

# Integrated water management planning for Victoria

## The Perils and Pitfalls of IWM Planning in Victoria's National Employment and Innovation Clusters

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### ABSTRACT

Integrated Water Management (IWM) planning in existing urban areas presents water practitioners with a range of challenges. In Victoria, the identification of strategic national employment and innovation clusters (NEICs) has resulted in the development of several IWM plans and projects. This paper explores the outcomes of IWM planning conducted in the Monash and Sunshine NEICs. Challenges identified during this process by utilities, councils, state government agencies and consultants are presented and discussed. Potential solutions are offered, with a view to improving the capacity for the broader industry to deliver IWM in these challenging environments.

**Key Words:** Integrated water management, urban development, planning, strategy, precinct scale

### INTRODUCTION

Integrated water management (IWM) brings together all facets of the water cycle to maximise social, environmental and economic outcomes (City West Water 2017, DELWP 2017, Melbourne Water 2017). It is a recognised approach for addressing the complexity of interactions across the various water services (e.g. potable water, wastewater, stormwater, greywater, groundwater, etc.) and the pressures placed upon existing water systems. The application of IWM practices is expanding across Australia's urban and rural sectors fuelled by drivers including population growth, urban development, drought and climate change.

In Victoria, the opportunity for IWM to enhance the resilience and liveability of cities and towns is recognised in Water for Victoria, the State Government's new long-term direction for managing water resources (DELWP 2016a). Action 5.7 of the Water Plan states that the government will adopt a systematic approach to IWM planning by "requiring the development of place-based integrated water management plans, with water corporations leading the development of these plans, unless it makes sense for another organisation to do so". This sets a new precedent in Victoria, as although IWM was already embedded in state government policy to varying degrees, Water for Victoria is the clearest endorsement of this approach at the state level. This is expected to result in a continued growth in the number of IWM strategies and projects development, and hence the need for improved IWM approaches.

The move towards increased IWM planning in Victoria coincides with the State Government's push to facilitate the development of national employment and innovation clusters (NEICs) as part of Plan Melbourne 2017-2050. Seven NEICs have been identified across Dandenong, Fishermans Bend, La Trobe, Monash, Parkville, Sunshine and Werribee areas. The NEICs are focus areas for jobs growth and strategic infrastructure investment to expand employment opportunities close to where people live. All of the clusters, except Werribee, are located in existing urban areas that already contain a significant concentration of businesses and institutions. These areas provide a diversity of employment opportunities and deliver a significant contribution to the national economy. The Victorian Planning Authority (VPA) is leading planning of the NEICs to harness potential growth and facilitate development of strategic sites throughout these precincts.

The policy direction set by Water for Victoria, with its move toward place-based IWM plans, and Plan Melbourne 2017-2050, with its focus on urban redevelopment nodes, have prompted the development of several IWM plans across Melbourne's NEICs. While each of the NEICs and their associated IWM plans have unique characteristics, their similarities in terms of the high rates of growth, redevelopment context, precinct scale and timing provide a valuable opportunity to explore the application of IWM practices.

## BACKGROUND AND METHODOLOGY

This paper explores the application of IWM planning approaches in the Monash and Sunshine NEICs. This examination is conducted through the lens of multiple projects and strategies that address different elements of the urban water cycle in the NEICs. This includes IWM visioning and objective setting as well as rainwater and stormwater options assessments.

The Monash and Sunshine NEICs are located in the east and west of Melbourne respectively (see Figure 1 below). Each NEIC has a range of specific natural (e.g. climate, waterways and habitat) and built environments (e.g. existing built form, transport infrastructure, education and health services). IWM planning in each NEIC has typically been led by one or more metropolitan water utilities, including Melbourne Water, City West Water, Yarra Valley Water and South East Water. Other key stakeholders include State Government (VPA and Department of Environment, Land Water and Planning (DELWP)) and Local Government (Brimbank, Greater Dandenong, Kingston and Monash City Councils).

The VPAs Draft Framework Plans for the Monash and Sunshine NEICs establish broad visions for connected and exciting places for employment, education, health, manufacturing, innovation, technology and research with investment in transport improvements, amenity and sustainability initiatives. The Draft Framework Plans also set out principles and strategic outcomes that outline the actions required to implement each vision (see e.g. Figure 2 below). The more water-focused visions and objectives of the IWM plans focus on potable water reduction, fit-for-purpose alternative water supply, stormwater flow reduction,

improved stormwater quality, reduced flood risk, and improved public open space, amenity and liveability.

### The Monash NEIC

The Monash National Employment and Innovation Cluster (Monash NEIC) is located 20km south-east of Melbourne's CBD. It covers an area of 3,720 ha of mixed residential and non-residential developments along the Cranbourne-Pakenham train line from Huntingdale in the north to Sandown Park in the south (see Figure 3 below). The Monash NEIC encompasses world class health, education and research institutions, including Monash University, Monash Business Centre, Monash Medical Centre, Monash Children's Hospital, CSIRO and the Australian Synchrotron.

The Monash NEIC sits at the intersection of the Scotchmans Creek, Mordialloc Creek, Mordialloc Settlement Drain and Dandenong Creek catchments. Most waterways in these catchments are piped and channelised, providing minimal environmental and limited to no aesthetic function.

The Monash NEIC supports approximately 75,000 jobs across a diverse range of industries. It is Melbourne's largest concentration of jobs outside the CBD and contributes over \$9.4 billion to the Victorian economy each year (VPA, 2017). As part of its Draft Framework Plan, the VPA anticipates that employment numbers within the Monash Cluster may double over the next 35 years. Investment in the area is expected to revitalise existing activity centres, develop new business town centres, drive residential growth and improve the amenity, image and function of the area (VPA, 2017).

