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Dear Ms McDonald

The City of Melbourne is pleased to provide input to the inquiry into stormwater by the Senate Standing Committees on Environment and Communications.

The City of Melbourne practices sustainable water management and our actions are guided by our strategic water framework *Total Watermark: City as a Catchment*. This strategy has been revised to keep pace with the change in practice and theory within the water industry. For example, our 2008 strategy was written towards the end of the millennium drought and had a strong water conservation focus. Our 2014 update includes a greater emphasis on flood mitigation and climate adaptation. In our 2014 version of *Total Watermark* we have focused on efficient use of water and seeking alternative water sources for landscape irrigation, and maintaining a healthy soil moisture level.

Over the last decade the City of Melbourne has invested over \$30 million dollars in stormwater harvesting and water sensitive urban design projects. We have strong stormwater quality and alternative water source targets. Our targets are reinforced in several of our policy documents that sit alongside *Total Watermark*, including the *Urban Forest Strategy*, the *Open Space Strategy*, the *Climate Change Adaptation Strategy* and in our structure plans for the urban growth areas of Southbank, City North and Arden Macaulay.

We particularly recognise the value of storm water for our Urban Forest and all of the city's horticultural assets - these had been severely impacted by a lack of irrigation during the millennium drought. Some years ago we identified that we were set to lose 27% of our 70,000 council trees in the coming 10 years through accelerated decline due to lack of soil moisture and an aging tree stock. Stormwater is viewed as a valuable resource and we are actively working to capture it, treat it and re-use it in our streetscapes and parks and gardens, to ensure a more liveable, water-sensitive and climate adapted city.

The City of Melbourne's drainage system is characterised by old infrastructure designed for a much smaller city. The majority of drainage infrastructure is over 60 years old, with some drains dating back to the 1850s. The flood mapping was poorly charted and understood until the late 1990s. Generally areas can accommodate either 10 or 20 years Average Recurrence Interval (ARI) event, however, much of the existing drain infrastructure is reportedly designed to accommodate one in five year events and many road locations are not designed to adequately accommodate overland flow. There are several locations of flash flooding risk in the City of Melbourne. We are currently focussing on the Elizabeth Street catchment with an emphasis in retaining more water in the upper catchment, to take pressure off the drains lower in the catchment so that the lower catchment drains can then cater for one in twenty year rainfall events.

Over the following pages we provide information relevant to the terms of reference. A summary of the key points in our submission is listed below:

- The quantum of stormwater resource in Melbourne has potential to be used for a significant proportion of green space irrigation needs. Stormwater harvesting schemes have been put in place to capture 363 ML of water in the municipality and more harvesting projects are underway. By creating greener spaces with healthy vegetation the City can become more resilient to climate change. Vegetation is paramount for cooling the city during heatwaves. Adaptive design of open space and use of stormwater capturing systems will also be crucial for flood mitigation, likely to be another impact due to a changing climate.
- Scientific knowledge is critical for determining Council strategy and investment decisions on how to most effectively capture, treat and reuse stormwater. The City has implemented a range of policies, strategies, small and large scale capital works, communications and education projects and modelling to better manage stormwater in the municipality. These are all dependent on high quality local research and evaluation. We partner with industry bodies, governments and academic institutions to pursue research into integrated water cycle management.
- Several projects between Council and partner organisations are exploring model frameworks and policy incentives for stormwater management. These include policy options to support green roof development (*Growing Green Guide for Melbourne* project), modelling to show how green and grey infrastructure can impact on flooding probabilities under a range of future climate scenarios (*Integrated Climate Adaptation Model* project), and developing an economic framework for green infrastructure (*Valuing Green Infrastructure* project).
- The City has introduced local planning policies to improve stormwater management on private land, and will investigate opportunities in the planning scheme to levy downstream property holders to fund projects upstream that will mitigate flooding.
- The City contributes the lessons we have learned to the development of stormwater management guidelines and projects undertaken by other councils, we advocate for regional approaches to stormwater management, host tours to our stormwater harvesting sites, and we are currently creating a comprehensive website of information about our urban water projects, to raise awareness of the work we are doing and to share technical information.
- The City notes a concern with the current governance arrangements that requires local government to own and maintain the stormwater infrastructure whilst not owning the water asset itself.

