victorian Planning Authority, 2022)*

Prior to this project Alluvium had worked with Melbourne Water to prepare a wetland layout for Melton East in preparation for the Melton Regional Stormwater Harvesting Scheme project. The driver for the investigation of a Regional scheme is that Kororoit Creek Lower sub-catchment is defined as a priority sub-catchment within the Healthy Waterways Strategy. As a priority sub-catchment there are stormwater harvesting and infiltration targets:

- Stormwater harvesting of 3.8 ML/year per additional impervious Ha, and
- Stormwater infiltration of 0.7 ML/year per additional impervious Ha.

These rates of harvesting and infiltration are deemed necessary to meet the Healthy Waterways Strategy targets for the Kororoit Creek Lower sub-catchment.

The wetland layout prepared was reviewed by Melbourne Water's development services team. Overlaying this work from 2021 with the above plan shows that the two are closely aligned (see Figure 4). Based on this, the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) model that was associated with that layout has been relied upon to estimate stormwater and pollutant volumes for the precinct.

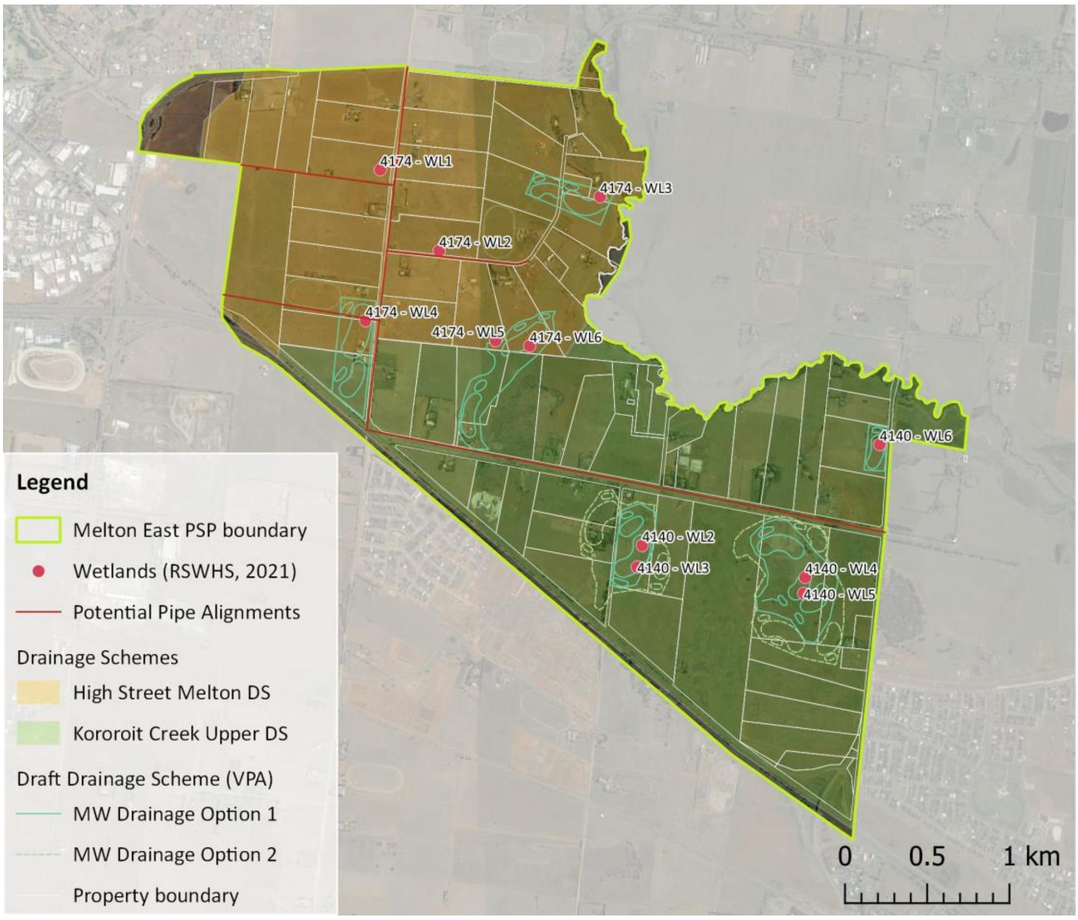

Figure 4. *Proposed wetland asset locations based on Regional Stormwater Harvesting Scheme*

The MUSIC model was developed using Melbourne Airport rainfall and evapotranspiration data at a 6-min timestep in accordance with the 2018 Melbourne Water MUSIC Guidelines. The MUSIC models for the High Street Melton DS and Kororoit Creek Upper DS had an average imperviousness of 70%.

Table 4 summarises the catchment sizes for each wetland asset within the Melton East PSP.

Table 4. Summary of catchment sizes and assets from MUSIC

Drainage Scheme	Catchment (ha)	Asset Name
High Street Melton DS	69.4	WL1
	50.2	WL2
	55.3	WL3
	97.6	WL4
	30.6	WL5
	66.8	WL6
Kororoit Creek Upper DS	190.5	WL2
	20.2	WL3
	60.8	WL4
	124.9	WL5
	53.4	WL6
	18.6	SB1
	12.8	SB2

A summary of the outputs from the MUSIC model are provided in Table 5 below.

Table 5. Stormwater volume and pollutant load summary

Description	Total
Average stormwater runoff volume (GL / year)	2.34 GL/year
Stormwater pollutants (tonne / year)	
Total suspended solids	75
Total nitrogen	3.7
Total phosphorus	0.3

2.5 Base case water balance summary

A summary of the Melton PSP base case water balance set out above is provided in Figure 5.

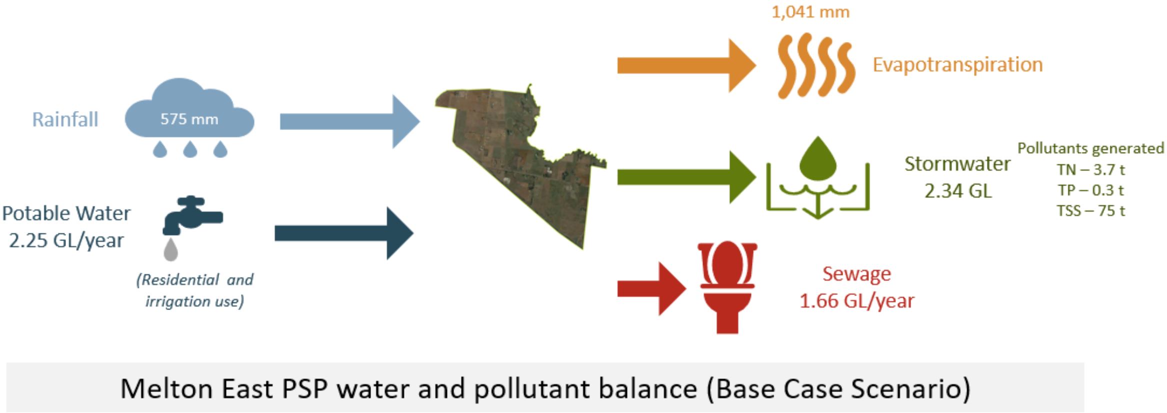

Figure 5. *Melton East PSP base case water balance schematic*

3 IWM Issues and Opportunities

The process of identifying IWM Issues and Opportunities began with the previously published Situational Analysis report. While the Situational analysis didn't specifically identify IWM Opportunities, it did identify a number of Issues that will need to be considered as part of this study. Issues and Opportunities were also identified within the project's stakeholder workshop.

3.1 Stakeholder Workshop

A stakeholder workshop was held on 21st September 2022, which included attendees from VPA, Melbourne Water, DELWP, Greater Western Water and Melton City Council (Table 6). The main aims of the workshop were to:

- Present the outcomes of the Situational Analysis.
- Seek feedback from stakeholders on their perspectives of the site, the region and factors that will influence the approach to IWM within the precinct.
- Collaborate to identify place-based IWM issues and opportunities.

Table 6. Attendees for Stakeholder Workshop

Organisation	Attendee	Role
Victorian Planning Authority	Rion Casey	Strategic Planner
	Zachary Powell	Senior Strategic Planner
	Alastair Jaffray	Strategic Planning Manager
	Monique So	Infrastructure Engineer
	Olivia Gauci	Student Planner
Department of Environment, Land, Water and Planning (DELWP)	James Walsh	Project Officer
	Cameron J Pearce	Planner
Melbourne Water	Ian Pham	Strategies Engineer
	Katy Marriott	Environmental planner
	Andrea Carr	Strategic Planning Manager
	Olivia Blair-Holt	Stormwater Advisor
Greater Western Water	Jonathan Ho	IWM Planner
Melton City Council	Anastasia Badina	Strategic Planner
	Jayson Tran	
	Marshall Kelaher	City Design Co-ordinator
	Bhavin Mehta	Infrastructure Planning Coordinator
	Inoka Sanjeewanie	Infrastructure Planning Engineer

Workshop Issues and Opportunities summary

A summary of the outcomes of the stakeholder workshop is provided in Table 7 (Opportunities) and

Table 8 (Issues). A screen shot of the 'raw data' on the Mural board from the workshop is provided in Appendix A. With the workshop these were categorised against the seven outcomes defined within the Werribee IWM Strategic Direction Statement (SDS) and according to three scales: lot, street and precinct. SDS Outcome 2 "Effective and Affordable Wastewater Systems" was not addressed directly, however some Opportunities will impact wastewater generation and reuse.