### The Sunshine NEIC

The Sunshine National Employment and Innovation Cluster (Sunshine NEIC) is located 15 km northwest of the Melbourne CBD. It covers an area of 2,100 ha of mixed residential and non-residential developments extending from Albion and Sunshine in the south-east, through the central Sunshine Hospital sub-precinct, up to St Albans in the north-west (see Figure 4 below).

The Sunshine NEIC currently supports 18,000 jobs and is identified as an emerging cluster that has the potential to double the population and jobs by 2051 with strengths in tertiary education, health-related training, healthcare, retail and professional services opportunities. Major economic anchors include Western Hospital, Victoria University, Sunshine Plaza and Sunshine Market Place. The Sunshine

NEIC extends across three major waterway catchments including the Maribyrnong River, Stony Creek and Kororoit Creek.

The VPA is preparing a draft Framework Plan to guide development of the Sunshine NEIC up to 2051. As such City West Water (CWW), Melbourne Water (MW) and Brimbank City Council (BCC) have investigated the future water and

stormwater servicing requirements for the NEIC. The three organisations are jointly preparing an IWM Plan for the NEIC that will enable them to provide servicing advice to the VPA. The IWM Plan will also assist Brimbank Council in achieving targets in its Sustainable Water Strategy; and enable the three organisations to manage new and re-developments within the NEIC with advice to developers and planning controls.

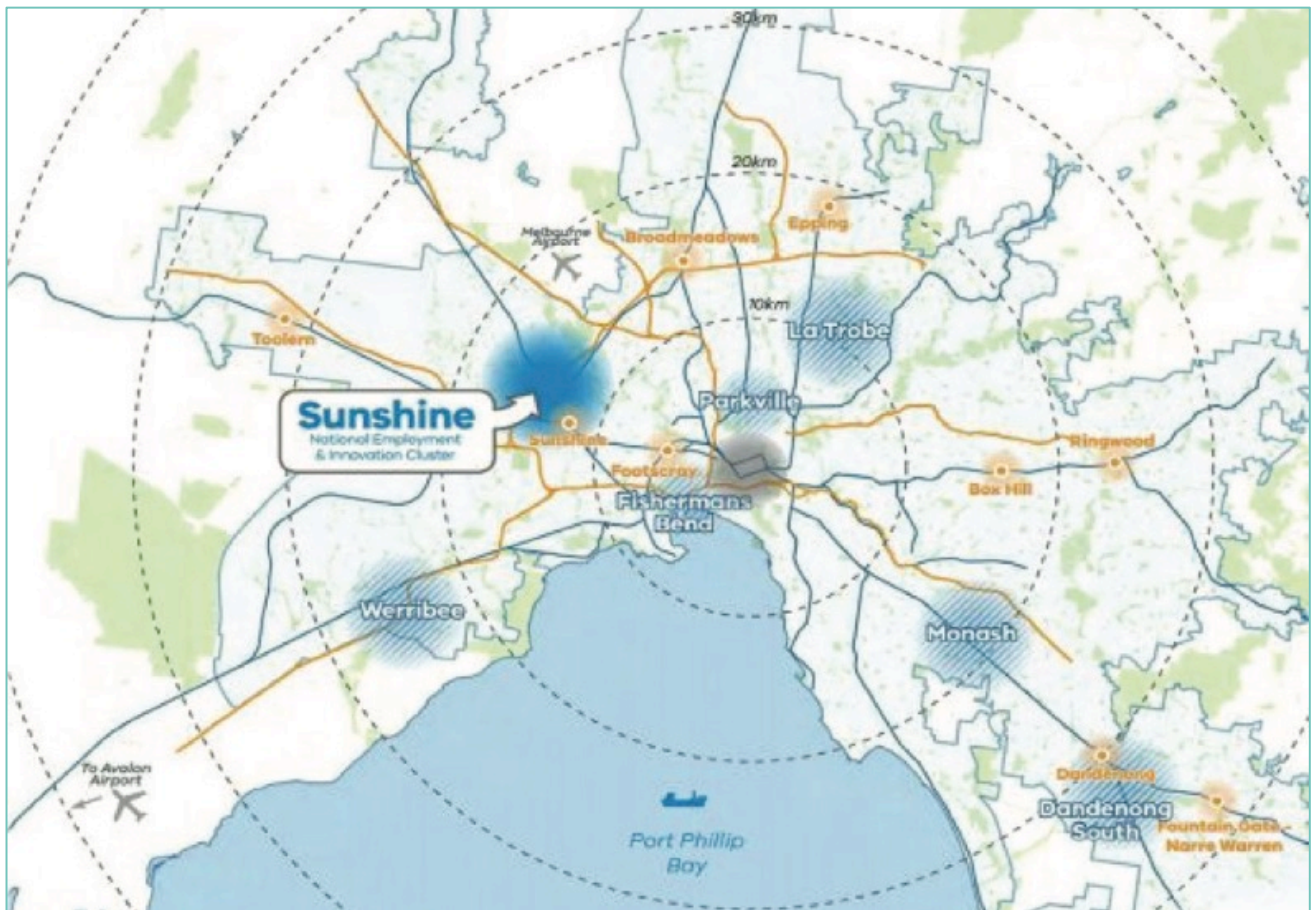


Figure 1: Sunshine and other NEICs across Melbourne (Urban Melbourne 2017)

