Government of South Australia
Adelaide and Mount Lofty Ranges
Natural Resources Management Board

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Committee Secretary
Senate Standing Committees on Environment and Communications
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Dear Committee Secretary

RE: Senate Inquiry into Stormwater Management in Australia

Thank you for the opportunity to present this submission to the Senate Enquiry into Stormwater Management in Australia. South Australia has been at the forefront of stormwater harvesting in Australia for two decades, and enjoys a reputation and profile as a leader in the field. The region covered by the Adelaide and Mount Lofty Ranges Natural Resources Management Board (the Board) includes more than 30 harvesting schemes, of varying scale, designed to treat and use between around 1ML and 2,000ML of stormwater each year.

Nonetheless, stormwater harvesting is only one aspect of best practice stormwater management. Harvesting needs to be supported by a greater array of management practices and policy to meet the challenges to urban and natural environments posed by unmanaged stormwater. This submission addresses some of the threats and challenges posed by stormwater in the Adelaide region and provides advice to inform the inquiry.

Stormwater in the Adelaide and Mount Lofty Ranges region

In 2014 around 120,000ML of water flowed from Adelaide's waterways to Gulf St Vincent, with approximately 90,000ML of this coming from stormwater from urban areas and the remainder from upstream rural areas. Around 60,000ML (70%) is produced in the urban areas of the River Torrens and Patawalonga catchments, which include the oldest and most densely urbanised areas in the region. To the south, the growing urbanised portions of the Field River and Christie Creek catchments represent ever increasing nodes of stormwater generation.

The transfer of pollutants to Gulf St Vincent from metropolitan Adelaide has been investigated by the Adelaide Coastal Waters Study (Wilkinson et al. 2004[1]). Total loads of suspended sediment, nutrients and heavy metals for the period 2001 to 2004 are summarised in the table below.

Mean and median total concentrations of copper, lead and zinc in most stormwater exceed the guidelines for marine species protection (Wilkinson et al. 2004). Concentrations are highest in stormwater from highly urbanised catchments in the central metropolitan area. Median copper and lead concentrations are between 2 and 10 times, and 1.5 and 4 times the guideline values respectively. Median zinc concentrations also exceed the guideline values.

[1] Wilkinson, J., Hutson, J., Bestland, E. and Fallowfield, H. 2004. Audit of contemporary and historical quality and quantity data of stormwater discharging into the marine environment, and the field work programme. ACWS Technical Report No. 3.

Importantly, the total load of more than 3,500 tonnes of sediment entering the Gulf St Vincent from just the urban creeks summarised in the table below is greatly in excess of that able to be sustainably processed by the marine environment.

The scale of stormwater pollutants discharged to the marine environment has been shown to cause significant negative impacts.

Location	Year	Suspended Sediment (tonnes)	Total nitrogen (kg)	TKN (kg)	NOx as Nitrogen (kg)	Total Phos. (kg)	Copper (kg)	Lead (kg)	Zinc (kg)
River Torrens	2001	986	51,626	25,839	25,787	2,505	867	323	2,228
	2002	202	14,196	7,534	6,661	588	89	67	551
	2003	577	27,517	15,021	12,496	1,569	141	158	1,384
	2004	1,998	41,684	24,214	17,470	6,556	259	270	1,505
Brownhill Ck	2001	412	16,192	12,782	3,410	2,071	293	158	1,512
	2002	140	4,911	4,071	841	764	50	67	558
	2003	162	8,023	6,261	1,762	1,082	74	58	853
	2004	287	7,994	6,233	1,761	1,136	100	81	915
Sturt Ck	2001	487	12,536	8,036	4,501	2,162	170	99	719
	2002	268	7,837	5,890	1,948	1,808	65	69	533
	2003	517	19,853	14,540	5,313	3,830	103	68	473
	2004	977	16,399	12,465	3,935	3,546	126	99	670
Field River	2001	182	4,021	2,059	1,963	479	19.8	58.6	299
	2002	88	2,491	1,172	1,319	229	10.3	26.1	155
	2003	127	3,401	1,651	1,750	329	14.7	37.7	222
	2004	154	3,585	1,815	1,769	404	17.1	48.3	258
Christie Ck	2001	273	4,852	3,264	1,588	447	60.6	46.2	217
	2002	165	3,676	2,480	1,196	385	19.2	37.9	168
	2003	143	3,206	2,359	848	365	17.1	32.4	146
	2004	103	2,826	1,876	950	263	17	19.5	108