Table 7. Summary of IWM Opportunities – workshop output

Scale	Strategic Direction Statement Outcomes					
	Safe, secure, and affordable supplies in an uncertain future	Opportunities are optimised to manage existing and future flood risks and impacts	Healthy and valued waterways and marine environments	Healthy and valued urban and rural landscapes	Community values are reflected in place-based planning	Jobs, economic growth and innovation
Lot	***Household rainwater harvesting***: for toilet, laundry and garden irrigation ***Water efficiency standards***: for household appliances.			***Passive irrigation of street trees:*** Connect roof catchment to street trees as an alternative to passive irrigation from stormwater runoff. Consider charged downpipe for rainwater harvesting. ***Infiltration of roof water:*** roof water diverted to lot scale raingardens.		
Street	***Class B recycled water***: for street tree irrigation along boulevards (ongoing operation would need to be considered) ***Centralised / communal rainwater collection:*** for local use e.g. public realm irrigation or feeding back to higher density residences. Consider smart tank technology for flood mitigation and maximum rainwater yield.	***Distributed storages:*** Using public realm to retain stormwater and reduce peak flows (Potentially combine with centralised rainwater harvesting?).	***Growling Grass Frog (GGF):*** Creek and road crossing locations for GGF to improve habitat connectivity.	***Passive irrigation of street trees:*** via stormwater diversion from kerb ***Services:*** shift services to beneath road pavement to maximise tree growing space ***Road cross-sections:*** alter road cross sections to accommodate passive tree irrigation e.g. see Minta Farm example presented in the workshop ***Transform encumbered land:*** Use encumbered space for recreation and amenity space.	***Shadeways:*** use trees, shade and passive irrigation to support community connectivity.	
Precinct	***Centralised / communal rainwater collection***: as above, for local use e.g. public realm irrigation or feeding back to higher density residences ***Class B recycled water***: for active and passive open space irrigation. ***Regional Stormwater Harvesting Scheme (RSWHS) infrastructure***: Allow space for pipeline easements and pump stations footprints.	***Asset delivery***: timely delivery of scheme flood mitigation and stormwater assets i.e. wetlands and retarding basins ***Land take***: Strategically place stormwater harvesting infrastructure to reduce land take ***Seasonal Herbaceous Wetland (SHW):*** divert flows to the SHW e.g. from the west of PSP boundary.	***Growling Grass Frog:*** alternative water sources to supply GGF habitat along Kororoit Creek ***Ecohydrology***: PSP to support hydrological requirements for the SHW and GGF habitat. ***Western and eastern depression***: Maximise the multiple benefits associated with the western and eastern 'depressions'	***Shadeways***: Integrate shadeways into PSP urban structure & prioritise neighbourhood green spaces ***Community ecological spaces***: SHW drainage reserves, Kororoit Creek and GGF habitats are integrated into community as unique ecological assets ***Revegetation of Kororoit Creek:*** Consider thermal variability along the creek. A mosaic of open un-shaded areas that provide warm pools along the creek that are beneficial for GGF in minimising impacts of Cytrid fungus ***Healthy Waterways Strategy targets***: contribute to stormwater harvesting and infiltration	***Cultural heritage***: Incorporate indigenous cultural heritage through wetland and waterway design and interpretation ***Connection to ecological assets:*** Layout (and drainage) to incorporate Kororoit Creek, SHW and GGF habitat to preserve unique ecological assets.	***Land owner support***: Encouraging the major landowners to be supportive for innovative and holistic approaches to IWM

Table 8. Summary of IWM Issues – workshop output

Scale	Strategic Direction Statement Outcomes					
	Safe, secure, and affordable supplies in an uncertain future	Opportunities are optimised to manage existing and future flood risks and impacts	Healthy and valued waterways and marine environments	Healthy and valued urban and rural landscapes	Community values are reflected in place-based planning	Jobs, economic growth and innovation
Lot						
Street					***Cultural Heritage:*** the VPA's cultural heritage review might impact the location and design of existing drainage infrastructure (TBC). ***Traditional owner consultation:*** Melbourne Water to consult with Traditional Owners where proposed assets are located to avoid/minimise impact.	
Precinct	***Regional Stormwater Harvesting Scheme (RSWHS) infrastructure***: Ensure RSWHS doesn't impact natural conditions and functions of the Seasonal Herbaceous Wetland. ***Floodplain function:*** As per existing conditions, the precinct has primary flood plain function which needs to be retained in a developed scenario.	***Upstream flows:*** Large upstream catchments (including Iramoo Circuit & Shogaki Drive) upstream of the PSP will influence flooding ***Stormwater management strategy:*** there is not an existing, interim stormwater management strategy **Encumbered open spaces:** locations within the Western Growth Corridor Plan for regional active open spaces are subjected to flooding ***Flood mapping:*** required to understand how much of regional active open space will be impacted by flooding.	*Sodic soils*: Impacts of sodic soils on waterway cross sections and wetland management ***Seasonal Herbaceous Wetland (SHW):*** • Need to maintain the wetting and drying regime of the SHW • The SHW has a floodplain function that needs to be retained in a developed scenario. *Growling Grass Frog*: Ensuring water going to GGF wetlands is appropriate quality *Groundwater and groundwater dependent ecosystems*: Need to understand the impacts of development on groundwater and groundwater dependent parts of Wetland 3 and other values (such as River Red Gums)	*Environmental flows:* Can water for the environment be prioritised over harvesting? These are relatively small volumes but very important to support the Biodiversity Conservation Strategy (BCS)	***Cultural Heritage:*** IWM will need to consider the Cultural Heritage implications of the natural depressions within the precinct. Input from Traditional Owners on landscape and future vision for the site.	

3.2 Ecohydrology Issues and Opportunities

There are a number of important ecological values within the Melton East PSP that give rise to issues and / or opportunities around their protection and preservation over the longer term. In general terms a key issue will be how urban hydrology will impact resident ecological values. Conversely, a key opportunity will be understanding how the urban water cycle can be designed to support ecological assets into the future. Previous reports have addressed some of these concerns, however in some cases further investigation is likely to be required. Four features that are highlighted below include:

- Wetland Number 3 (Seasonal herbaceous Wetland)
- Growling Grass Frog and associated habitat
- The Eastern (RB2) and Western (Paynes Road Wetland) depressions
- Woodlands Reserve (to the east of Leakes Road, and outside of the PSP).

Seasonal Herbaceous Wetland (Wetland Number 3)

Seasonal Herbaceous Wetlands (SHW) are isolated freshwater wetlands that are seasonally or intermittently filled by a local non-riverine catchment. They are usually inundated from spring to winter and generally dry out by late summer. SHWs are dependent upon these wetting and drying patterns where the depth, duration and frequency of inundation is highly variable (Glenelg Hopkins Catchment Management Authority, 2017).

Kororoit Creek No. 3 wetland is identified as 'a Seasonal Herbaceous Wetland protected under the Environment Protection and Biodiversity Conservation Act [EPBC] (1999)'. The Kororoit Creek No. 3 wetland has a surface extent area of approximately 13 ha and a catchment area of 605 hectares (approximately 460 ha within the PSP boundary) (Figure 6).

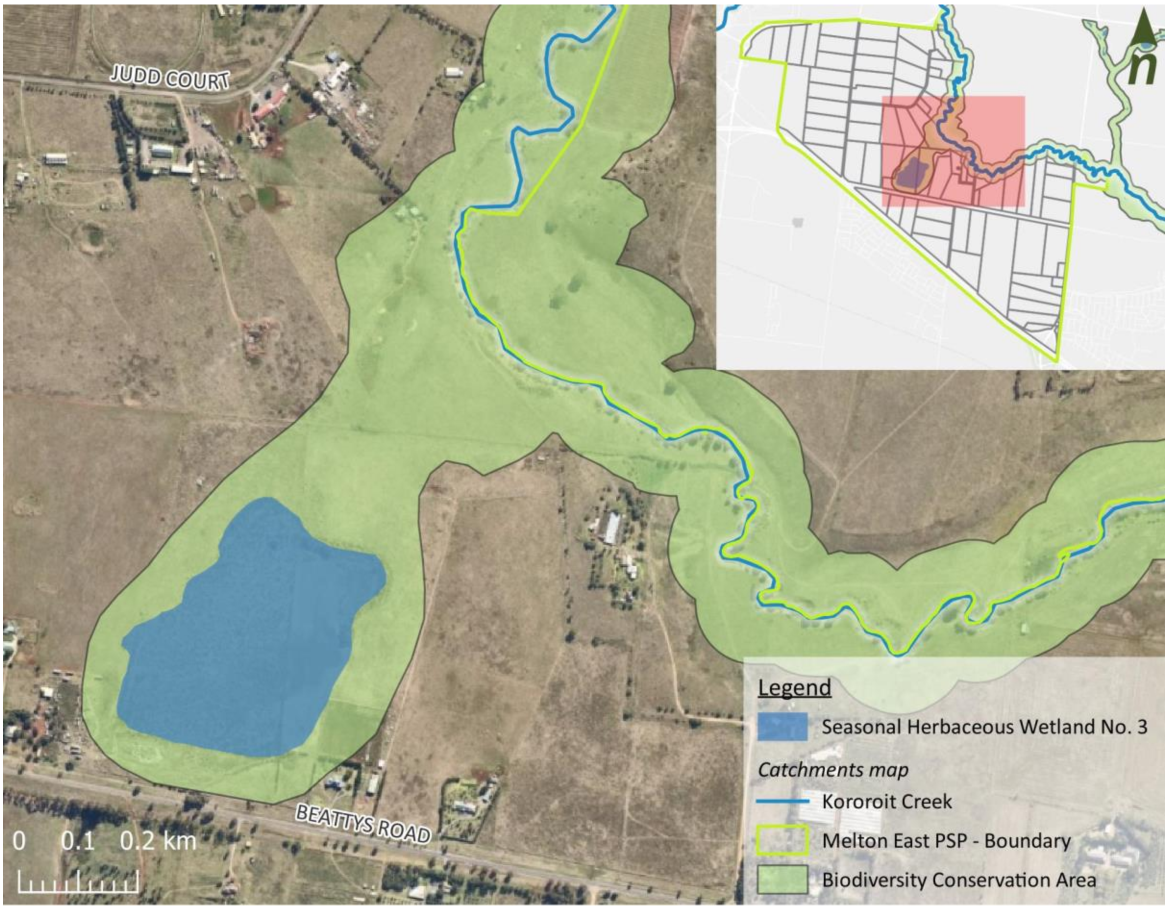

Figure 6. *Kororoit Creek No. 3 wetland location within the Melton East PSP*

The SHW was covered in the Situational Analysis, however one of the key challenges will be designing a drainage scheme that mimics the wetting and drying regime that is necessary to sustain a SHW. In general terms, there are four wetting and drying phases:

1. Dry – where most plants remain dormant and species may be difficult to identify
2. Filling – with inundation taking place over 2 – 3 months stimulating aquatic plant growth
3. Full phase – a diverse array of aquatic plant and invertebrate species are present
4. Draw down phase – evaporation exceeds rainfall and water levels reduce. SHW may dry out relatively quickly.