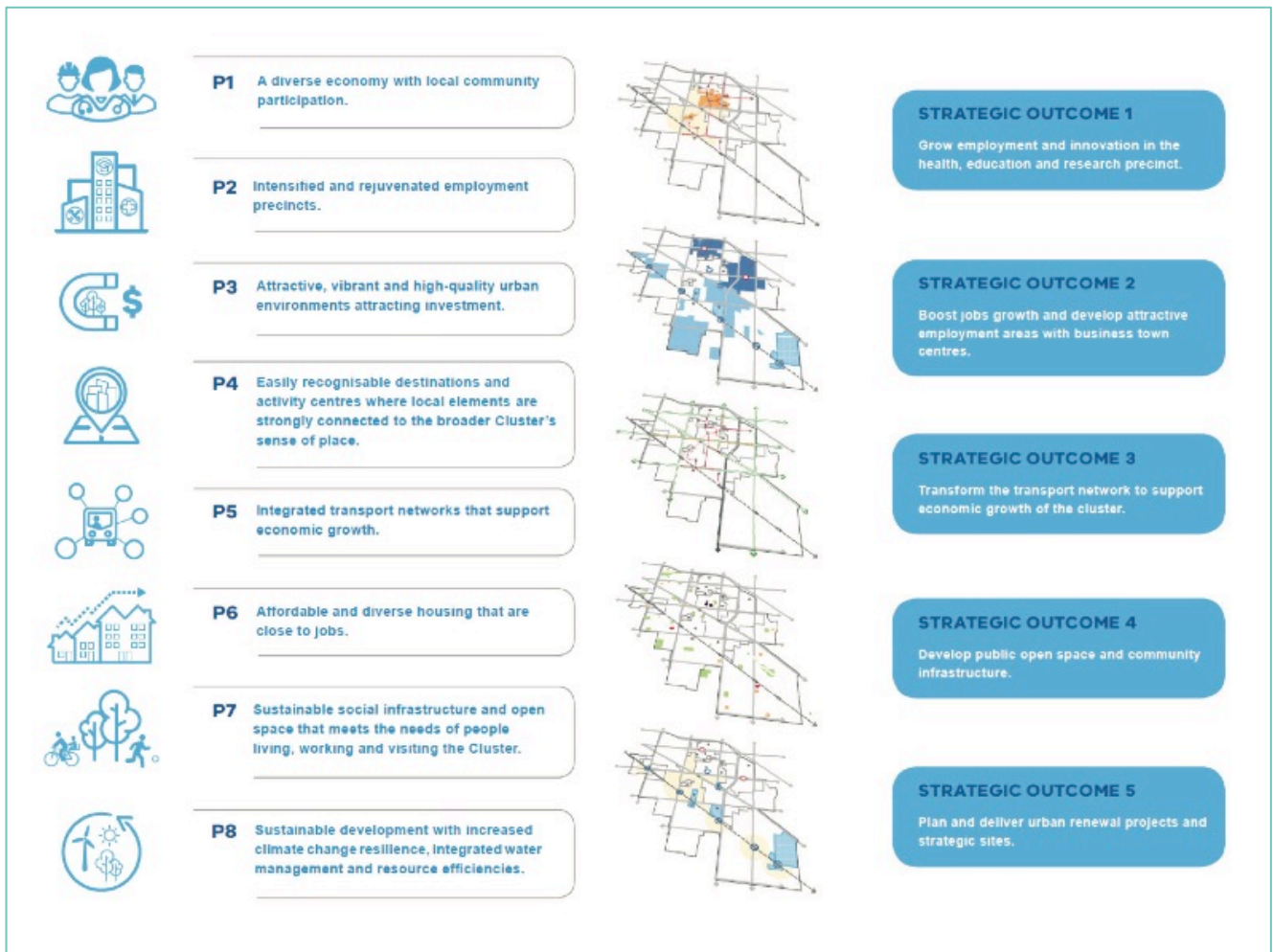


Figure 2: Example of principles (left) and strategic outcomes (right) from the Sunshine Draft Framework