Threats Posed by Stormwater in the AMLR Region

Whilst attitudes towards stormwater have changed over the last 20 years, the dominant management approach is still to treat it as a threat to urban infrastructure and remove it from an area as quickly as possible. This approach moves the problems of increased flows and pollutant loads downstream to urban creeks, wetlands and Gulf St Vincent.

Gulf St Vincent (GSV) is a recognised national biodiversity hotspot, of critical importance to the local fishing industry as well as recreational fishing, and is fringed by Adelaide's popular beaches. Pollutant loads identified in the table above flow directly to Gulf St Vincent.

Aerial photography and mapping have confirmed the loss of around 5,000 Ha of seagrass meadows since 1949. Whilst much of the losses have been attributed to discharges from waste water treatment plants, in more recent decades sediments in stormwater flowing into GSV have contributed towards increased losses and reduced seagrass meadow recovery. The ecosystem services provided by seagrass meadows around the world are well known and include the provision of food sources and habitat for recreational and commercial fishing. International research (Costanza et al. 1997[2]) estimates the ecosystem services value of seagrass at more than AU$20,000/Ha. In the Mediterranean, seagrasses are estimated to be worth AU$107mil to the commercial fishing industry, and a further AU$155mil to recreational

[2] Costanza R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R.V., Paruelo, J., Raskin, R.G., Sutton, P. and van den Belt, M. 1997. The value of the world's ecosystem services and natural capital. *Nature*, 387: 253.

fishing (Jackson et al, 2015[3]). No estimates of additional value in relation to recreational fishing are available locally, however, recreational fishing groups have suggested that recreational fishing injects as much money into the local economy as commercial fishing.

Seagrass is also important in safeguarding seabed sediments against erosion. Along the Adelaide shoreline, seagrass loss has contributed towards the erosion and movement of sand northwards along the coastline. Today the region invests around $5mil/year in physically moving sand southwards from northern beaches as part of sand replenishment.

Urban creeks are a critical component of our urban stormwater network, receiving runoff from streets and conveying stormwater to GSV. Just as critically they provide aquatic habitat, and recreational benefits for urban communities. Whilst around 70% of creeks outside of urban Adelaide are considered to be in reasonably stable condition (AMLRNRMB, 2008[4]), creeks within urban Adelaide are generally in poor condition. Poor condition results from excessive stormwater flow volumes and rates scouring soft soils and leaving deeply and steeply incised creeks that are prone to continued bank failure. This in turn leads to continued migration of sediment to GSV as well as continued loss of urban creek habitat.

Continued urban growth and infill is both contributing to and suffering from stormwater related problems. Flooding of at-risk areas in metropolitan Adelaide occurs with some regularity, and can lead to significant domestic and economic losses, create personal hardship and disrupt lives and livelihoods.

The Benefits of Best Practice Stormwater Management

South Australia has lead the way nationally on stormwater harvesting. At a local scale these schemes provide some level of independence from centralised (mains) sources of water. Most directly, this benefits the owners by providing a cost competitive source of water (resulting in lower internal transaction costs), a source of water that is independent of drought restrictions, and in many cases provides attractive and functional open spaces and recreational opportunities for their communities. These systems also treat and remove significant quantities of pollutants from stormwater reaching GSV.