The wetland catchment is hydrologically disconnected from the Kororoit Creek. Based on the HWS Co-designed Catchment Program for the Werribee Catchment (2018), the current state of the wetland's bird and vegetation values are denoted as 'very low', while the frog value is 'moderate'. There are however other investigations that have made comment on the condition and values of the SHW including:

- Cook (2013) 'Rockbank Area Wetland Survey' which identified the area as potentially high quality Seasonal Herbaceous Wetland (pers comms, 2023), and

- Biosis (2012) in their review of habitat corridors for Growling Grass Grog (GGF) which identified the wetland as likely Growling Grass Frog Breeding habitat.

The SHW is a protected ecosystem under the EPBC Act (1999) and the shift toward an urban hydrology is likely to have a significant impact on resident values if not carefully managed. A study by Alluvium (2018) modelled changes in hydrological regime due to urbanisation. The study investigated two scenarios:

1. A Connected Catchment: where runoff from impervious surfaces was connected to the wetland (increasing the frequency of inundation to a near continuous state), and
2. A Disconnected Catchment: where the runoff from impervious surfaces bypasses the wetland through local drainage.

The study concluded that a business-as-usual approach (A 'connected catchment') will reduce the ecological values of the wetland. Suggested mitigation measures were recommended and are summarised in Table 9.

Table 9. Seasonal Herbaceous Wetland Recommendations summary (Alluvium, 2018)

Mitigation Options	Description
Prevent development within the SHW catchment	Provide a hydrological regime that provides seasonal water availability to support SHW vegetation
Create a hydrologic buffer	Preserve part of the SHW catchment in its existing condition. Incorporate public open space as part of the buffer to maximise the benefits of the buffer without compromising the health of the SHW. Adjust (design for) water flows to respond to seasonal water requirements and/or water level monitoring information
Installation of operable flow diversion within the local drainage system and WSUD assets (such as inlet sediment ponds) to improve quality of water entering the wetland	Provide stormwater treatment from the catchment flows to mitigate sediment and dissolved nutrient flows to the wetland.
Alternative water supply	Provide an alternative water source (e.g. from potable water or groundwater) to manually inundate the wetland.

While meeting these recommendations may not be practicable in the context of the proposed development, they provide a meaningful guide as to what will need to be considered in order to protect the SHW.

Growling Grass Frog Habitat

The *Growling Grass Frog Masterplan for Melbourne's Growth Corridor (Masterplan)* identifies the Kororoit Creek within the Melton East PSP ('Reach 4') as a "high-level investment priority with the lowest risk of extinction and greatest capacity to support multiple metapopulations". The Kororoit Creek wetland No. 3 (i.e. the SHW discussed above) is also identified as an 'Area of Strategic Importance' for Growling Grass Frogs with the opportunity to enhance this wetland (i.e. the SHW) and construct a cluster of up to seven wetlands to support GGF habitats (DELWP, 2017).

Clearly, a key ecological opportunity will be the connection of the Kororoit Creek's riparian habitat with the SHW as per Figure 7 below. The design of this approach will need to be investigated however the figure from the Growling Grass Frog Masterplan suggests a number of smaller wetlands to connect the creek and wetland. Consideration will also need to be given to the location of GGF wetlands. Advice from DEECA , suggests that "wetlands in a cluster should be within easy migration distance, preferably no more than 200-300 metres apart where feasible".

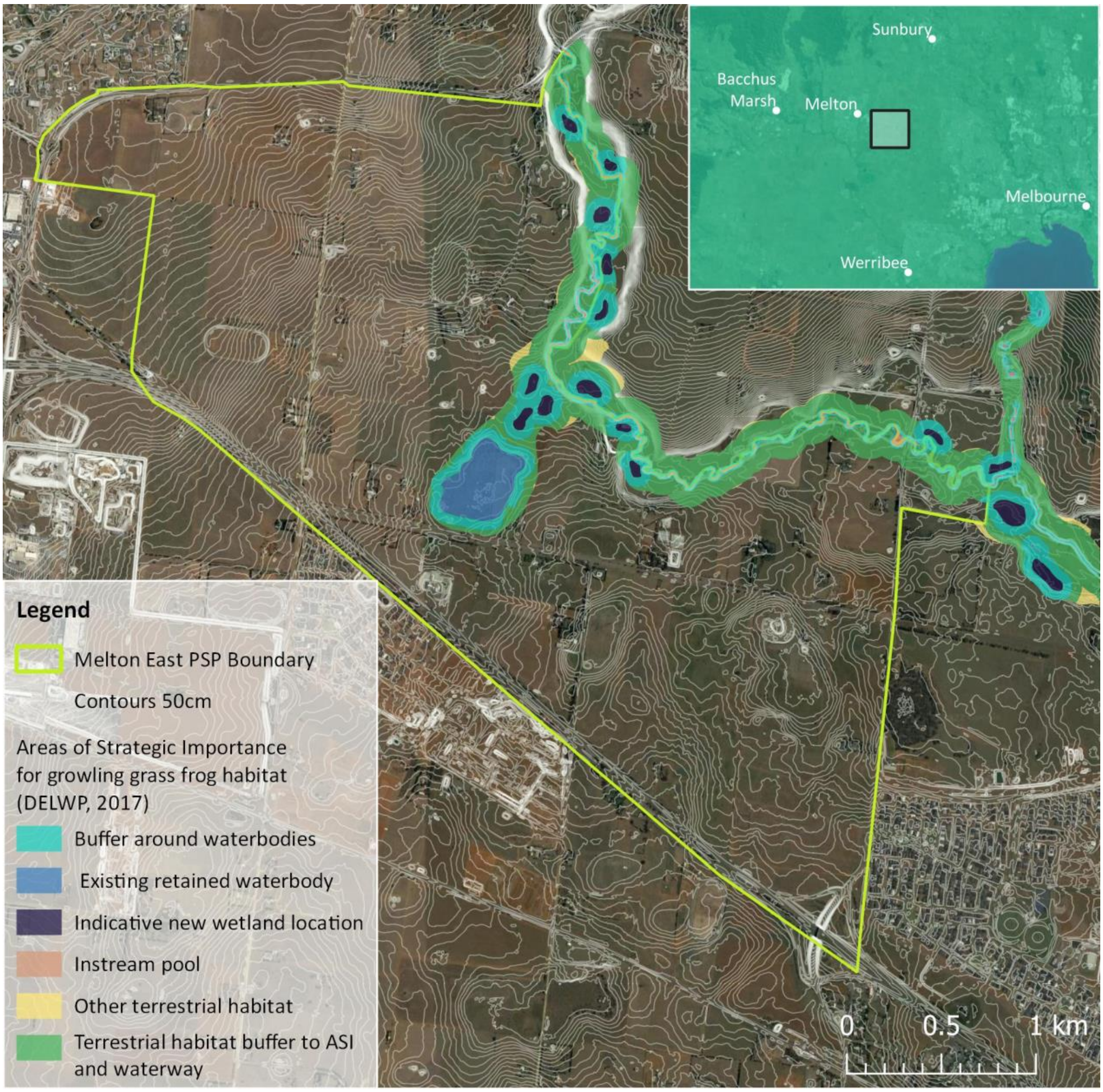

Figure 7. *Areas of Strategic Importance for growling grass frog habitat at the Melton East Precinct*

The *Growling Grass Frog Habitat Design Standards (DELWP, 2017)* provide practical advice regarding GGF habitat requirements, protection and investment (Table 10). Considerations for the design of GGF wetlands are included in Appendix B.

Table 10. Summary of Growling Grass Frog wetland design considerations (DELWP, 2017)

Specification	Parameters	Design consideration
Type	Wetland clusters	10 off-stream breeding wetlands should be in a cluster, however for shorter reaches, smaller clusters are acceptable with at least one wetland larger than 7,000m^2. Wetlands also need to be 200-300 m apart from one another
Hydrological design parameters	Size	• Surface area: At least 3,000m^2 (for most new wetlands) • Submergent zone: At least 1,000 m^2
	Shape	Wide enough to efficiently provide the required depth for submerged vegetation
	Volume	For a standard 3,000m^2 wetland, approximately 3.3ML or greater volume is required depending on area and water availability
	Depth	• Submergent vegetation zone: minimum 50% (ideally 60-70%) of total wetland surface area at Normal Water Level (NWL). Depth needs to be maintained greater than 1.5m • Emergent vegetation zone: 30-40% of the total wetland surface area at NWL
	Lining	Clay lining to prevent leakage, topped with a layer of soil (ensuring this doesn't lead to high turbidity). Clay soil is acceptable as substrate
Hydroperiod	Permanent wetlands	At least ¾ wetlands in a cluster should have permanent hydroperiod. Important for all wetlands to hold water during the breeding period (September to February)
	Semi-Permanent/Ephemeral wetlands	Accepted where capacity is limited to provide a permanent wetland or to maintain Seasonal Herbaceous Wetland
Terrestrial habitat	Temperature	All wetlands must incorporate extensive, shallow, permanently inundated emergent zone where water temperatures will be elevated due to the heat of the sun
	Rock piles	• All wetlands should incorporate jumbled piles of rock and boulder around at least 20% of the wetland margin (1m from NWL) to control chytrid fungus control. • "Anti-chytrid" wetlands in the basalt region (where excavated material can be used on site rather than paying for disposal offsite) should incorporate rocks around 50 per cent of the wetland margin if within budget

It should be noted that within the Melton East PSP there are different wetland types (SHW and GGF) that will need to respond to their own requirements while achieving a collective or PSP wide outcome. In that sense, they will need to be designed together. For example, there are ponds that will need to meet Growling Grass Frog (GGF) Guidelines, drainage scheme constructed wetlands that will meet Melbourne Water's Constructed Wetland Guidelines and Seasonal Herbaceous Wetlands that will respond to the ecological drivers.

From an IWM perspective, a suitable water source is important in creating habitat and maintaining water levels within the wetlands. Referring to the design standard, there are advantages and disadvantages to each water source based on availability, feasibility, suitability, and potential impacts.

Table 11 provides a summary of these parameters against a range of possible water sources assessing them from most to least preferred where:

- Most preferred is green
- Neutral is yellow and
- Least preferred is red.