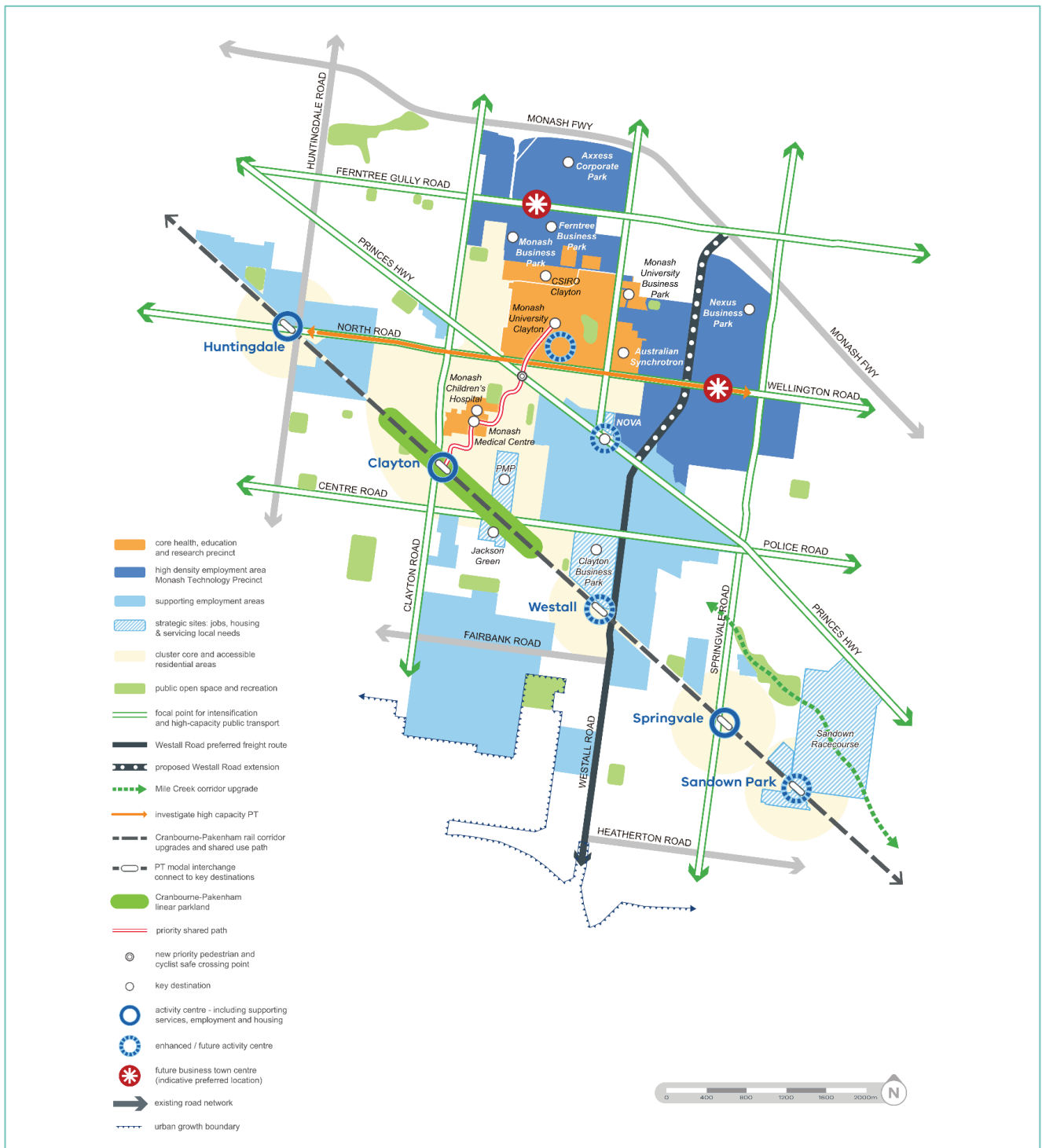


Figure 3: The Monash National Employment and Innovation Cluster (Monash NEIC) (VPA, 2017)

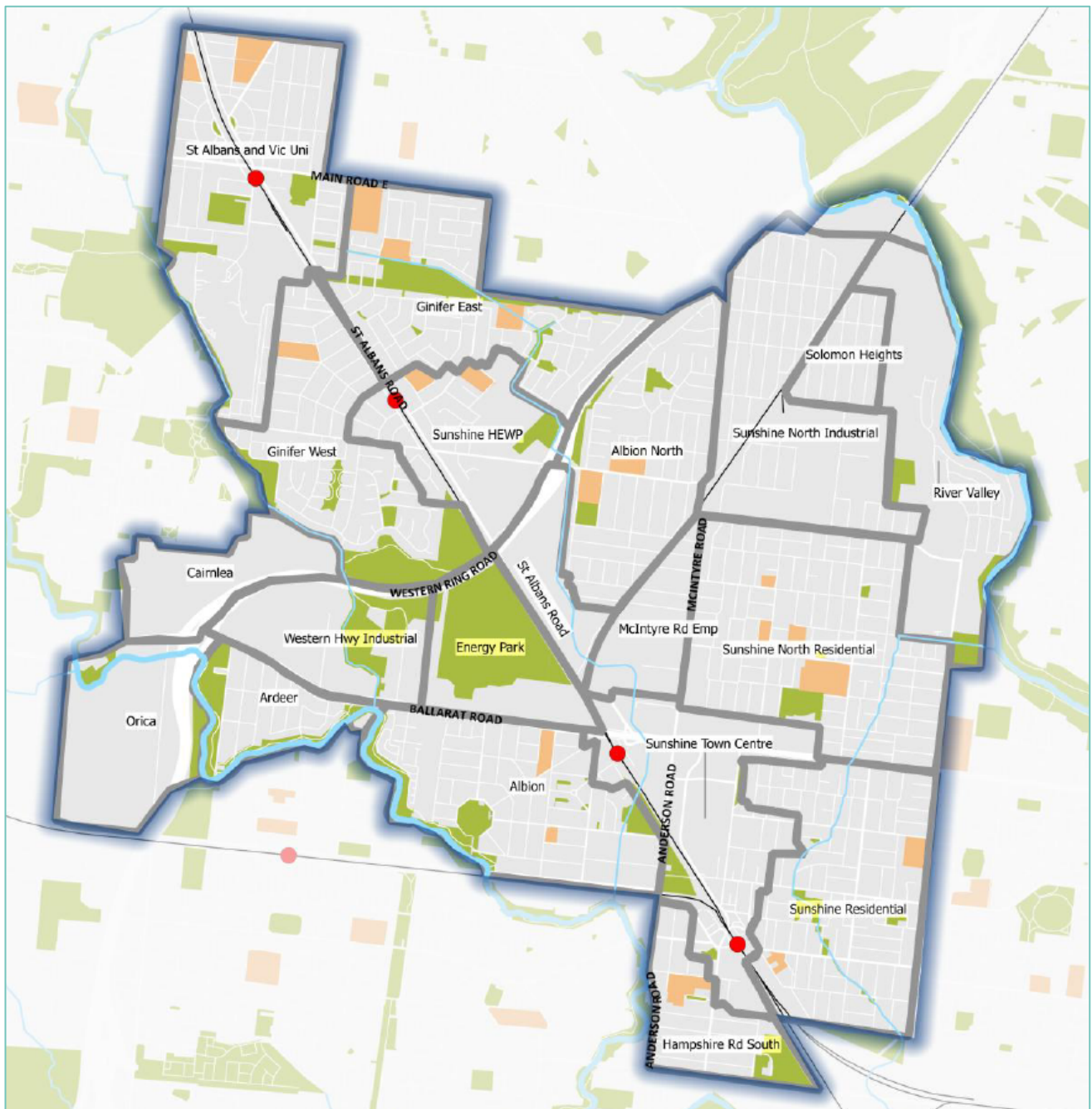


Figure 4: Sunshine National Employment and Innovation Cluster (Sunshine NEIC)

