E2DESIGNLAB

WATER
ENERGY
DESIGN

Melbourne
Tenancy 4
Level 9 Carlow House
289 Flinders Lane
Melbourne VIC 3000
P +61 (0) 3 9654 7274

Brisbane
8A Princhester Street
West End QLD 4101
PO Box 5945 West End QLD 4101
P +61 (0) 7 3255 1571

Sydney
PO Box 286
Lane Cove NSW 1595
M +61 (0) 431 663 310

Canberra
Australian National
Botanic Gardens
Clunies Ross St
Acton ACT 2601
GPO Box 569, Canberra ACT 2601
P +61 (0)2 6262 5033

info@e2designlab.com.au
www.e2designlab.com.au

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Submission to the Inquiry into stormwater resources in Australia

This submission has been prepared on behalf of the staff of E2Designlab, an ecological and engineering design consultancy who provide water and stormwater management expertise and advice to government, utilities, developers and communities. Our staff work across Australia, and some have been instrumental in driving key policy and practice changes at a state and local level throughout the evolution of water services and stormwater management over the last 20-30 years. We have a close working relationship with research bodies in this field and also with partnering professions working in land development, planning, and economics. We welcome the opportunity to contribute to the Inquiry on such an important topic, and have included our perspective drawing on a depth of experience for each of the terms of reference below. A summary set of desirable outcomes is also included at the conclusion of the submission.

1. **The quantum of stormwater resource in Australia and impact and potential of optimal management practices in areas of flooding, environmental impacts, waterway management and water resource planning;**

The increase in stormwater runoff volume and rate following catchment urbanisation is well known. Managing urban flooding and protecting assets has fundamentally shaped our cities and suburbs. This urban excess runoff also impacts our receiving water ecosystems, often leading to irreversible damage. These impacts have recently been termed the urban creek syndrome. Conversely, urban stormwater could be a major opportunity for improvement of Australian cities – if it is managed correctly.

The opportunity lies in the fact that runoff generated from the impervious surfaces of an urbanised catchment is a predictable high yield water resource. In temperate Australia, urban stormwater runoff from cities typically equals or just exceeds post millennium drought potable water demands. This has led to the ‘City as a Catchment’ concept, which recognises that the creation of a large impervious area (a city) actually effectively captures and channels rainfall, and if we can include infrastructure to treat and reuse that water locally we can deliver excellent liveability and self-sufficiency outcomes. The City as Catchment is also strategy to address climate change reduced rainfall. Because of catchment runoff coefficients most rain falling on an impervious catchment is converted to runoff, whereas most rain falling on a natural catchment is intercepted by vegetation and soil and lost as evapotranspiration.

The City as a Catchment concept has already demonstrated success in Singapore, where urban stormwater is increasingly being viewed as a valuable water resource rather than just a drainage problem. The design of the city is being re-thought to include stormwater treatment, conveyance and storage. In doing so, the presence of water and vegetation in the city is reaping a much wider range of benefits for liveability, health, climate, amenity and tourism related economies.

A challenge in applying the City as Catchment concept is the availability of storage downstream from most Australian cities that are primarily located on the coast. As a result in most large Australian cities stormwater harvesting systems will need to be decentralised and potentially networked. Adelaide is leading the way in terms of stormwater capture and use by virtue of its favourable geology and the use of aquifer storage and recovery (ASR) systems. Such systems could be applicable in many inland rural towns and cities.

However, it should be stressed that while urban stormwater is a great potential water resource for cities, it cannot be considered in isolation. For any meaningful progress to be made in the environmental management of our urban water resources, stormwater needs to be considered in the context of Integrated Water Cycle Management (IWCM). Viewing the water cycle as a whole, stormwater is an important part of the picture, but not the only part. The discharge of urban wastewater is also a risk to our waterways and coasts, and is also a valuable alternative water source for our cities. Many studies have shown the combination of stormwater and recycled water (treated wastewater) far exceeds the current potable demands in many, if not all, Australian cities.