South Australian stormwater planners and practitioners also recognise the importance of water sensitive urban design (WSUD) to optimise the benefits that good stormwater management create. Benefits of WSUD have been well articulated by researchers and practitioner groups across Australia and can be measured in environmental, social and economic terms. These benefits are recognised as being applicable to Adelaide, although progress towards implementing widespread WSUD is limited by investment and developer willingness.

The landmark Adelaide Coastal Waters Study (EPA, 2007[5]) resulted in 14 recommendations designed to improve water quality in the GSV. Achievement of the top 5 recommendations necessarily includes comprehensive consideration of WSUD as a means of improving the quality of diffuse and point source stormwater discharges. One of these top 5 recommendations involves the reduction by 50% of sediment load in stormwater to the GSV. Stormwater harvesting is an important part of reducing stormwater discharges to GSV, but it

[3] Jackson, E.L., Rees, S.E., Wilding, C., & Attrill, M.J. (2015). Use of a seagrass residency index to apportion commercial fishery landing values and recreation fisheries expenditure to seagrass habitat service. *Conservation Biology* DOI:10.1111/cobi.12436.

[4] Adelaide and Mount Lofty Ranges NRM Board. 2008. Creating a Sustainable Future. Volume A – State of the Region Report.

[5] Environment Protection Authority (SA). 2007. The Adelaide Coastal Waters Study. Final Report, Volume 1 - Summary of Study Findings.

needs to be supported by the widespread delivery of WSUD into existing and new developments.

The benefits of WSUD are most immediately delivered and observed in urban environments. Green infrastructure can be considered an aspect of WSUD and uses vegetation in aesthetic and functional ways to improve urban liveability, create healthier communities and improve tourism based economic opportunities. Compelling information is available that green spaces are critical to human wellbeing and quality of life (Botanic Gardens of SA, 2015[6]). Substantial international research has established the vital role of green infrastructure in securing the health, liveability and sustainability of urban environments. To best embody sustainable practices, green infrastructure takes advantage of stormwater opportunities, turning problems into solutions along the way.

Best practice stormwater management that embodies sustainability, environmental and community principles need be no more expensive than traditional practices. Over the last 15 years stormwater treatment design has evolved from single objective infrastructure aimed at capturing and conveying stormwater, to multi-objective systems that consider how urban liveability can be improved. Common objectives include creating better opportunities for recreation and social interaction, protection or improvement of urban biodiversity, providing for active nature play and learning, as well as reducing stormwater pollutants and in some cases harvesting stormwater to offset mains water use.

Evidence around Australia suggests that stormwater management practices that incorporate WSUD principles can extend the lifetime of stormwater infrastructure, and reduce long term maintenance and management costs. In this region environmental considerations are rarely factored into cost benefit analyses for stormwater projects, and so project costs rarely represent the true cost to the environment.

Action required to improve stormwater management

Action is required across all urban centres to maximise best practice stormwater management outcomes. Whilst lagging behind optimum desired performance, stormwater management in new developments is at least subject to development controls that can include WSUD funded by developers. Implementation is variable across local governments and lacks dedicated coordination or mandated policy to lead activity. As a result the degree to which WSUD principles are incorporated into new developments is determined largely by the willingness of developers to participate. Housing affordability is often used as an argument not to incorporate tried and proven WSUD treatments, and little or no regard is given to the direct and in-direct costs that such treatments may save the community over their lifetime.

Stormwater management in older, well established urban areas of Adelaide is characterised by open channels and incised urban watercourses conveying stormwater away from at-risk areas and out to sea as quickly as possible. Stormwater management in these areas is challenged by open space opportunities to incorporate detention and treatment facilities. Nonetheless, such opportunities are available, and advancements in stormwater management techniques make such opportunities practical and achievable. It is considered that poor water quality in the iconic Torrens Lake in the heart of Adelaide could be improved by incorporating better stormwater management across the urban Torrens catchment. This would require significantly more investment in stormwater management to achieve the scale of implementation likely to make a significant difference.

[6] Botanic Gardens of SA. 2015. Green Infrastructure Project. Summary Report, 2012-2015.