Table 11. Water sources for GGF wetlands listed from most preferable to least preferable (DELWP, 2017)

	Factor					
Water Source	Salinity to reduce chytrid infection	Protection from Predator Fish	Water Source Reliability	Turbidity	Presence of Nutrients and Contaminations	Maintenance and Construction requirement
Groundwater						
Rainwater (surface runoff)						
Treated stormwater						
Stream water						
Rainwater (from roofs)						
Potable water						
Recycled water						

Since the release of the 2017 Masterplan, DELWP (now DEECA) has reviewed this hierarchy and concluded that gravity fed, treated stormwater is preferred when compared to stream water due to a number of factors including water quality, licensing requirements and predatory fish. The above table has been updated to reflect this change.

In summary:

- Groundwater is a potential source of water for GGF habitat as long as it has moderate salinity and isn't contaminated (that helps reduce chytrid infection and protects from predatory fish species). *Information from Melbourne Water suggests that groundwater quality may not be suitable and this will need to be confirmed*.
- Rainwater is a favourable source and (Kororoit) creek water may be suitable depending on the nutrient concentration.
- As noted above, DELWP see gravity fed and treated stormwater as preferred to stream (creek) water. Melbourne Water have suggested that they would prefer ecohydrological requirements to be prioritised over other uses such as stormwater harvesting uses/diversions. Melbourne Water has also acknowledged water to support GGF Seasonal Herbaceous Wetland will come out of the drainage/waterway system (*Melbourne Water pers comms*). This will need to be confirmed during more detailed design stages.
- Recycled water is likely to contain high nutrient loads making it less suitable.
- There is also potential to consider a mix of sources such as a 'shandy' of groundwater and stormwater, however the potential for this has not been investigated in detail.

Eastern (RB2) and Western (Paynes Road Wetland) Depression

The Eastern and Western Depression are natural depressions located close to Beattys and Paynes Roads respectively within the Melton East precinct. Referring to the Situation Analysis (Alluvium, 2022), the Eastern and Western depressions have the following features:

- The Eastern depression:
  - is approximately 3 ha in area
  - includes Plains Grassy Wetland ecological vegetation class (EVC)
  - is at an elevation of 105 m Australian Height Datum (AHD)
- The Western depression is:
  - approximately 9 ha in area
  - does not have an evident EVC
  - is at 102 m AHD.

As per communications with Melbourne Water, both depressions will function as retarding basins. The Eastern depression is referred to as RB2 and the Western depression is referred to as the Paynes Road Wetland. Melbourne Water has provided the following recommendations to utilise these depressions to provide a hydrologic function and to protect resident ecological values:

- Melbourne Water need to understand the nature and extent of existing values within these natural depressions to determine the layout and land-take for the preferred drainage servicing strategy.
- The VPA need to understand expected land uses, arterial road and path networks and land take risks in order to achieve better outcomes overall.
- Developers will seek alignment in timeframes, milestones and deliverables between Melbourne Water's drainage scheme and VPA's precinct planning.

Following the co-design workshop (November 2022), MW provided land take information in relation to both depressions (Figure 8). The two layouts show:

- On the left: Land take where drainage infrastructure is located within existing depressions (34 Ha)
- On the right: Land take where drainage infrastructure is located outside depression areas. (72 Ha).

This indicates the likely lower and upper bounds for land take for these depressions.

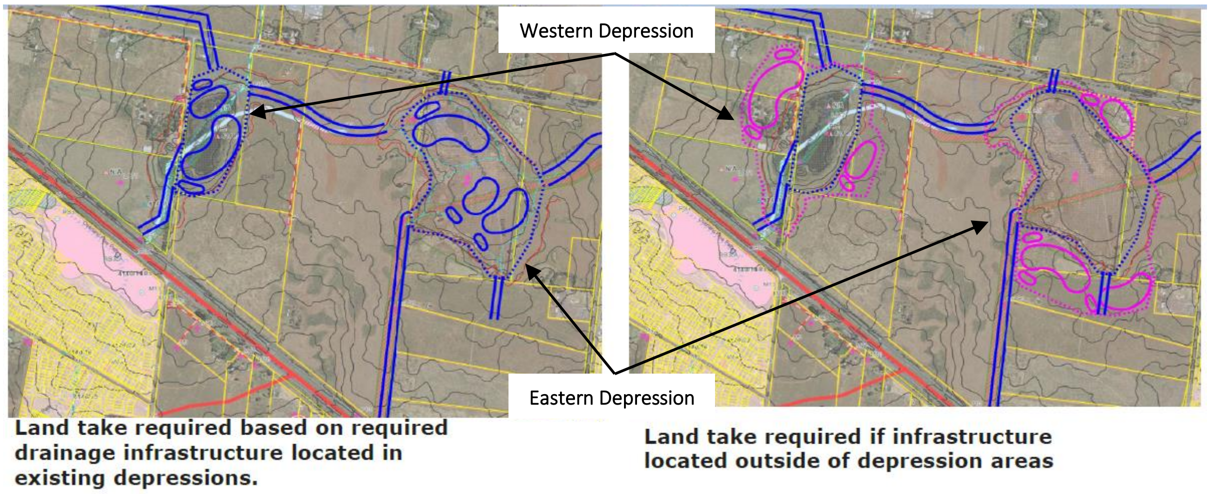

Figure 8 *Land take information for eastern and western depressions (Courtesy of Melbourne Water)*

Additional recommendation contained within the *Climate Resilience Assessment for Melton East PSP* (Hip V. Hype, 2020), for natural assets such as the Western and Eastern depressions was to "consider the creation of guidelines within landscape planning for the precinct (small depressions in the landscape that can capture inundation and dry out over a few weeks with a variety of plantings to support a diversity of fauna like frogs)."

Groundwater dependent ecosystems and Woodlands Reserve

During the review of this document questions were raised regarding the presence of Groundwater Dependent Ecosystems (GDE). The Land Capability Assessment undertaken by Jacobs in 2022 was referred to. While only summarised in dot points here, the interaction of groundwater with some of the ecological assets discussed above is highlighted:

- Kororoit Creek is listed as having a high potential for groundwater interaction as are "three wetlands adjacent to Beattys Road". The three wetlands referred to are the Seasonal Herbaceous Wetland and the Western (RB2) and Eastern Depressions (Paynes Road Wetland).
- "Vegetation on the banks of Kororoit Creek and toward the middle of the PSP are listed as having moderate to high potential for groundwater interaction".

Figure 9 below shows the three wetlands along Beattys Road as "High potential GDE – from regional studies". As such further consideration regarding the role of stormwater infiltration in recharging groundwater in the urban context is likely to require further consideration to maintain the ecological health of these features.

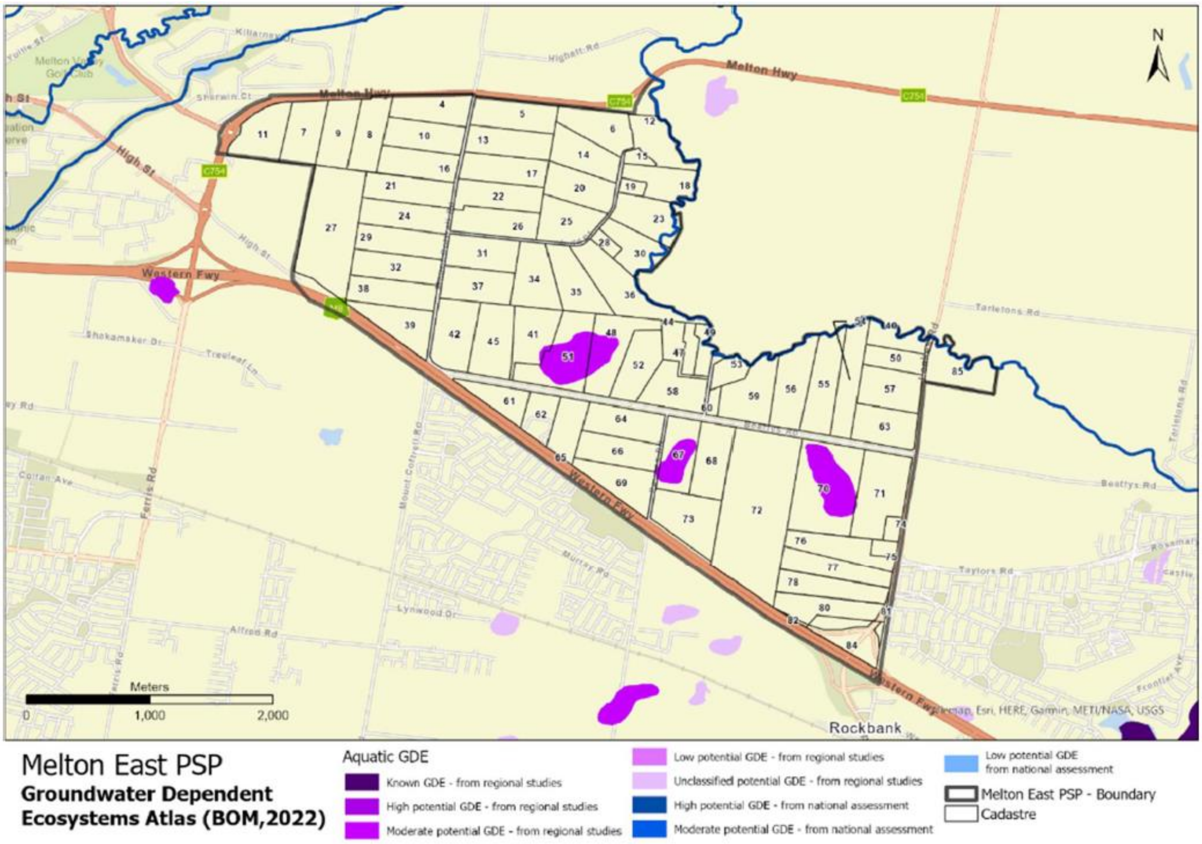

Figure 9 *Aquatic Groundwater Dependent Ecosystems (Source Jacobs, 2022)*

Woodlands Reserve: Another location identified during consultation is Woodlands Reserve. The Woodlands Reserve refers to a treed area to the east of Leakes Road. This is part of the Rockbank North PSP, to the east of the Melton East PSP.

Concerns were raised by Melton City Council regarding the potential impact of urbanisation on the reserve. This is based on the proposition that the reserve is a GDE. This is based on anecdotal evidence rather than any on-site or hydro-geological analysis. The anecdotal evidence refers to the reserve remaining green through extended dry periods. The issue is whether urbanisation may disconnect the reserve from its water source.