The current structure of many of our urban water utilities is not well geared to take significant advantage of these alternative water sources. The magnitude of these alternative water sources suggests that they could represent a significant economic opportunity for our cities, if harnessed to increase urban sustainability by:

- Increasing urban liveability associated with city "greening" by delivering enhanced amenity value and improved health benefits.
- Retention of water within the urban environment combined with green infrastructure to tackle the Urban Heat Island effect and improve microclimate outcomes.
- Increasing urban food production to the city through the use of urban water discharges as an irrigation supply.
- Improved flood resilience through rainwater and stormwater harvesting.
- Improved drought resilience through reduced demands on potable supplies, retention of water within the urban landscape and improved deep soil moisture stores.
- Developing safe, economically sustainable approaches to indirect reuse of alternative water sources as potable water.

2. The role of scientific advances in improving stormwater management outcomes and integrating these into policy at all levels of government to unlock the full suite of economic benefits;

Policy to drive the uptake of improved stormwater management is ad hoc and inconsistently applied across the states and territories of Australia. This has resulted in considerable difference in the extent and success of delivering multiple beneficial outcomes. The establishment of a national over-arching framework to drive consistent policy application is required. State and local policy would then need to reflect any special local conditions and would need to cover all forms of urban development and land use types.

Even using reasonably established technologies considerable advances could be made in terms of Integrated Water Cycle Management if these technologies were widely applied. In our view, the unlocking of the "full suite of economic benefits" possible with Integrated Water Cycle Management is not currently about scientific or technology barriers, it is rather about consistent policy, organisational structure and capacity within the water industry and urban planning sectors, and their ability to deliver a new approach which requires integration across activities which have traditionally been dealt with separately.

The current influence of competition policy and treasury and finance settings geared to driving down water pricing and operating costs of water businesses, has had the effect of reinforcing traditional management silos. These traditional silos focus on optimisation of single purpose solutions rather than delivering the full suite of economic benefits through an integrated approach. Creating industry efficiency is clearly desirable. However, re-fashioning the current siloed water supply, sewerage, and drainage industries into effective delivery bodies for Integrated Water Cycle Management will need investment.

A fundamental shift in water resource management will require significant change in the water industry business model. The shift will provide an increased level of service for communities, with water management delivering much broader benefits in liveability, health and resilience. It is worth noting that all previous step changes in levels of service (reticulated water supply, sewerage, formed roads and formal drainage) all came with significant investment and increased service costs. Similarly, a step change towards integrated water management and the delivery of multiple benefits requires a restructuring of financial mechanisms away from traditional singular outcome metrics and recognition that further investment will deliver value.

There are strong drivers to preserve and protect our past investments in high value potable water supplies (and to help justify the past environmental damage created by the development of assets such as dams and reservoirs). Accordingly, the future use of alternative water sources (including urban stormwater) will need to be integrated in a sensible way that makes efficient use of past investments while diversifying opportunities. For this to happen in a significant way will require a whole of government approach to the change and clear signals from state and federal treasury and finance areas that a change of this type is needed and is in the long term interests of Australia.

This transition needs the recognition that Integrated Water Cycle Management has real economic value in terms of:

- Increasing the resilience and flexibility of urban water supply and management systems to adapt to future environmental conditions, technological advances, and economic conditions.
- Increased liveability of our cities and health of our citizens through provision of safe water, cool, green and shaded urban areas and healthy urban water environments.
- Provision of important nutrients and water supplies through the use of treated wastewater or stormwater for agricultural production and

resource recovery, improving the connection of cities to their peri-urban and surrounding rural areas.

- Improved health and resilience of waterways, bays and coastal regions which provide critical income through tourism, fisheries etc.
- Creating a value and a market for the recovery and use of urban wastewater and stormwater products.