### Integrated Water Management (IWM) Challenges

The following IWM challenges are discussed in turn below:

1. Project boundaries
2. Scale of analysis
3. Infill development
4. Addressing uncertainty
5. Consultation
6. Project scope and objectives
7. Data analysis

Each challenge is first described in generic terms. An example of how that challenge arose in the context of IWM planning for the Monash and / or Sunshine NEICs is also provided. Finally, potential solutions or recommendations on how these challenges could be managed, or even avoided, are offered.

#### Challenge #1: Project boundaries

**Description:** The boundaries of each NEIC often cut across multiple existing physical (e.g. catchments and waterways) and administrative boundaries (e.g. councils, water utilities etc.) in existing urban areas. This creates challenges for data collection, analysis and preparation. Multiple data owners need to be consulted and it is often requested that outputs be reported according to each different administrative area (or part thereof). More significantly, by cutting across multiple administrative boundaries multiple stakeholders have a role in the NEICs. This increases the need for consultation but also makes it difficult to identify a permanent lead organisation or body to drive ongoing IWM planning and implementation.

**Example:** The Monash NEIC project boundary intersects:

- Four major catchments
- Three water utilities (Melbourne Water, South East Water, Yarra Valley Water)
- Three councils (City of Greater Dandenong, Kingston City Council and the City of Monash)

The Monash NEIC also includes Monash University's Clayton Campus which has around 26,000 students and falls within the jurisdiction of the Victorian Planning Authority and Department of Environment, Land, Water and Planning.

**Potential solution:** The NEIC boundaries are dictated by state level planning considerations. It is unclear whether opportunities to increase the alignment of the NEIC boundaries with existing administrative boundaries were

considered. Furthermore, in some instances crossing organisational boundaries is necessary and desirable, e.g. to reflect existing housing and employment patterns around activity centres that sit on the edge of council boundaries. Although it is unlikely that boundary intersections can be avoided entirely they should be minimised where possible. This is particularly true in areas where there is no clear benefit in expanding the study area to involve additional land or stakeholders.

In terms of identifying a lead organisation, this challenge goes beyond the project boundaries established for the NEICs as it relates to government planning processes and the typical organisational accountabilities in urban water management (see Table 1 below).

Melbourne Water is the only organisation with experience and responsibilities related to all water sources. Its role is "to manage and protect Melbourne's major water resources on behalf of the community" (Melbourne Water 2018). This includes integrated management to deliver drainage and flood management, high-quality water, reliable sewerage, healthy waterways and enhanced life and liveability in the face of climate change, urbanisation and population growth (Melbourne Water 2018).

Given Melbourne Water's role in the management of all major water resources (including waterway health and amenity improvements) it is proposed that Melbourne Water lead the development of IWM strategies in metropolitan Melbourne. This aligns in part with the Water Plan which states that urban water corporations will lead the collaborative IWM planning process mandated by Water for Victoria. However, urban water corporations include urban water retailers (e.g. City West Water, Yarra Valley Water, South East Water etc.). As such, it does not identify Melbourne Water as the primary leader of metropolitan IWM planning.

Melbourne Water is also well positioned, given its broad responsibility, to advocate for IWM outcomes that deliver the best whole of community outcomes. This is important as the implementation of some IWM solutions requires significant collaboration and novel financial and management arrangements (e.g. sharing of costs, profits, operational and maintenance responsibilities).

The proposal that Melbourne Water lead metropolitan IWM planning would require extra funding and resourcing. There are several options available to achieve this, however, these will not be explored in this paper.

Regardless of who leads metropolitan IWM planning, it is recommended that:

- DELWP provide support and oversight to ensure collaboration across parties with unique as well as interconnected roles, responsibilities and capacities in integrated urban water management.
- VPA plays a more active role in supporting and coordinating the roll out of IWM strategies in the NEICs. This is recommended because the VPA establishes the NEIC boundaries, leads consultation across all

stakeholders (including the community) and sets the vision, principles and strategic outcomes in each NEIC Framework Plan.

- Melbourne Water enters into strong partnerships with each metropolitan urban water retailer as part of IWM planning. This is needed in the NEIC context as many of the larger precinct scale solutions are likely to financially and/or operationally impact on Melbourne Water and retailers.

**Table 1: Typical organisational accountabilities in urban water management (DELWP 2017)**

Agency	Accountability
Victorian Government and Departments	Legislation Policy Regulation
Environment Protection Agency	Environmental regulation (including best practice guidelines and protection policies)
Essential Services Commission	Economic regulation
Water corporations	Water supply Wastewater management (including sewerage and sewage treatment) and trade waste management Waterway and major drainage systems (Melbourne Water only)
Catchment management authorities	Waterway health Floodplain management Environmental water
Local government	Urban stormwater management Parks and gardens management Onsite domestic wastewater management Urban planning Building and planning approvals
Property owners, residents and businesses	Meeting terms and conditions of services provided Following permit conditions



	Onsite water management, e.g. rainwater, stormwater
Victorian Planning Authority	Urban growth structure planning for Melbourne and (where invited) regional Victoria
Developers	Construction of development scale water infrastructure

### Challenge #2: Scale of analysis

**Description:** Scoping the scale, type and timing of integrated water management opportunities to be considered within each NEIC represents a key challenge. The NEICs generally incorporate the following scales:

- Precinct scale: Multiple suburbs and activities centres (e.g. 100's to 1000's of hectares)
- Streetscape scale: Including multi-lane freeways and arterials down to smaller suburban streets and alleyways (e.g. widths up to 100m and lengths up to several kilometres)
- Lot scale: Individual residential, commercial and industrial lots (e.g. 100's to 1000's of square metres)

Different IWM tools and technologies are suited to each of these scales and some cut across multiple scales. If project scope is not clear and / or stakeholder expectations are not carefully managed the scale of focus for an IWM strategy may remain unclear and result in a large range of different options being considered in insufficient detail.