Melton City Council has undertaken some very preliminary analysis that quantifies the catchment and potential water source that may be sustaining the woodlands. While this analysis would require on-ground validation, the main issue this raises is managing ecological assets that cross PSP boundaries. Consultation on this issue with Melbourne Water revealed that the woodlands is being considered as part of their drainage scheme process.

The important takeaways therefore is that further investigation is required in order to:

- understand if the Woodlands Reserve depends on groundwater for its health,
- based on that understanding, seek to undertake development within Melton East in a way that does not compromise that relationship.

Figure 10 *Woodland Reserve location plan*

Proposed Ecohydrology Principles for Melton East

It is proposed that eco-hydrology principles be applied to the Melton East Precinct that reflect the considerations outlined above. Some of these are / will be aspirational, however they are listed here to guide the development of a PSP that will better protect its ecological assets.

1. Prevent development (as far as practicable) within the SHW catchment. It is accepted that this is not entirely practicable, however increasing infiltration and other actions like early construction of treatment and diversion assets, will mitigate impacts on the SHW from non-sequential development.
2. Create a hydrologic buffer between the catchment and the SHW. Again, it is accepted that this may not be practicable to be applied across the entire catchment.
3. Install suitable drainage and WSUD assets to regulate flow, improve quality and maintain optimal hydrological regime of water entering wetlands.
4. Design wetlands as per the Growling Grass Frog wetland design considerations.
5. Identification of an alternative water supply to maintain suitable water levels within GGF wetlands (including groundwater or rainwater).
6. Understand the role of groundwater in supporting ecological assets (i.e. identify groundwater dependent ecosystems).

Stakeholders have suggested that incorporating flexibility into mitigation actions to protect the hydrological values of SHW is important. Flexibility will allow future designers and managers to adapt to foreseen and unforeseen variables e.g. groundwater level and quality and rainfall under climate change.

3.3 IWM Opportunities Summary (against SDS outcomes)

From the stakeholder workshop, we compiled a list of 17 IWM opportunities for Melton East PSP across lot, street and precinct scales. As a first step in assessing these opportunities, they were each reviewed against the 7 SDS outcomes from the Werribee SDS. The opportunities and their performance against SDS outcomes are summarised in Table 12.

Table 12. IWM Opportunities for Melton East PSP

Scale	Opportunity	Description	SDS outcomes						
			Safe, secure, and affordable supplies in an uncertain future	Effective and affordable wastewater systems	Manage existing and future flood risks and impacts	Healthy and valued waterways and marine environments	Healthy and valued landscapes	Community and TOs values are reflected in place-based planning	Jobs, economic benefit, and innovation
Lot	Rainwater harvesting for toilet, laundry and garden irrigation on all lots	Conventional rainwater harvesting on all lots (regardless of size) with internal and external reuse							
	Water efficiency standards for household appliances	Conventional water efficiency measures to reduce appliance and fixture water use		Reduces wastewater volumes					
	Connect roof to street trees as an alternative to passive irrigation from stormwater runoff.	Passive street tree irrigation using a portion of the roof runoff	Assume no ongoing irrigation of street trees therefore no ongoing saving of water						
	Infiltration of roof water / stormwater on lot scale (e.g. via lot scale biofiltration)	Use of biofilter to receive and infiltrate rainwater tank overflow to reduce runoff							

Scale	Opportunity	Description	SDS outcomes: Safe, secure, and affordable supplies in an uncertain future	Effective and affordable wastewater systems	Manage existing and future flood risks and impacts	Healthy and valued waterways and marine environments	Healthy and valued landscapes	Community and TOs values are reflected in place-based planning	Jobs, economic benefit, and innovation
Street	Class B recycled water for street tree irrigation along key pedestrian boulevards	Dedicated Class B lines going down main streets to provide reliable water supply and reduce need for passive irrigation	Assume no ongoing irrigation of street trees	■			■	■	
	Integrate the 'shadeway' concept into PSP urban structure (w/ passive irrigation)	As per the Minta farm PSP example presented in the workshop				■	■	■	
	Centralised / communal rainwater collection for local use	Proposed as a pilot near to higher density housing to either irrigate open space or to be plumbed back to households	■			■	■		
	Creek and road crossing locations for GGF to improve habitat connectivity						■	■	
	Services under road pavement to maximise tree growing space						■		
	Transform encumbered land (e.g. for service infrastructure) as recreation and amenity space	Improved amenity associated with encumbered space e.g. as per Reimagining Retarding Basins					■	■	

Scale	Opportunity	Description	SDS outcomes: Safe, secure, and affordable supplies in an uncertain future	Effective and affordable wastewater systems	Manage existing and future flood risks and impacts	Healthy and valued waterways and marine environments	Healthy and valued landscapes	Community and TOs values are reflected in place-based planning	Jobs, economic benefit, and innovation
Precinct	Class B recycled water for open space irrigation	Class B network directed to open spaces	■	■			■	■	
	Accommodate Regional Stormwater Harvesting Scheme (RSWHS) infrastructure	Allow for easements for transfer mains and footprints near wetland outlets to house pump stations				■			■
	Redirect flows from constructed wetlands and catchments to the west	Reinstate pre-development flow paths			■	■	■		
	Alternative water sources to supply future GGF habitat along Kororoit Creek	Alternative source would need to be potable water or rainwater. Could rainwater harvesting serve this demand?					■	■	
	Implement ecohydrology principles	GGF / SHW / Kororoit Creek integrated into community as unique ecological assets					■	■	
	Western and eastern depression	Maximise multiple benefits – further description required. Assumed to be recreation / ecology / cooling / greening			■	■	■	■	
	Incorporate indigenous cultural heritage (through wetlands and waterways)	Further description required					■	■	

4 Issue and Opportunity assessment

The following is a high-level assessment of the opportunities listed above. Opportunities were assessed in line with the principles of the Preliminary Assessment Method (PAM) (DELWP, 2015) whereby options were assessed against benefits and costs with a view to shortlisting those options to take forward to the co-design process for the Melton PSP. The following is largely a qualitative assessment using low (L), medium (M) and high (H) ratings. What constitutes those ratings is explained in Table 17 below.

4.1 Opportunity assumption detail

Irrigation assumptions

Irrigation assumptions are relevant for stormwater harvesting and Class B irrigation network.

- For stormwater harvesting it is assumed that water supplied will equate to 60% of active open space demand. While schemes that are designed using MUSIC software are designed to meet 80% of the irrigation demand, communications with Councils with functioning systems suggest this may not be achieved in practice. We therefore propose that achieving 60% of irrigation demand may be a more conservative and reasonable estimate.
- For Class B water, it is assumed that 100% of irrigation demand will be met. It is also assumed that passive and active spaces will be irrigated by the Class B network across the precinct according to the following rates:
    - Active open space at 4.9 ML/Ha/year (as per Table 1)
    - Passive open space at 2.0 ML/Ha/year (assumed based on about half of the irrigation rate of active spaces).
- It is assumed that Class B will not be used for street tree irrigation.

The total irrigation demand for the precinct is summarised in Table 13.

Table 13. Irrigation demand summary

Category	Area (Ha)	Rate (ML/Ha/year)	Total (ML/year)
Active open space	33	4.9	162
Passive open space	22	2.0	44
			206

Communal rainwater harvesting
To support sizing of a communal rainwater harvesting scheme, it has been assumed that a tank could be assigned to a medium residential density of 20 lots per hectare. The rainwater would be fed back to the lot to meet toilet and laundry demands. Looking at Figure 11 below, and for the purposes of our analysis, a 30 kL tank is likely to be suitable and the minimum volume worth considering. This equates to 1.5 kL per lot.

A cost of $550/m^3 for sub-surface storage has been assumed based on previous projects that have gone to construction. The cost will also include collection of rainwater per house and distribution back to the house.

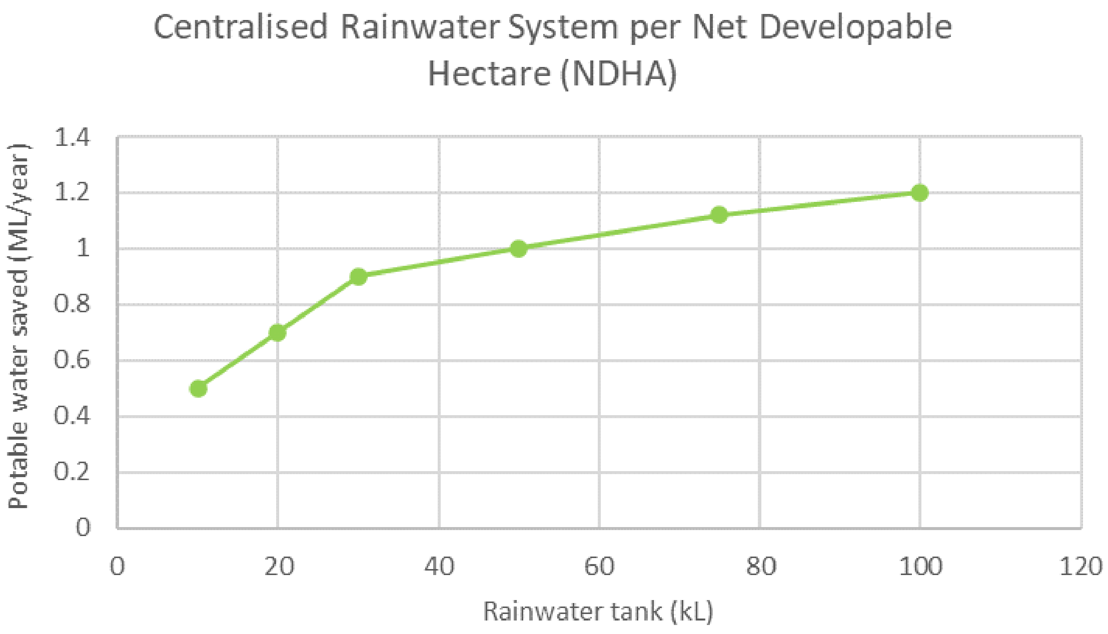

Figure 11. *Communal rainwater harvesting scheme potable water saved*

Rainwater harvesting
The rainwater harvesting modelling assumed that each lot has a 2kL tank was receiving roof water from a 230 m^2 roof area. This tank was then connected to laundry, toilet and irrigation demands as set out in Table 3.