3. **The role of stormwater as a positive contributor to resilient and desirable communities into the future, including 'public good' and productivity outcomes;**

The role and function of water and waterways in urban communities is complex. The delivery of potable water and the collection, treatment and disposal of sewage is generally treating water as a simple commodity. This had some advantages in the past by allowing cities to grow and create a simple fee for service industry around a part of the water cycle. However, the management of stormwater in the environment generally enlists arguments around water being an essential requirement for life of humans and terrestrial and aquatic ecosystems.

As such stormwater and its management in this context essentially have a public good role and is a feature of the common treasury for all people to share and benefit from. Ideas around equity, social justice, resource law, and environmental protection generally come into play when considering stormwaters role in the landscape. While the water as a commodity versus water as a vital part of the environment is an old debate, little positive progress has been made in resolving these issues until the ideas of Water Sensitive Urban Design and Integrated Water Cycle Management were introduced. These concepts allow us to treat water as both a commodity and a natural resource and draw on conservation and market instruments to optimise water use and the overall benefit to the ecosystem services that support our communities and the environment.

There are a many examples of where Water Sensitive Urban Design and Integrated Water Cycle Management have been integrated at the strategy or even policy level across local and state governments in Australia. While it is great to have this direction in place, the absence of organisational and economic frameworks has resulted in the delivery of Water Sensitive Urban Design and Integrated Water Cycle Management being typically limited to more engineered solutions. Many of these solutions are not successfully integrated into the urban landscape and therefore are not seen to provide 'public good' outcomes. Therefore to truly value stormwater as a contributor to public good and unlock wider benefits for communities, we need to integrate the principles of Water Sensitive Urban Design and Integrated Water Cycle Management into the organisational and economic frameworks which govern design and planning decisions in our cities.

4. Model frameworks to develop economic and policy incentives for stormwater management;

Part of the complexity of realising multiple beneficial outcomes is the lack of economic and policy incentives to support existing frameworks (objectives, guidelines and standards) for the design and approval of Water Sensitive Urban Design and Integrated Water Cycle Management. In and around most of our large cities most “easy to develop” land has already been delivered. We are increasingly being faced with developing the “difficult land”. The application of past development procedures and rudimentary stormwater management practices in these situations have resulted in poor economic, social, and environmental outcomes. In many situations these poor outcomes have led to questions regarding the suitability of the guidelines and a criticism of “green tape”. Now we are trying to develop more difficult sites further demands are being made of both the development and approval communities. However, little or no review has been undertaken to understand the economic settings, planning, design, approval, and asset handover procedures in situations where poor design outcome have been delivered in the past. In many situations the organisations that are complaining about poorly functioning assets are those who have approved the designs and accepted the built assets.

Where guidelines for Water Sensitive Urban Design are available and have received support through development approvals processes, a range of issues have emerged:

- Application of guidelines and good design practices are varied by the urban development community (Developers).
- Assessment of designs are inconsistent and poorly constructed systems are sometimes accepted by the ultimate asset owner (typically Local and State Government).
- Guidelines are often poorly adopted or respected by the urban development consultants – planners, urban designers, engineers, and landscape architects
- Water Sensitive Urban Design guidelines and policies are poorly related to more powerful policy instruments such as the EPA Acts and State Environmental Protection Policies. This is because the issue of sustainable urban development is not typically a whole of government priority regardless of any commentary to the contrary.

These criticisms apply to all stages of development and are a major inhibitory factor in implementing change and moving towards a more sustainable future development model.

5. **Model land use planning and building controls to maximise benefits and minimise impacts in both new and legacy situations;**

In most areas of Australia, land development charges from utilities are generally independent of the real costs of servicing new growth areas. Generally, these development charges are capped at a rate which is deemed 'acceptable' and the additional costs are passed on to the broader community. Servicing costs based more closely on actual land capability assessments and servicing costs would help direct development to more concentrated areas and as a result simplify servicing development areas from an overall sustainability perspective (Water, Power, Transport, Social, Environmental, etc.).