**Example:** The Monash NEIC strategy considered a long list of project opportunities that apply at different scales. For examples, this included lot scale rainwater tanks and biofilters that were applied at the precinct scale as part of a mandated scheme that applies to all new dwellings, street tree pits at the streetscape scale and precinct scale stormwater reuse schemes. The impact of each of these projects on the NEIC water and pollutant balance varied greatly based on the scale of application of the tool or technology in question. This creates difficulty when comparing the costs and benefits of individual projects as well as portfolios.

**Potential solution:** The scales of IWM planning are inherently linked and it is not recommended that IWM planning focuses too significantly on one scale to the detriment of the others. However, as the NEICs span the precinct scale they are well suited to exploring opportunities that make the most of the distribution of resources and opportunities at this scale. This often cannot be achieved as part of smaller scale projects that focus on streetscapes, parks or smaller scale urban nodes such as activity centres.

In general, it is recommended that precinct scale projects focus on innovative centralised and decentralised solutions that are able to have a significant impact on an area's water and pollutant balance. What is deemed a 'significant' impact will be determined by the scope of opportunities in the study area and will likely necessitate high level testing and consideration of a range of options using methods such as the Preliminary Assessment Method (PAM) (E2Designlab 2015).

Streetscape projects will nearly always complement IWM initiatives at other scales. If local government adopt a stormwater management objective or standard for all streetscape works (pavements, drainage, street trees, etc.) projects at this scale could be assumed to occur over an estimated redevelopment period. By having a clear objective or standard of service, IWM planning can easily accommodate works at this scale through the use of unit models and deemed to comply designs. In contrast, a lack of commitment or clear guidance as to the desired level of service creates uncertainty and expands the scope and scale of solutions to be considered. This necessarily adds complexity to IWM planning and draws resources away from the exploration of precinct scale solutions.

Planning for streetscape and lot scale focused projects should be considered early to determine whether they can be scaled up to have a significant impact or can complement larger projects and should therefore still be considered. However, if the impact of projects is not significant in terms of the objectives of the strategy at hand they should not be analysed further as part of the IWM plan. Rather, they should be considered as part of future studies or other simultaneous projects (e.g. council streetscape strategies, urban greening initiatives, activity centre masterplans or local planning amendments).

### Challenge #3: Infill development

**Description:** Each NEIC is dominated by existing housing and commercial building stock. However, large increases in housing, population and employment are predicted. To achieve this growth, a significant volume of infill development is required (i.e. existing homes and businesses are demolished and replaced by new higher density buildings). This infill development will occur in a largely piecemeal fashion as the majority of landownership is private and diffuse. This creates several challenges for strategy development as the specific location and timing of development is unclear.

**Example:** In the Sunshine NEIC, approximately 22,600 total additional residential properties are predicted by 2051. To achieve this predicted growth, roughly 72% of existing residential properties are expected to be subject to infill development. This high level of infill development is difficult to service with alternative water supplies. The cost and methodology for retrofitting such a large existing urban area with a dual reticulation network contains a considerable degree of uncertainty when the timing of redevelopment is unpredictable.

**Potential solution:** Infill development is a necessity of urban development. Although there are difficulties in terms of timing and location of infill development in the NEICs there is also significant opportunity to improve existing urban areas through the adoption of best practice IWM technologies and policies. In order to make the most of this opportunity new processes and ideas for implementing staged infrastructure need to be developed. For instance, utilities, councils and state planning bodies could work together to incentivise and concentrate infill development in specific areas that support easier and more cost-effective retrofits.

Simultaneously, the uncertainty in the predictions of population, employment and dwelling growth in the NEICs needs to be considered as part of future servicing solutions. Analysis of multiple development scenarios and uncertainty analysis requires significant increased project resourcing. The VPA predictions of growth in the NEICs are generally high and therefore the impact of low growth for a short or extended period should be factored into servicing options that rely on high levels of infill growth. In this context, IWM options that roll out in line with development and are resilient to fluctuations in growth appear desirable (e.g. rainwater tanks) but may not always be the best overall long term solution.

### Challenge #4: Addressing uncertainty

**Description:** Strategic planning for future conditions is difficult given the uncertainty surrounding policy and governance (e.g. industry standards and organisational roles), social and economic factors (e.g. population and employment growth) as well as environmental factors (e.g. climate). In general, it is difficult to adequately address the current status quo of water management in terms of regulation, policy, technology etc., whilst also accommodating potential future social and economic scenarios. This is particularly true when trying to reach consensus with large and diverse stakeholder groups with divergent views and aspirations.

**Example:** The greatest challenges related to future uncertainty in the NEIC IWM projects were:

- a. Potential changes to policy and targets that influence the management of stormwater quality, flow volume and flow frequency.
- b. Devising solutions that are resilient to changes in forecast population and employment growth and associated development.