For the purposes of this assessment, it is assumed that 50% of the roof area is connected to the rainwater tank. This is a total water saving of 396 ML/average year. This is 17% of average annual stormwater volumes. The 50% connected assumption is to ensure a level of conservatism in our estimates, but also to accommodate other opportunities that may rely on roofwater, such as passive irrigation of trees.

Table 14. Rainwater harvesting summary

Total roof area (m2)	Percentage of roof area connected (%)	Roof catchment area (m2)	Non-potable water volumes reused (kL/lot/year)	Total rainwater reused assuming 11,000 lots (ML/year)
230	100	230	47	517
	75	172	44	484
	50	115	36	396

Rainwater harvesting with overflow to a small biofilter

In this example, the rainwater from the 230 m2 roof catchment is directed to a 2 kL tank where some water is reused in toilet, laundry and garden. The overflow is directed to a.5 m^2 biofilter. The aim of this is to reduce runoff, increase infiltration and create a catchment hydrology that is more conducive to supporting the precincts ecological values, as well as broader HWS infiltration targets.

Table 15. Rainwater harvesting and flow reduction estimate

Roof catchment area (m2)	Stormwater out (kL/year)	Rainwater reused (kL/year)	Residual flow - post biofilter (kL/year)	% flow reduction (from roof catchment)
230	99	47	51	48

Class B Network

For the purposes of the assessment of a potential Class B scheme, we have assumed potential alignments of Class B pipelines that could theoretically 'cover' the Melton East Precinct (Figure 12). These are assumed alignments as we do not yet know the locations of open space that would be irrigated.

According to communications from Greater Western Water (GWW), the trunk main that is planned to go down Leakes, Beattys and Paynes Road is DN450 main. The Class B interconnector has been deferred until 2030 however and design activities have been put on hold. Therefore, ongoing engagement with GWW will be required to understand nthe status of that project.

Based on the alignment shown in Figure 12, the Class B pipe network would be approximately 10,000 m in length. At an assumed rate of $600/m for a DN450 main, this is estimated to cost about $6M. Figure 12 also shows the proposed Sunbury-Melton interconnector alignment, as GWW will be funding this interconnector, the costing for the Class B option will only account for the offtakes from the interconnector to the proposed open space locations.

GWW continue to analyse the costs and benefits of providing a Class B supply to the Melton East PSP. In general terms, as the main is proposed to run down Leakes Road, west along Beattys Road and south along Paynes Road, the cost of supplying open space to the east of the PSP will be less than those to the west. This work in ongoing and should be input into the process to inform later stages of planning and design.

Figure 12. *Class B recycled water proposed locations for Melton East*

4.2 Benefits summary

There are three 'Benefits' criteria that have been used to assess the performance of our IWM Opportunities:

1. **SDS outcomes**: This is an assessment based on the number of Strategic Directions Statement Outcomes the opportunity potentially responds to. This is essentially an assessment of the multiple benefits associated with the opportunity. This also includes a volumetric estimation (where possible) of the potable water saved by the opportunity.
2. **Healthy Waterways Strategy (HWS) Targets**: This assesses whether the Opportunity will contribute to the HWS targets for the Werribee Catchment, and therefore to waterway health.
3. **Ecohydrology principles**: This refers to whether the Opportunities contribute to the ecological health o the PSP and the ecohydrology principles proposed within this document.

4.3 Assumed costs

Preliminary costs have been estimated based on previous design and construction projects as well as industry references (e.g. Rawlinsons). These costs are indicative only and are provided for the purpose of comparison and are not to be relied upon for tendering purposes.

Table 16. Cost assumption summary

Item	Unit cost	Assumption	PSP cost	Description
Rainwater tank	$1,500 / lot	One per lot	$16.5 M	A 2kL rainwater tank that is estimated to save 36 kL / year / household or **396 ML/year**
Passive irrigation of street trees via kerbside entry	$2,500 / lot	One for every two lots	$13.7 M	Based on cost example from Minta Farm project
Passive irrigation of street trees via roof	$900 / lot	One for every two lots	$5 M	Based on cost example from Minta Farm project
Lot scale biofilter	$1,000 / lot	One per lot	$11 M	1.5 m^2 biofilter per lot installed at the outlet of the 2kL rainwater tank to reduce **48%** of lot scale flows.
Precinct scale stormwater harvesting scheme	$1.5 M per scheme	6 schemes across the precinct	$7.5 M	No detailed costs undertaken. Based on previous functional and detailed design cost estimates **Meets 60% of active irrigation demand or 176 ML**
Class B recycled water supply	$600 / m	10km of main	$6.0 M	It is assumed that a Class B recycled water main will cost $600/m based on rates associated with similar work in the western growth areas. A notional map of a Class B network could extend up to 10km (Figure 12). This will need to be refined. **Meets 100% of irrigation demand or 374 ML**
Centralised communal rainwater harvesting scheme	30kL tank @ $550.m3 $4,200 / lot rainwater collection network $2,500 / lot rainwater delivery network	20 lots	$150k	Assume 1 Ha or 20 lots of development. Assume 30 kL tank (based on Figure 11 below) saves **0.9 ML/year** (Source 'Gamble Road IWM Plan' that included an investigation of communal rainwater harvesting).
Shadeways	NA – as per passive irrigation			Enhanced greening along key boulevards. Based on Minta Farm shadeway cost estimates

4.4 Assessment framework

Table 17 provides a summary of assessment approach to benefits and costs of IWM approaches in Melton East. The adopted approach at this early stage of investigations, has been to assign a high, medium or low assessment against the three benefits (as defined in Section 4.2) and the estimated costs. Please note that costs have not been able to be estimated for all opportunities and in these cases a qualitative assessment has been provided.

Table 17. Benefit and cost summary

Criteria	Description	Guidance
Benefits	Number of IWM Strategic Directions Statement outcomes	H: meets > 3 SDS outcomes
		M: meets 2 or 3 SDS outcomes
		L: meets 0 or 1 SDS outcome/s
	Targets (Healthy Waterways)	H: Directly contributes to meeting Healthy Waterways Strategy targets (large harvesting scheme)
		M: Indirectly contribute to meeting Healthy Waterways Strategy targets (reduces stormwater volumes)
		L: No contribution to Waterway Health targets (no change in stormwater volumes)
	Ecohydrology principles	H: Contributes to two or more ecohydrology principles
		M: Contributes to one ecohydrology principle
		L: No contribution to ecohydrology principles
Cost	An opinion of likely cost based on the scale of infrastructure, complexity of the opportunity or number of assets (e.g. number of rainwater tanks).	H: Precinct / Larger scale assets (e.g. Stormwater harvesting scheme, Class B supply scheme, large number of distributed assets. About > $10M of capital works)
		M: Neighbourhood scale assets e.g. WSUD assets, Communal rainwater scheme (e.g. for 20 lots), Infiltration in open spaces. About $5 - 10M of capital works
		L: Smaller lot or street scale assets e.g. smaller rainwater tanks, non-infrastructure work that can be completed is largely internal. $0 to $5M

The 'Benefit summary' column within Table 19, Table 20 and Table 21 is a subjective summary of the three benefit categories that can be compared to the assumed cost for that opportunity.

Benefit and cost matrix

Table 18 is a 'Benefit and cost matrix'. The aim of the matrix is to provide a quick overall assessment of the costs and benefits associated with each opportunity. This is a high level assessment tool that is aimed at providing a relatively quick prioritisation of a large number of IWM options for further consideration.

It works like a risk assessment framework, whereby cost and benefit assessments contribute to an overall assessment (e.g. High benefit and Medium cost results in a High overall assessment).

Table 18. Benefit and cost overall assessment matrix

Benefit	Cost		
	Low	Medium	High
High			
Medium			
Low			

4.5 Opportunities assessment

The following sets out the assessment of each IWM opportunity by scale.

Table 19. Lot scale IWM Opportunities for Melton East PSP

Scale	Opportunity	Benefit			Benefit summary	Cost	Overall Assessment
		SDS outcomes	HWS targets	Ecohydrology principles			
Lot	Rainwater tanks for toilet, laundry on all lots	3	M	M	High (396 ML/year water saved)	High $16.5M	Medium
	Water efficiency standards for household appliances	4	L	L	Medium	Low <$5M	High
	Connect roof to street trees as an alternative to passive irrigation from stormwater runoff	3	M	M	Medium (48% reduction in roof catchment flows)	Low $5 M	High
	Infiltration of roof water / stormwater on a lot scale (e.g. via lot scale biofiltration)	2	M	M	Medium	High $11 M	Low

Table 20. Street scale IWM Opportunities for Melton East PSP

Scale	Opportunity	Benefit			Benefit summary	Cost	Overall Assessment
		SDS outcomes	HWS targets	Ecohydrology principles			
Street	Class B recycled water for street tree irrigation along key pedestrian boulevards	3	M	M	Medium	Assumed to be Medium addition to proposed Class B scheme	Medium
	Integrate shadeways into PSP urban structure	3	L	L	Medium	TBC	Medium
	Centralised / communal rainwater collection for local use – installed in place of lot scale rainwater tanks	3	M	M	Medium (~1 ML/Ha scheme)	Low	High
	Creek and road crossing locations for GGF to improve habitat connectivity	2	L	M	Medium	TBC	Medium
	Transform encumbered land (e.g. for service infrastructure) as recreation and amenity space	2	M	M	Medium	Low	High

Table 21. Precinct scale IWM Opportunities for Melton East PSP

Scale	Opportunity	Benefit			Benefit summary	Cost	Overall Assessment
		SDS outcomes	HWS targets	Ecohydrology principles			
Precinct	Class B recycled water for open space irrigation	3	H	M	High	M	High
	Accommodate Regional Stormwater Harvesting Scheme (RSWHS) infrastructure	2	H	M	Medium	Low	High
	Redirect flows from constructed wetlands and catchments to the west	3	M	M	Medium	Low	Medium
	Alternative water sources to supply future GGF habitat along Kororoit Creek	2	M	H	Medium	TBC	Medium
	Implement all ecohydrology principles	2	M	H	Medium	High	Low
	Western and eastern depression (maximise multiple benefits: recreation / ecology / cooling / greening)	4	M (Infiltration)	M	Medium	Low	High
	Incorporate indigenous cultural heritage (through wetlands and waterways)	2	L	M	Medium	Low	High

5 Results and proposed actions

Reviewing the results of the above tables there are some recommendations regarding the opportunities that are taken forward through the co-design process. It is recommended that High and Medium outcomes be assessed further through Co-design with the following supporting notes.