It also needs to be recognised that effective Integrated Water Cycle Management may require additional land area. Better integration of water management with habitat, vegetation, open space and the urban form is therefore essential to support urban development that provides high amenity and liveable outcomes. As our cities become denser, we cannot afford to make compromises on the essential provision of natural and open space assets to support communities, ecology and the local management of resources, including water.

A water related issue that is not currently considered through land use planning is food requirements of growing urban populations. In the current urban planning paradigm, food is generally provided through "market processes". However, through Integrated Water Cycle Management, excess stormwater and recycled water (treated wastewater) could be beneficially used locally to support peri-urban farming and urban agriculture – simultaneously benefitting food production and water management.

6. **Funding models and incentives to support strategic planning and investment in desirable stormwater management, including local prioritisation;**

While Integrated Water Cycle Management can deliver a range of benefits, many of these benefits are difficult to measure directly, particularly those relating to ecosystem services and human wellbeing. Significant progress is being made in developing economic evaluation tools which begin to quantify these more intangible benefits in monetary terms, however there is still a lot of work to be done. In terms of past investments into improved stormwater management, the case for investment is often made through the advocacy of committed champions and has relied heavily on grant funding. Higher prioritisation of stormwater management needs to be reinforced for local government, water utility companies, land development agencies and land owners, through policy and expectation to ensure budgeted investments are made on an ongoing basis.

The presence of a dedicated coordinating organisation with policy making and funding powers could enable a step change. Significant stimulus for delivery of Integrated Water

Cycle Management was seen in Victoria through the governance of Office of Living Victoria who facilitated the creation of collaborative stakeholder networks and provided seed funding for a range of strategic and implementation projects. While this initiative has experienced some serious problems the fundamental ideas around this initiative are worthy of further evaluation.

7. **Asset management and operations to encourage efficient investments and longevity of benefit;**

The maintenance and management of stormwater treatment assets has been a major stumbling block in the journey so far. From our experience, the lack of ongoing commitment and quality in asset management results from these key factors:

- Poor transfer of design and maintenance information to the department that is the primary manager of stormwater treatment assets.
- Insufficient funding allocations for asset management (by local government or others).
- Lack of capacity and knowledge in local government (the primary manager of stormwater treatment assets).
- Failings in the of design, approval and handover of assets including:
    - Assets that don’t meet “Best Practice Guidelines” in terms of sizing and configuration
    - Assets are designed and approved without sufficient consideration for on-going maintenance (such as lack of access, onsite storage of silt for dewatering, occupational health and safety requirements, etc.).
    - Post construction impacts due to construction activities damaging the asset and rectification activities not occurring prior to handover.

All of these issues stem from one cause. Stormwater management is given a comparatively low priority within the perceived role of local government, and there is lack of accountability for poor asset management from either communities or environmental authorities. Clearer responsibilities and accountability is needed as well as ongoing monitoring to ensure investments deliver their full potential.

8. **The role of innovation in supporting desirable outcomes and transparent decision making, including access to information and novel technologies for planning, design and implementation;**

Research and innovation is an essential driver of any step change in practice. In the case of stormwater management, excellent research and innovative technologies and techniques have developed in Australia through the work of Cooperative Research Centres and a committed professional industry. On a global platform, Australia is recognised for its progressive work in stormwater management techniques. From our point of view as practitioners, the key innovations in technology and practice have been developed which will allow us to technically achieve the outcomes we are aiming for. However initiatives are limited by the existing water industry structure. Technical progress will continue as a part of the general research community. A heightened focus needs to be on, the innovation of delivery models, engagement and organisational frameworks. A focus on implementation will allow Australia to reap the benefits of the investments already made in technical areas and to reap the benefits of a sophisticated approach to science-policy partnership that includes essential social needs.