Detailed responses to the terms of reference follow in the attached pages.

Yours sincerely,

Ian Shears, Manager Urban Landscapes Branch
City of Melbourne

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.

Modelled stormwater runoff for the municipality of Melbourne is 10,573 million litre per year. The City of Melbourne (CoM) demand is 1000ML primarily for irrigation of our state significant parks and gardens. We are currently able to supply about 25% of this demand from harvested stormwater. This has been achieved through the assistance of the Federal Government's Water for the Future fund. More stormwater harvesting schemes are being developed in partnership with the State Government of Victoria.

By 2018 we hope to supply 8% of all the municipal water demand (7600 ML) from alternative water sources, rising to 20% by 2030.

By making future stormwater harvesting schemes work for flood protection as well, we will also address the issue of our drainage infrastructure being under the generally accepted minimum service level.

The city is working to develop optimal integrated water cycle management practices to reduce flooding through improving drain capacity and unsealing the soil higher in the catchment. We are also working to reduce the negative impact of storm water such as pollutant levels and erosion from fast moving water, by using biofilters with stormwater harvesting schemes and by detaining flow through permeable areas such as parks and green roofs.

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.

Scientific understanding underpins our approach to water cycle management. We are currently working on a joint project with the University of Melbourne and others to develop cutting edge models of water flow in the city under different climate scenarios with a range of alternative water management practices – from drain upgrades to increased parks and green roofs in the city. CoM is an industry partner to the CRC on Water Sensitive Cities and looks to the CRC for leadership on scientific research, which helps us to implement leading practice on ground. We have partnered with the University of Melbourne through Australian Research Council Linkage grants, to develop our scientific understanding of the impact green roofs can have on stormwater retention. We rely on scientific research to provide local level data that will convince our Council to invest in stormwater projects, based on local research not just international experience.

We use scientific understanding to inform our local government policies, and expect it to inform strategy and policy at a state and federal level.

CoM has a number of industry leading strategies such as *Total Watermark*, *Urban Forest Strategy*, *Open Space Strategy* and *Climate Change Adaptation Strategy*. We also have guidelines such as the *Growing Green Guide: A guide to green roofs, walls and facades for Melbourne and Victoria, Australia*. These were all developed in collaboration with academia and the industry, underpinned by science and evaluation of projects, to allow them to become the leading documents that they are.

THE ROLE OF STORMWATER AS A POSITIVE CONTRIBUTOR TO RESILIENT AND DESIRABLE COMMUNITIES INTO THE FUTURE, INCLUDING 'PUBLIC GOOD' AND PRODUCTIVITY OUTCOMES.

Stormwater is an integral facilitator of resilient and liveable communities into the future. It is important for irrigation of our parks, gardens and street trees to counter the effects of climate change.

By 2030 Melbourne is predicted to be significantly affected by warmer temperatures and heatwaves, lower winter and spring rainfall, intense storm events and flash flooding. By 2070 we are predicted to be experiencing more than double the number of heatwaves, a more than 10 per cent reduction in rainfall and a significant increase in extreme storm events. The frequency and intensity of heatwaves is expected to increase, and with it the economic impacts of such events on businesses. By 2030, the municipality of Melbourne's current population of approximately 105,000 (as at 2012) is predicted to more than double. Our worker and visitor populations are also increasing rapidly, with 1.2 million daily visitors projected by 2030, up from 800,000 daily in 2013.

Demographically the city has also changed. An apartment building boom has meant that 93 per cent of new homes built between 2006 and 2012 were apartments. This higher density living and working places additional demand on our city's existing open spaces – the publicly owned land used for recreation, including major sporting venues, public parks, gardens, reserves, waterways and forecourts.