5.1 Lot scale

- Water efficiency standards for household appliances (High): A low cost way to meet numerous objectives, primarily reduced potable water use. What efficiency standards should be proposed and can such a directive be included within the PSP?

  Action: Define the base case water efficiency standard (i.e. what is likely to be installed) and identify opportunities for improvement.

- Rainwater tanks for toilet, laundry on all lots (Medium): A conservative assessment suggests that approximately 400 ML/year of potable water can be saved through rainwater harvesting with a corresponding reduction in runoff. This is however relatively high cost across 11,000 lots.

  Action: In the absence of Class A recycled water for residential lots, it is proposed that rainwater tanks be considered for all lots to provide a non-potable source for internal and external demands.

- Passive irrigation of street trees: Passive irrigation of street trees using stormwater is mandated by Melton City Council and supported by the VPA's Precinct Structure Planning (PSP) Guidelines (2021) that states that "all streets containing canopy trees should use stormwater to service those watering needs". Further to this, a target canopy coverage of 30% is also specified by the VPA (2021). Melton City Council have published design approaches on their website and an allowance to accommodate passive irrigation within nature strips will be required.

  - *Connecting the roof to irrigate street trees (High):* An alternative approach to passive irrigation was raised in the workshop, whereby roof water would be directed straight to street trees at the front of the lot. While this is an option, Council expressed reservations and would not support this approach. Some of the issues expressed include:
    - limited capacity for water storage on narrow lots
    - storage system led by house drains failed in the past as it led to flooding and property damage.

  Following the review of costs and these issues, the overall assessment of the option was downgraded to low.

  Action: Passive irrigation using stormwater to be implemented. Do not consider connecting roof to trees as an alternative to current approaches.

5.2 Street scale

- Centralised / communal rainwater collection for local use (High): These are community tanks that would be installed instead of lot scale rainwater tanks, and could be applied where there are space limitations for lot scale tanks and opportunities to house storages nearby (e.g. such as an open space). This option is seen as relatively low cost and correspondingly low yield. This could be proposed for specific location/s e.g. where there are high density residential buildings near to smaller open spaces that can house a sub-surface storage.

  Action: Identify the support for a pilot project that showcases this approach with stakeholders.

- Transform encumbered land (e.g. for service infrastructure) as recreation and amenity space (High): Seen as a low cost approach to improving liveability. While this has rated as high, the actual details will need to be investigated and defined within future workshops.

Action: Investigate the potential for this through the co-design process with the aim of agreeing where this may be applicable.

- **Creek and road crossing locations for GGF to improve habitat connectivity (Medium):** While costs for this opportunity are unclear, it is recommended that suitable locations for these crossings be identified as part of the co-design process to support GGF populations.

  Action: Identify suitable locations for GGF crossings as part of the co-design process.

- **Integrate shadeways into PSP urban structure (Medium):** While costs for this approach are unclear, they are not likely to be evaluated as high. This option was widely supported in the workshop and responds to a number of SDS outcomes. Shadeways will adopt the passive irrigation approach discussed above.

  Action: Agree principles for the inclusion of shadeways across the PSP (i.e. for what criteria, road types or uses should shadeways be applied). Ensure that road widths are suitable to accommodate shadeway assets and requirements.

- **Class B recycled water for street tree irrigation along key pedestrian boulevards (Medium):** While this opportunity has benefits, commentary from both GWW and Council suggests that passive irrigation using stormwater water is the preferred approach to irrigating street trees. This is mainly due to concerns regarding the ongoing operation of such a system.

  Action: Do not proceed as an option based on concerns over future operational responsibilities.

5.3 Precinct scale

There are a number of precinct opportunities that performed well under the assessment.

- **Class B recycled water for open space irrigation (High):** A relatively low cost / high reliability opportunity that could save up to 374 ML/year. It is assumed that active and passive spaces are watered to maximise use and greening. Workshop feedback suggests that this is supported by Greater Western Water. Feedback from GWW suggests the truck recycled water mains would be approximately DN450. Main servicing individual open spaces would be significantly smaller diameters than this.

  Action: Recommend business case work be completed by GWW with a view to extending the Class B network as far as feasible across the PSP

- **Allowance for future Regional Stormwater Harvesting Scheme (RSWHS) infrastructure (High):** This is also relatively low cost, however noting that land costs have not been estimated. This option does not suggest building infrastructure, just ensuring that future opportunities are enabled.

  Action: Define easements and footprints for a future regional stormwater harvesting scheme and include these within the PSP.

- **Redirect flows from constructed wetlands and catchments to the west (Medium):** This option was discussed directly with Melbourne Water. The drainage scheme process will take into account the needs of SHW and GGF habitat. As such it is agreed that an appropriate surface water management approach will be defined through that process. Therefore, redirecting flows is not supported, unless directly specified within the drainage scheme.

  Action: This is being considered as part of Melbourne Water's drainage scheme investigations. Hydrology will be managed as per the drainage scheme.

- **(Maximise multiple benefits in) Western and Eastern depression (High)**: These are existing depressions with potential to deliver benefits across recreation, ecology and greening. Maximising their utility in the context of the PSP was well supported in the workshop. As GDE's their reliance on groundwater should be reflected in the infiltration requirements across the PSP.

  Action: Depressions should be protected with further investigations into how these can best provide a range of community benefits while protecting resident ecological values. This is being considered as part of Melbourne Water's drainage scheme investigations.

- **Incorporate indigenous cultural heritage (through wetlands and waterways) (High):** A low cost and high benefit approach that should be incorporated into all IWM planning work, particularly in the context of the ecological values present within the precinct.

  Action: Further investigation and consultation with Wurundjeri (Traditional Owners) is required to define a suitable approach to representing cultural heritage and storytelling.

6 Discussion

The above report summarises a long list of IWM opportunities and applies a qualitative assessment (with qualitative calculations where possible) to identify a short list of opportunities that are suitable for inclusion in the co-design process for Melton East PSP.

6.1 Core opportunities

The following headings summarise the opportunities to address key drivers for IWM within Melton East.

Reduce potable water use

Potable water demand can be reduced through:

- Rainwater harvesting at the lot scale for internal and external residential use
- Class B recycled water for irrigation of open space, and
- Place – based community scale rainwater harvesting.

It should be noted that Council is undertaking investigations into the potential for communal rainwater harvesting. The outcomes of that work should be incorporated into the planning for the PSP.

Support liveability and ecological objectives

Liveability and ecological objectives can be supported through:

- Protection of ecological values, particularly in relation to the Seasonal Herbaceous Wetland and Growling Grass Frog habitat via the adoption of ecohydrological principles a far as practicable.
- Enhancing the ecological, hydrologic and community benefits associated with the western and eastern depressions.
- Accommodating ongoing connection between groundwater and groundwater dependent ecosystems where they are identified.
- Using 'shadeways' and the passive irrigation of street trees to increase canopy cover, reduce the impacts of heat and improve liveability within the PSP, particularly along key pedestrian routes and boulevards.

An adaptive approach to stormwater harvesting

While questions remain as to the role of stand along stormwater harvesting schemes (in the context of Class B water availability and the prospect of a Regional Stormwater Harvesting Scheme), space should be allowed at wetland outlets to house infrastructure (i.e. pump stations and rising mains) associate with either outcome.

This footprint should included as part of the design for all treatment wetlands.

6.2 Other opportunities

There are items that were raised in the workshop and in subsequent communications that will require further discussion to understand their suitability.

Ecohydrology

The extent to which ecohydrology principles can be applied within residential developments catchments. It is accepted that 'no development' within the SHW catchment is not practicable, however the nature of development will need to respond to the sensitive and legislatively protected environment downstream.

Stormwater harvesting

Stormwater harvesting for open space irrigation is supported in both Melton City Council's IWM Strategy, the VPA's PSP Guidelines (2021), that encourages the co-location of sporting fields and stormwater treatment wetlands amongst its General Principles and also through Greater Western Water's Stormwater Harvesting Fund, that financially supports new schemes.

Stand-alone stormwater harvesting scheme/s (e.g. for the irrigation of sporting fields) have not been specifically identified and located within this report. The reason for this is that other issues will need to be resolved prior to being able to plan for stormwater harvesting in detail, including:

Understanding the extent of the proposed Class B network across the PSP and therefore whether all open spaces, or only some, are likely to have access to Class B water. Once this is understood a comparison of costs and benefits of those two sources being supplied independently or together can be undertaken.

Melbourne Water are also investigating a Regional Stormwater Harvesting Scheme (RSHS) that would rely on outflows from Melton East PSP wetlands. Therefore the treated stormwater may not be available of this regional scheme harvests it.

It is for these reasons that the proposed approach is to maintain an adaptive approach to stormwater harvesting, as discussed above.

Growling Grass Frog water supply

There is a question if an alternative water source for GGF can be identified. Stakeholders are generally supportive of further work to understand what opportunities there are to meet this need, of the options that are available and that have been presented here.

This report suggests investigating groundwater, rainwater, gravity fed treated stormwater and streamflow opportunities as priorities. Further planning should look at how these sources might be co-located with GGF habitat.

This document will provide the basis for the inclusion of prioritised IWM opportunities into the co-design process and the PSP itself.

7 Reference

Alluvium (2019) Kororoit Creek Wetland ecohydrology. Report prepared for Melbourne Water by Alluvium Consulting.

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Department of Environment and Primary Industries [DEPI] (2013). Biodiversity Conservation Strategy for Melbourne's Growth Corridors

Department of Environment, Land, Water and Planning [DELWP] (2017). Growling Grass Frog Habitat Design Considerations. Melbourne Strategic Assessment

Department of Environment, Land, Water and Planning [DELWP] (2017). Growling Grass Frog Masterplan for Melbourne's Growth Corridors

Department of Sustainability, Environment, Water, Population and Communities [DSEWPC] (2013). Approval decision for the taking of actions in accordance with an endorsed program under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC ACT).