9. Any related matters.

Stormwater could be a very valuable local water supply for our cities. Through delivery of treatment and storage infrastructure, we can utilise stormwater as a resource that can meet local water needs. To date, practice has focussed on the harvesting of stormwater for low risk water needs like irrigation and toilet flushing. However, these demands can easily be met, with a significant excess of stormwater still being discharged from cities to waterways, contributing to pollution, habitat destruction, erosion and flooding. Meanwhile, Australian Cities are growing and requiring further water supplies. Past investments in desalination and rural water transfers to cities have been costly in more than a monetary sense – with significant environmental and energy impacts.

Stormwater is a locally available water source which can be captured and treated to a potable standard using existing and well-understood technologies, and straightforward risk management measures can be put in place to ensure human health is completely protected. From a cost-efficiency point of view, direct contribution to the potable supply avoids the need for dual pipework for water supply, easing implementation and management. The barriers to the use of stormwater as a potential water source for mains water supply (potable water) lies in a lack of policy support and organisational aversion to risk and fear of change. Investment needs to be made in education, demonstration and consultation to support the delivery of strategic stormwater management measures like indirect reuse for cities.

Further urban development under our current paradigm is going to result in future impact on our environment and increased difficulty for future generations to repair the situation.

10. Desirable Outcomes and Recommendations:

- Recognition that our cities represent a unique source of alternative water resources. Also that harvesting water from impervious city catchments will help to build water supply resilience in a changing climate. For this to occur in most Australian cities would require a move towards de-centralised water infrastructure and an integrated network of harvesting systems. This would require major structural and policy change within the water industry.
- All our water resources are utilised through the widespread adoption of Integrated Water Cycle Management. For this to occur would require the acknowledgement that water within our cities is both a commodity and a shared common and natural resource. This would require major structural and policy change within the water industry and recognition that water needs to be managed for both profit and public good.
- Water Sensitive Urban Design is widely adopted to benefit cities in terms of water security and resilience, liveability, microclimate management, and food security. This would require major change in the development industry both within government and the private sector. Much greater vertical integration is required during urban development process through planning, urban design, infrastructure design and delivery, and maintenance and operation. Significant structural and cultural change is required to enable greater levels of collaboration and integration.
- Whole of government (Federal, State and Local) policy settings (particularly in the treasury and finance areas) encourage and enable change in the water industry to allow broad-scale adoption of Integrated Water Cycle Management
- National policy (supported by strong Acts – State Planning Provisions, EPA Acts, State Environmental Protection Policies) requires adoption and application of Water Sensitive Urban Design in a uniform way around the country.

11. Examples

The following tables and diagrams demonstrate the proven quantum of stormwater resources in a range of urban contexts in Australia compared with the scale of local demand for water. Please contact E2Designlab if you require further detail.

Location	Catchment area (ha)	Impervious area (ha)	Stormwater runoff (ML/year)	Urban stormwater excess (ML/year)	Existing		Identified			Source
					Rainwater and stormwater harvesting (ML/year)	Potable demand	Stormwater harvesting (ML/year)	Potable demands (ML/year)	Non-potable demands (ML/year)	
City of Casey (VIC)	40,072	3,867	76,442	22,726	100	16,393	7.5 ML/year by 2019	-	-	City of Casey Integrated Water Management Strategy, E2Designlab for City of Casey, 2014
San Remo (VIC)	634	-	1,493	-	-	391	128	757	145	San Remo Integrated Water Management Strategy, E2Designlab for Westernport Water, 2014
Nillumbik Shire (VIC)	43,200	1,844	20,882	2,919	552	4,426	-	-	-	Nillumbik's Integrated Water Management Strategy, E2Designlab for Nillumbik Shire Council, 2013
City West Water service area (VIC)	-	-	-	100,000	-	92,790	8,145	92,696	23,720	City West Water's Integrated Water Management Strategy, E2Designlab for City West Water, 2012
Canberra (ACT)	-	-	-	-	-	65,000	4,220	120,000	4,920	ACT Non-potable Water Master Plan Study, AECOM for ACTPLA (Environment and Sustainability Directorate), 2011
Toolern growth area (VIC)	-	-	-	-	-	-	3000	-	-	Western Water
Black Forest Road Catcment (VIC)	-	-	-	-	-	-	2900	-	-	Black Forest Road Catchment Integrated Water Management Study, E2Designlab for City West Water, 2014
Elsternwick Park (VIC)	-	-	-	-	100	-	-	-	-	City of Bayside
Total	**83,906**	**5,711**	**98,817**	**125,645**	**771**	**179,000**	**18,393**	**213,453**	**28,785**	