Melbourne's tree population is vast and is a defining part of the city. But more than a decade of drought, severe water restrictions and periods of extreme heat, combined with an ageing tree stock, have put our trees under immense stress and many are now in a state of accelerated decline. As a result, we expect to lose 27 per cent of the city's current tree population in the next decade and 44 per cent in the next 20 years. We are working to plant new trees and increase the canopy cover across the city. This will require water for irrigation and soil surrounding trees that can readily absorb and hold water for the vegetation to use.

Using local sources of water, especially stormwater will reduce the need to extract water at the headwater of our major river, providing environmental flows where they are most needed.

Stormwater quality improvement will also add to the amenity and attraction of our waterways, especially the major rivers such as the Yarra running through the city and to Port Phillip Bay. This will translate to a greater tourist attraction and a higher sense of well being for the local community.

MODEL FRAMEWORKS TO DEVELOP ECONOMIC AND POLICY INCENTIVES FOR STORMWATER MANAGEMENT

The City of Melbourne, as part of an Inner Melbourne Action Plan project, *The Growing Green Guide for Melbourne*, has developed a policy options paper for Victorian local and state governments to consider how they can encourage and support green roofs, walls and facades, all of which can play a role in stormwater management, but especially green roofs. The paper is available on www.growinggreenguide.org. It has received national and international attention to date.

The City of Melbourne is undertaking another partnership project to develop an economic framework for green infrastructure. To date, planning for green infrastructure has largely been opportunistic, taking advantage of funding opportunities, rather than being a strategically managed portfolio sustained by ongoing funding. This has meant that tools and methods to integrate green infrastructure with other types of infrastructure have not been developed fully. Decision-makers find it difficult to properly evaluate the type of investment needed, why it is needed and how it is needed. As a result, green infrastructure is viewed as a peripheral aspect of

infrastructure planning so is often underutilised and undervalued. This has meant that opportunities to improve these assets or maximise their benefits have not been taken up.

The framework aims to create better understanding of:

- The value and benefits of green infrastructure.
- The available options and how these options support the future viability and liveability of our communities.
- The development of business cases for preserving existing and investing in future green infrastructure.

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

The CoM stormwater management and ecologically sustainable design Planning Scheme regulations ensure that it is now business as usual for developments to treat stormwater to best practice standards. This is mostly achieved through rainwater tanks for water quality. Building-scale blackwater recycling systems have been installed for water use reduction credits but these are generally too expensive to operate and are turned off. Rainwater harvesting and precinct scale sewer mining or stormwater harvesting systems are better options for best practice water management.

Another relevant part of the Planning Scheme is Clause 56.07-4 of the Victoria Planning Provisions (administered by councils) which applies to the subdivision of residential land on greenfield and brownfield development sites. The provision requires pollutant removal and flow control for stormwater but does not clearly link this requirement with using stormwater as an alternative water supply. The clause has limited applicability in established suburbs because it does not apply to subdivision of commercial or industrial land and to site developments that are developed prior to being subdivided. A review of this planning provision was conducted in 2013 by Melbourne Water and the former Office of Living Victoria (now part of the Department of Environment, Land, Water and Planning (DELWP)). This provided a very comprehensively researched report that provided a number of insightful recommendations. The report is not public but could be provided to the panel upon request.

FUNDING MODELS AND INCENTIVES TO SUPPORT STRATEGIC PLANNING AND INVESTMENT IN DESIRABLE STORMWATER MANAGEMENT, INCLUDING LOCAL PRIORITISATION.

CoM is generally funding its small scale projects through its rate base and faces internal competition for funding of these projects. The majority of our (large scale) stormwater harvesting projects have been co-funded by federal and state government grants. This has given CoM the confidence to invest further. But to achieve our targets of stormwater harvesting and alternative water use, a different funding model will need to be explored. Particularly, from a flood retention/protection sense, a majority of the work needs to occur in the upper catchment to protect the properties down in the flood prone areas. If development is occurring in the flood prone areas we currently do not have a mechanism to levy a fee for the works that are required in order to provide this development with a better level of flood protection. We are going to be exploring various models with as developer contributions or an offset, as part of our Elizabeth Street Catchment Plan actions in the coming years.