A complex mix of policy regulation influences the management of water in Victoria. As part of the Monash NEIC a summary of key documents and current reviews was incorporated into the project to clarify the current state, and potential trajectory, of regulation for stakeholders. This included the State Environment Protection Policy (Waters of Victoria), Urban Stormwater Best Practice Management Guidelines (BPEMG), Victorian Planning Provisions, Better Apartments Design Standards, the National Construction Code / Building Amendment Act 2011, local council Planning Scheme Amendments, the Melbourne Water and City of Kingston Stormwater Offsets programs and reviews being conducted by the Department of Land, Water, Environment and Planning (DELWP) and the Environment Protection Authority (EPA).

Key changes to regulation being investigated in Victoria at the time of strategy development included proposed amendments to:

- Increase stormwater quality targets,
- Introduce flow volume reduction targets, and
- Expand the application of existing provisions to capture all new greenfield, infill and commercial development.

These changes could foreseeably take place during the time period being considered in the IWM plan for the Monash NEIC (i.e. 35 years, 2017 to 2051). In an attempt to deal with this considerable uncertainty in regulation, one servicing option considered in the IWM strategy was based

on existing regulatory conditions (i.e. assuming no changes to 2051). All future servicing options were based on the impact of expanding the existing best practice stormwater management targets to capture all residential and non-residential development (i.e. including infill and greenfield development). This was considered a likely future regulation scenario based on anticipated amendments.

The fundamental challenge is that individual strategies are required to test multiple regulatory scenarios and their economics due to the lack of clarity and guidance about potential and likely changes. While state government cannot predict the future, more guidance is needed to support consistency and reduce duplication of effort.

While it was assumed that the existing stormwater targets would be expanded it was not assumed that the best practice pollution reduction targets would be increased and/or that flow reduction targets would be introduced. This approach was the subject of considerable discussion with the stakeholder group and although a consensus was reached there was a general lack of clarity as to what approach should be taken to deal with this uncertainty.

The challenge of devising solutions that are resilient to changes in forecast population and employment growth and associated development was apparent in both the Monash and Sunshine NEICs. This issue was discussed as part of workshops and meetings between stakeholders. However, limited resources were available to assess the impact of changes in assumptions on the servicing strategies being investigated and no systematic sensitivity analysis was conducted.

**Potential solution:** In terms of changing regulatory conditions it is impossible to predict which specific provisions will change and over what time frame. This uncertainty needs to be acknowledged and accepted early in the project. The next step requires early consultation to determine the best course of action based on:

- a. the objectives of the study in question (which may be to explore the impact of future policy changes or to represent what is considered the 'most likely' future regulatory setting) and
- b. a consideration of the level of uncertainty of the proposed regulatory changes.

If there is a strong consensus that there is a high probability of a regulation changing relatively early in the period of analysis then arguably it should be included in the analysis. Conversely, if there is a low probability of change and / or the change is expected to occur late in the period of analysis then it may not be relevant to consider. It is unlikely that any

quantitative assessment of probability can be conducted, as such this should be qualitatively inferred from a review of existing documentation and discussion amongst stakeholders. Doing this early in the project is essential as the design of the IWM solutions is often guided by the regulatory conditions they set out to meet.

There are several practical steps that could be adopted by DELWP (or other government agencies) to help address the challenge of policy and regulatory uncertainty. This could include:

1. A summary of key policy and regulation that should be considered as part of precinct scale IWM plan.
2. A timeline for changes to be implemented (or not).
3. An agreed government position on which policy and regulatory changes and scenarios (if any) should be adopted for the assessment of IWM options and at what stage in the analysis they may come into effect. For instance, this could include a clearly addressed, tested and committed position around the indirect reuse of stormwater and recycled water.

These three items could be collated into an IWM "Policy and Regulatory Guideline" or "IWM Practice Note". To remain relevant this document would require regular updates (e.g. at a minimum a 12-month review). A good example is the *Guidelines for Assessing the Impact of Climate Change on Water Supplies in Victoria* (DELWP 2016b).

The benefits of this approach would include:

- **Increased consistency in IWM planning** – Currently there is no agreed baseline policy or regulatory setting for IWM planning. This results in highly variable assumptions and outcomes that hinders comparisons between studies.
- **Improved accuracy** – Water policy and regulation is complex, as such it is desirable to have those with the most expertise and easiest access to information on updates and delays to provide a collated set of guidelines or advice to practitioners.
- **Clarity for stakeholders** – This would reduce the consultation burden of IWM planning. Currently stakeholders with highly varied expertise, roles and responsibilities are asked for input on policy/regulatory positions that would significantly impact their organisations without having the time or capacity to make a fully informed decision.
- **Cost and time savings** – There is often considerable time invested at the start IWM planning to create a summary of relevant policy and regulation. This is followed by investment in collaboration and further work to interpret how any proposed changes should be applied.

### Challenge #5: Consultation

**Description:** Resourcing and actioning effective consultation is a major challenge for IWM projects that overlap with multiple stakeholders and projects. Challenges include:

- Tailoring the content and timing of consultation to best effect,
- Identifying and involving the right individuals within each organisation at the right time, and
- Communicating results and maintaining project momentum.

**Example:** The Monash NEIC included the following key stakeholders:

- Three water utilities (Melbourne Water, South East Water, Yarra Valley Water)
- Three councils (City of Greater Dandenong, Kingston City Council and the City of Monash)
- The Victorian Planning Authority
- The Department of Environment, Land, Water and Planning

Several IWM related studies were being conducted at the same time that addressed different elements of water management in the Monash NEIC. These included:

- IWM opportunity mapping (entire NEIC)
- Stormwater and rainwater options assessment (entire NEIC)
- Flood assessment (entire NEIC)
- Redevelopment Planning (two specific sites)

Having at least five water related projects running simultaneously across an area that involves so many stakeholders created several challenges.