Table 1: Identified stormwater resources in projects to date.

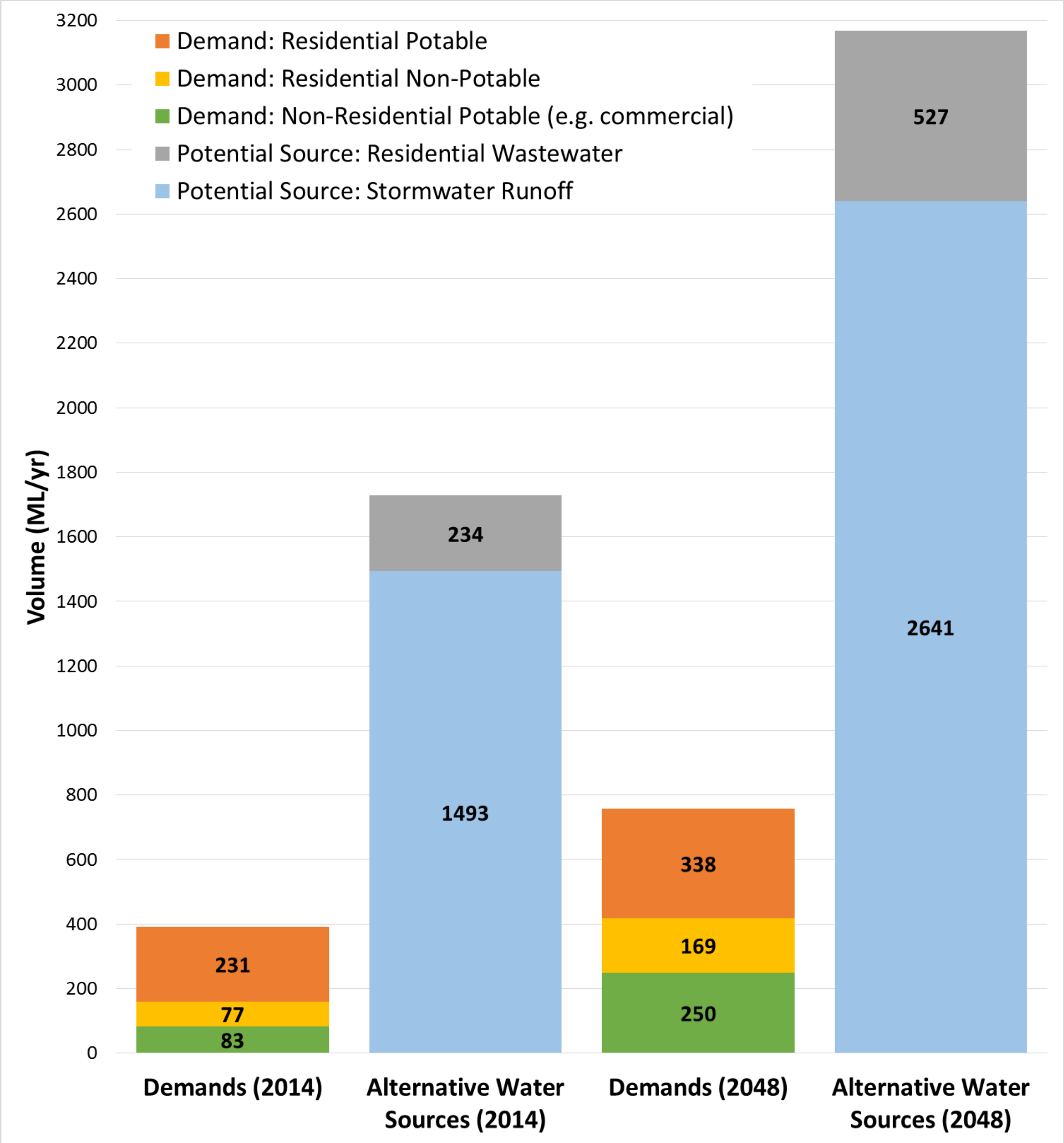

Figure 1: San Remo - potential sources and demands of water within the project area (San Remo