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Healthy Waterways Strategy (2018). Co-Designed Catchment Program for the Werribee Catchment Region

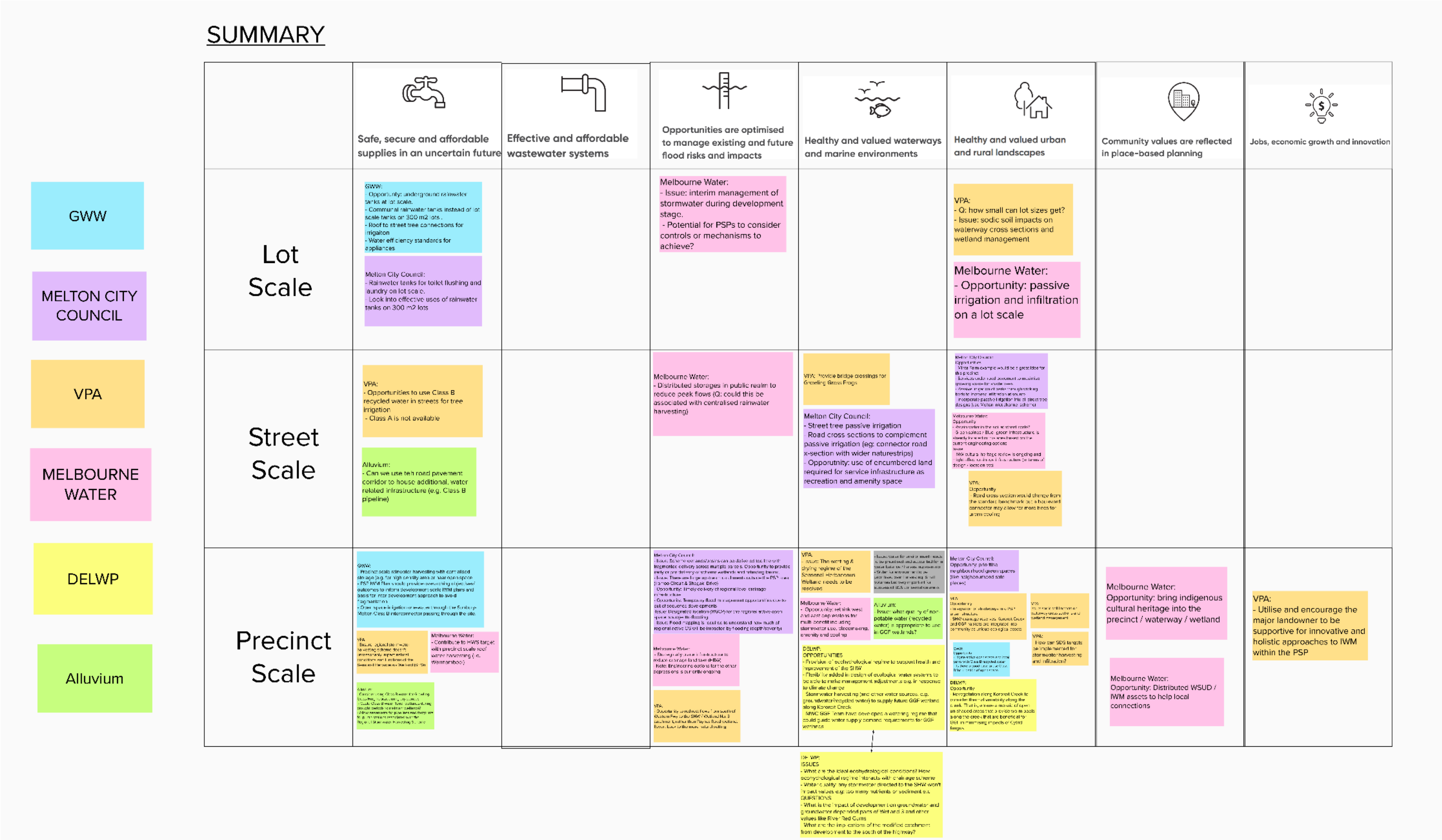
Spiire (in draft) Infrastructure Servicing Report –Grangefields PSP. Prepared by Spiire for 3L Alliance

Victorian Planning Authority [VPA] (2022). Melton East *Wurundjeri Country* PSP. Vision and Purpose.

Victorian Planning Authority [VPA] (2021). Precinct Structure Planning Guidelines – New Communities in Victoria.

Appendix A

Stakeholder Workshop MURAL Summary


SUMMARY
Safe, secure and affordable supplies in an uncertain future
Effective and affordable wastewater systems
Opportunities are optimised to manage existing and future flood risks and impacts
Healthy and valued waterways and marine environments
Healthy and valued urban and rural landscapes
Community values are reflected in place-based planning
Jobs, economic growth and innovation
GWW
MELTON CITY COUNCIL
VPA
MELBOURNE WATER
DELWP
Alluvium
Lot Scale
Street Scale
Precinct Scale
Melbourne Water:
- Issue: interim management of stormwater during development stage.
- Potential for PSPs to consider controls or mechanisms to achieve?
VPA:
- Q: how small can lot sizes get?
- Issue: sodic soil impacts on waterway cross sections and wetland management
Melbourne Water:
- Opportunity: passive irrigation and infiltration on a lot scale
VPA:
- Opportunities to use Class B recycled water in streets for tree irrigation
- Class A is not available
Alluvium:
- Can we use ten road pavement corridor to house additional, water related infrastructure (e.g. Class B pipeline)
Melbourne Water:
- Distributed storages in public realm to reduce peak flows (Q: could this be associated with centralised rainwater harvesting)
Melton City Council:
- Street tree passive irrigation
- Road cross sections to complement passive irrigation (eg: connector road x-section with wider naturestrips)
- Opportunity: use of encumbered land required for service infrastructure as recreation and amenity space
Melbourne Water:
Opportunity: bring indigenous cultural heritage into the precinct / waterway / wetland
Melbourne Water:
Opportunity: Distributed WSUD / IWM assets to help local connections
VPA:
- Utilise and encourage the major landowner to be supportive for innovative and holistic approaches to IWM within the PSP

Appendix B

Growling Grass Frogs Wetland Design Considerations

Specification	Parameters	Design consideration
Type	Clusters	Ideally, 10 off-stream breeding wetlands should be in a cluster, however for shorter reaches, smaller clusters are acceptable with at least one wetland larger than 7000m^2. Wetlands also need to be 200-300 m apart from one another
Hydrological design parameters	Size	• Surface area: At least 3000m^2 (for most new wetlands) • Submergent zone: At least 1000 m^2
	Shape	Wide enough to efficiently provide the required depth for submerged vegetation
	Volume	For a standard 3000m^2 wetland, approximately 3.3ML or greater volume is required depending on area and water availability.
	Depth	• Submergent vegetation zone: minimum 50% (ideally 60-70%) of total wetland surface area at Normal Water Level (NWL). Depth needs to be maintained greater than 1.5m • Emergent vegetation zone: 30-40% of the total wetland surface area at NWL (including littoral zone with fluctuating water levels)
	Lining	Clay lining to prevent leakage, topped with a layer of soil (ensuring this doesn't lead to high turbidity). Clay soil is acceptable as substrate
Hydroperiod	Permanent wetlands	At least ¾ wetlands in a cluster should have permanent hydroperiod. Important for all wetlands to hold water during the breeding period (September to February)
	Semi-Permanent/Ephemeral wetlands	Accepted where capacity is limited to provide a permanent wetland or to maintain Seasonal Herbaceous Wetland
Terrestrial habitat	Temperature	• All wetlands must incorporate extensive, shallow, permanently inundated emergent zone where water temperatures will be elevated due to the heat of the sun • Ideally, 18oC-24oC at the surface of water's edge, with a maximum of 27oC [Jacobs & MW study, n.d.]
	Rock piles	• All wetlands should incorporate jumbled piles of rock and boulder around at least 20% of the wetland margin (1m from NWL) to control chytrid fungus control. • "Anti-chytrid" wetlands in the basalt region (where excavated material can be used on site rather than paying for disposal offsite) should incorporate rocks around 50 per cent of the wetland margin if within budget
	Protection and Maintenance	• Minimise the shading and cooling of GGF wetlands by planting trees and tall shrubs (at least 30 m) from the edges • Minimise disturbance to frogs by locating shared trails at least 30 m from GGF wetlands • Urban development and recreation should be at least 50m from GGF wetlands • Maintain short open vegetation close to the wetlands for frogs to forage in, with scattered tussocks and shrubs • GGF wetlands should be located outside 1 in 10 year and preferably 1 in 20-year ARI
	Embankment	*Optional: embankment on the surface of wetland margin to protect from cold winds*

Water Source (listed in Table x)		
Water Quality	pH	Between 6 and 8.5
	Salinity	Up to 5000 µS/cm Optimal range for planting fill and vegetation establishment phase 1000-4000 µS/cm [Jacobs & MW study, n.d.]
	Turbidity	<40 NTU Preferably <10 NTU with a max of 30 NTU [Jacobs & MW study, n.d.]
GGF Wetland watering regime scenarios (Melbourne water and Jacobs)	Habitat Creation	One off; the two-year construction/establishment of the GGF habitat wetland; Water required to test integrity of wetland construction and support aquatic plant establishment.
	Normal Seasonal Fluctuation	Most years (e.g., annually for 5-7 years); Water required to provide an annual watering regime that supports GGF breeding, foraging, and sheltering over winter, high cover of aquatic vegetation, provide hydrological conditions to reduce chytrid fungus disease.
	Complete Dry out	Once every 5-7 years; Dry out to encourage submergent aquatic plants to germinate/recruit, and to undertake risk mitigation measures (e.g. exotic fish control) or maintenance. Water required to refill wetland afterwards.
Water demand for a standard wetland (3000m2)	Habitat Creation	Minimum 3.3ML, more water would be required if drawdown/refill is required within 1 year
	Normal Seasonal Fluctuation	Minimum 3.5ML/year, at a daily maximum fill rate of ~0.14 ML/day (spring timing)
	Complete Dry out	Daily fill rate* of ~0.05ML/year required for two fill events (spring and autumn) per year. Depending on water supply availability, fill required on ~10-22 days/year *Fill rate and drawdown rate to be controlled to <5cm wetland depth/day to maximise aquatic plant recruitment, growth and survival.