Firstly, stakeholders were required to make significant time commitments to ensure that one or more relevant staff members were involved in the consultation conducted for each project. For at least one of the projects one council communicated that it could no longer attend any consultation workshops due to “the very high number of State Government WSUD / Integrated water related policies / reviews / initiatives” that were occurring simultaneously and Council’s need to prioritise its “limited resources in both the water planning / engineering areas”. Secondly, stakeholders were often confused as to what project was being referred to as part of consultation, how each project was (or wasn’t) connected and who was leading each project.

These factors lead to stakeholder disengagement and made it difficult to maintain interest and involvement in IWM planning. It also reduced the certainty that stakeholders

were satisfied with the objectives established, projects identified and recommendations made during the IWM planning process.

**Potential solution:** It is essential that consultation activities are well resourced, planned and coordinated.

- Adequate resourcing requires sufficient funds and staff time to undertake these activities.
- Consultation activities can be managed by the industry organisations responsible for IWM planning and/or the consultants they appoint to assist with this work.
- Consultation planning needs to consider the focus and timing of other IWM projects.
- Opportunities to reduce consultation by overlapping the objectives or timing of consultation activities for multiple projects should be pursued where possible.

### Challenge #6: Project scope and objectives

**Description:** Addressing the breadth of related issues such as liveability, urban greening and micro-climate while retaining a focus on water.

**Example:** The following principles were established by the VPA as a reference tool supporting decision-making and managing change within the Monash NEIC (VPA 2017).

- Principal 3: Attractive, vibrant and high-quality urban environments attracting investment.
- Principal 7: Sustainable social infrastructure and open space that meets the needs of people living, working and visiting the Cluster.
- Principal 8: Sustainable development with increased climate change resilience, integrated water management and resource efficiencies.

Addressing these principles as part of IWM planning creates several overlaps. For instance, street tree pits are able to provide stormwater treatment, stormwater retention, urban cooling and urban greening benefits. Consequently these assets are able to deliver on many of the principles identified by the VPA. However, unless street tree pits are adopted on a very large scale they cannot significantly impact the Monash NEIC water and pollutant balance. This contrasts large scale stormwater or rainwater harvesting for non-potable demands, which has a major impact on the NEICs water and pollutant balance. Similarly, a waterway restoration project for Mile Creek may deliver a range of habitat, biodiversity and liveability outcomes but is limited in terms of its ability to improve stormwater quality or provide an alternative water supply.

As part of the Monash NEIC stormwater and rainwater assessment the decision was made to assess servicing



portfolios with a mix of IWM projects that cut across scales and deliver on a broad range of objectives or design principles. Deciding how to integrate and compare servicing options that include such variable IWM elements added complexity to the project and reduced the time available for detailed analysis of projects.

**Potential solution:** A trade-off between the breadth and depth of IWM needs to be reached for each project. If a broad suite of objectives must be addressed then broader range of IWM solutions will need to be included in the analysis. This expands the breadth of analysis and necessarily reduces the depth and accuracy of analysis.

In other instances, the core objectives of a particularly IWM project may be clearer and help reduce the number of IWM options to be examined. By narrowing the breadth of analysis this allows for a more detailed investigation of design options, costs and benefits.

It is important to consider what compromises are being made in terms of breadth and depth early in the project to ensure that all parties are clear on the objectives, the accuracy of the analysis and the benefit of the work to be undertaken.

### Challenge #7: Data analysis

**Description:** Resolving differences in the quality and content of data.

**Example:** Substantial time was invested as part of both the Monash and Sunshine NEIC projects to reconcile the VPA predictions of population and dwelling growth with the area available for development in each NEIC and synchronise different stakeholder data sets. This resulted in budget overrun and delays in project delivery.

**Potential solution:** Adequate budget should be allocated to identifying and addressing data anomalies early in an IWM project. Stakeholders also need to be more aware of the limitations of their data (e.g. is it quality controlled, cleaned and edge matched). As it is often difficult to predict the extent of these challenges prior to embarking on a project it is important that project managers work with IWM practitioners to understand and cater for data issues as they arise. Proceeding without addressing issues in the data that underpins an IWM strategy can result in highly erroneous results. Project data sets should be internally consistent throughout scales from lot to precinct.

## CONCLUSION

IWM provides an avenue for society to address some of the most pressing challenges of urbanisation in terms of water supply, sanitation and environmental protection. Similarly, strategic planning for large scale redevelopment in existing urban areas attempts to address broader urbanisation challenges including jobs, housing, transport and liveability. The importance of these two exercises warrants investment in IWM planning in redevelopment areas to ensure our cities meet the future needs of their inhabitants.

This paper presents a succinct and practical guide for those engaged with IWM in urban redevelopment areas. Two projects are drawn on to identify several key challenges, how they can manifest and what solutions or approaches could be adopted to help mitigate their impact. Many of these challenges cannot be avoided entirely and require additional funding and staff resourcing. Early consideration and intervention is key to minimising or avoiding many of the challenges identified. Ongoing project management is also key to ensure IWM planning projects remain on track.

The difficulties associated with addressing IWM planning challenges highlights the importance of adopting a 'less is more' approach when embarking on IWM projects. In a resource constrained environment, focusing IWM planning on a smaller number of high impact projects is more desirable than simultaneously running a large number of IWM projects that engage the same stakeholders in lengthy and complex planning processes.

## ACKNOWLEDGMENT

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Peter's career has spanned industry, government, academia and research. His longstanding interest in the integration of water science into the master planning and management of urban and rural catchments has driven his collaborative interest in master planning, urban design and landscape architecture. Peter is widely published in the fields of WSUD and IWM master planning, having authored or co-authored more than 100 papers.

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