Integrated Water Management Strategy, 2014)

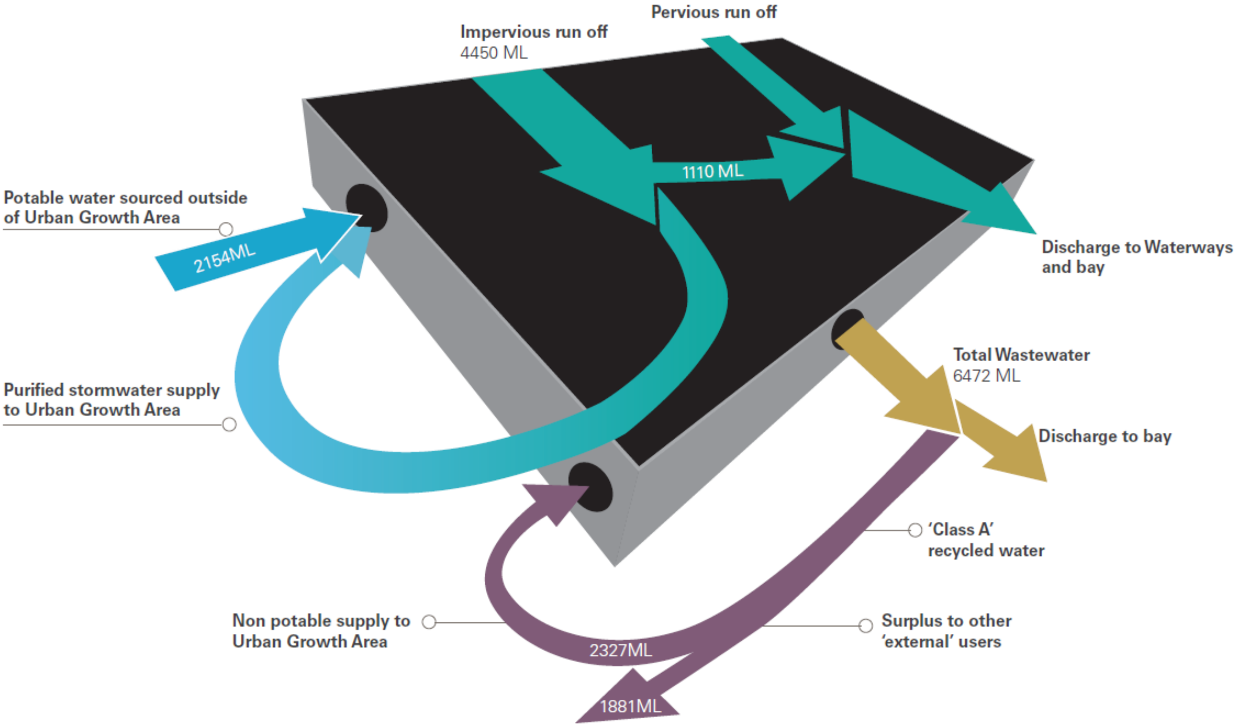

Figure 2: Toolern Growth Area - potential sources and demands of water within the project area (Western Water, 2011)