Melbourne Water manages a stormwater offset scheme based on modelled total nitrogen loading. The stormwater offset contributions are paid by developers to mitigate the impacts of stormwater pollution from urban developments. They apply outside of schemes, and may also apply inside some schemes. Full details of the scheme are provided at <http://www.melbournewater.com.au/Planning-and-building/schemes/about/Pages/What-are-stormwater-quality-offsets.aspx>.

Local council are also able to apply these offset rates if they set up the appropriate mechanisms within their planning provision. To date no Victorian council has undertaken this process. CoM is considering if this will be an appropriate mechanism to assist funding our stormwater quality improvement works.

Under this mechanism CoM currently applies a value to our council street trees that is beyond the simple replacement cost. This uses an amenity value that attaches greater value to older, larger, healthy trees to minimise the loss of such trees. This has been a very effective mechanism for protecting larger canopy cover tree from development.

ASSET MANAGEMENT AND OPERATIONS TO ENCOURAGE EFFICIENT INVESTMENTS AND LONGEVITY OF BENEFIT

Predominantly the stormwater network within the municipality is managed by the City of Melbourne. However, there is a division of responsibility with Melbourne Water who manages the majority of the drains with catchments larger than 60 hectares (although this is not strictly applied due to legacy issues) and all the natural waterways.

Over recent years savings are generally being sought from asset management and maintenance budgets. This makes it increasingly difficult to maintain the service standard of the system as budgets are maintained or decreased, yet the cost of providing the service is generally increasing. Unlike roads, footpaths and street furniture, pipes are a hidden assets where the effect of not working is generally not obvious until it rains and water runs over the surface rather than staying in the pipe network. In higher rainfall events this can cause flooding to occur earlier or to a greater extent and/or depth than necessary.

The other legacy issues that are needing attention now or in the near future are;

- the age of many of the assets in inner city areas;
- the lack of detailed information on the drain, in particular the invert levels, which were not transferred across onto digital formats from the old hand drawn plans;
- Lack of as-constructed plans being handed over post completion of a development;
- Lack of knowledge of un-authorized connections, intrusions or cross-connection that either increase flow or cause friction and slow down the flow within pipes.

Drainage budget for City of Melbourne in the current year:

Renewal:

Drain renewal (asset condition assessment / replacement) - \$2,351,000

Flood mitigation (asset capacity upgrade) - \$2,005,000.

Parks drainage renewal budgets vary between \$50,000 to \$100,000 per annum

New:

Drains new - \$250,000

Flood mitigation - \$1,000,000

Maintenance:

Pump station maintenance - \$50,000

Routine drainage maintenance in streetscapes - \$901,000

Drainage maintenance in parks is more than \$150,000 per annum.

THE ROLE OF INNOVATION IN SUPPORTING DESIRABLE OUTCOMES AND TRANSPARENT DECISION-MAKING, INCLUDING ACCESS TO INFORMATION AND NOVEL TECHNOLOGIES FOR PLANNING, DESIGN AND IMPLEMENTATION.

Access to information

Innovation is paramount in arriving at desirable stormwater management outcomes. The industry is learning at a rapid rate as it trials new approaches for stormwater. The City of Melbourne is contributing advice into a number of projects that are developing industry guidelines on WSUD. As a leader in WSUD we are often approached for details about what has worked, or not, in planning design and implementation, and so we are now creating a website with detailed information: The Urban Water project underway at the City of Melbourne will be a visually-focused education tool that engages the community to learn about water in the urban environment. It will be a hub where organisations, students and industry professionals, both local and international, can access technical information about urban water projects in the City of Melbourne. Urban Water will be a responsive digital platform that is tailored for a high quality user experience; making use of infographics, photos, animations, virtual and self-guided tours, videos, on-site signage and audio to fulfil its purpose as an engaging place to learn. The project is due for completion in June 2015.

There have been calls for a hub to be developed to share information and case studies wider than just the City of Melbourne. Already City of Melbourne provides information to the industry website hosted by Clearwater, and the two sites will complement each other in future. Urban Water will provide more detail about projects and include videos and infographics that provide more information than the Clearwater website. It will also include walking tours complemented by on-site signage that link back to the Urban Water website.

Novel technologies for planning

Climate projections for Melbourne indicate that we will experience lower rainfall with increased drought vulnerability, however when it does rain we are likely to receive intense rainfall events that will increase the likelihood of flash flood events.

Planning for these conflicting rainfall futures poses strategic management challenges for both water authorities and local governments. The City of Melbourne has recognised the need to develop its climate adaptation approach and is now seeking to understand how multi-purpose climate adaptation interventions might be undertaken across the city. We are working with others to develop an *Integrated Climate Adaptation Model* (ICAM).

To date the City has undertaken many climate adaptation activities in isolation - upgrading drainage, delivering new green space and stormwater harvesting capacity - without understanding of how each intervention impacts or compliments the other and without understanding the full spectrum of climate risk. Effectively, projects have been undertaken opportunistically rather than strategically and have focused primarily on single purpose benefit.

ICAM aims to develop better understanding of our catchment and the implications of future climate scenarios. ICAM will be capable of running multiple potential interventions and visioning the outcomes and consequences of implementing those interventions in a range of climate scenarios. Ideally this will assist CoM move towards holistic climate adaptation approach for the city to develop a set of smart solutions for that will ultimately be more cost effective and cohesive when compared to delivering solutions for these issues separately.

RELATED MATTERS

Governance

Governance of water assets is currently quite complicated. Council manages a majority of the stormwater drainage infrastructure in the municipality and we work collaboratively with the Catchment Management Authority. Melbourne Water deal with issues and explore opportunities within their jurisdiction. Given we are managers of the drainage system; stormwater is the best alternative source of water for us as we maintain the conveyance asset. However, current legislation is interpreted to state that water falling on building roofs (rainwater) is the property of the building owner, but once it reaches the ground and becomes stormwater it become the property of the crown. This puts council in a position of owning and maintaining the assets but not its contents. To date this has not been a problem as it is an undervalued resource and we have good working relationship with the relevant authorities. But there is not surety of supply with upstream landowner able to capture water irrespective of any downstream systems. For example, if the parliament building in Spring St was modified to capture all the stormwater falling on it, then the 45 million Fitzroy garden scheme would lose 25% of its catchment and hence the corresponding inflow volume.

Flooding

Council is very aware of the flooding implication within our municipality. In partnership with the federal government under the *Coastal Adaptation pathways* project we undertook flood modelling for our Southbank and Arden Macaulay precincts. These have indicated that flood water will be up to 1.2m deep across a large proportion of these precincts. We are currently investigating these areas in greater detail to determine what effective actions may be taken.

Another leading initiative the council is involved in that was not touched on in earlier responses to the terms of reference is the Carlton Squares Flood mitigation and stormwater harvesting scheme. The City of Melbourne has delivered several large scale stormwater harvesting schemes over the last three years. We intend to build on this knowledge and introduce the dual function of flood mitigation for this project. Stormwater will be diverted from the existing 750-900mm diameter drains running south of Lincoln Square under Bouverie Street and serving well established older residential catchments include parts within the University of Melbourne. The scheme will provide fit for purpose recycled water for the irrigation of University, Lincoln and Argyle Square's as well as street trees in Lygon and Bouverie Streets. This area forms the majority of the upper catchment of the Elizabeth Street drain. This catchment has been classified as 'extreme' by Melbourne Water regarding the potential flood risk, predominantly in the southern section of Elizabeth Street. As such we are designing a solution that will aid in flood mitigation for the downstream catchment. The objectives of the Carlton Squares Stormwater Harvesting Scheme are to:

- Capture, treat and store for reuse stormwater flows from the urban catchment upstream of Lincoln Square to meet the irrigation needs of Lincoln, Argyle and University Squares as closely as possible
- Treat stormwater to a 'fit for purpose' standard suitable for unrestricted irrigation using appropriate water quality treatment system
- Mitigate Flooding in Bouveire St by bringing the pipe flow capacity immediately downstream of the off take point up to a 1:20ARI level