Australian Government Involvement in Stormwater Management

The primary responsibility for local stormwater management belongs to local and state government. In 2007 the state government established the Stormwater Management Authority and a $4mil/year Stormwater Management Fund. Whilst the state government is contributing within its means, the funds available are inadequate to undertake even modestly ambitious works.

As with state government, local government is increasingly facing cost pressures and this is translated to all their on-ground works. Collectively local government is a large investor in stormwater management related activities, but insufficient funding, and in some cases direction, produces suboptimal results.

The Board also engages in stormwater management activities, largely through local government. The Board invests in stormwater management where water recycling, water quality protection and aquatic biodiversity improvement are the main drivers. Again, the Board's involvement is limited to its resource capacity.

All levels of government in South Australia are keenly aware that changes in rainfall runoff patterns resulting from predicted climate change may in turn result in higher flood levels, more often into the future. Without significant investment of time, effort and money in better, multi-objective stormwater management, current infrastructure and management approaches will become even less adequate to protect urban and natural environments into the future.

In recent years the Australian Government has invested in stormwater harvesting and reuse through the previous National Urban Water and Desalination Plan stormwater harvesting grants program. This program was a clear and highly successful demonstration of how Australian Government investment can expand and accelerate action on stormwater at a national level. In South Australia the program has resulted in the near tripling of stormwater harvesting capacity in just 7 years. In addition, the schemes are well accepted by the community for the stormwater they recycle, and also the social and recreational opportunities they provide. Without Australian Government funding these achievements would not have been possible as the upfront capital required to establish harvesting schemes is beyond the means of scheme partners.

In the same way, Australian Government funding support could be instrumental in helping regions achieve even more social, economic and environmental outcomes through better stormwater management. Building on from previous and current funding programs, the funding support could be directed specifically at improving stormwater management in existing urban centres to achieve minimum standards and water sensitive urban design principles. The funding program could focus on improving urban liveability, with benefits measured in terms of better protecting urban and environmental assets, enhanced climate change resilience and improved community health in the long term.

A funding program aimed at improving stormwater management in existing urban areas could significantly reduce pollutants reaching Adelaide's waterways and GSV, as well as improve urban liveability.

In some regards the Australian Government's involvement in stormwater management in a formal capacity would follow on from the important reforms made by COAG to water management in 1994. Back then COAG agreed in relation to water resource policy,

> *"that action needs to be taken to arrest widespread natural resource degradation in all jurisdictions occasioned, in part, by water use and that a package of measures is*

required to address the economic, environmental and social implications of future water reform."

The reforms laid the foundation for water allocation entitlements backed by separation of water property rights from land title and clear specification of entitlements in terms of ownership, volume, reliability and transferability. In South Australia this has allowed effective and efficient water trading to maximise return on water use, whilst also allowing for sustainable management.

National policy direction that views stormwater as a resource for use (in accordance with environmental requirements) and that seeks to limit environmental impacts would be a significant further outcome of the 1994 reforms. Such policy could further consider recommendations by Professor Mike Young that effective and efficient stormwater management should consider the use of market-based offsets and tradable credit mechanisms (Young and McColl, 2006[7]).

The task of improving stormwater management to achieve best practice with respect to protection of community and environmental assets is large. However, the economic benefits that would be achieved by best practice stormwater management are much larger again in the medium to long term. Any investment now will deliver much greater, social, economic and environmental returns into the future.

The development of national standards for best practice stormwater management could work in concert with state and local government based policy and guidelines to ensure consistent implementation nationwide. Any future funding programs could then be linked to the national standard to promote its implementation and the resulting community and environmental benefits.

Such a funding program would be popular in the Adelaide region where the need and desire to implement stormwater management practices that better protect the environment are greater than funds availability. Funding could be put to use immediately in on-ground works identified in strategic plans already in development, and the funding program outcomes would be amplified by industry capacity building, policy development and high level planning already under way.

The Board and its regional partners are ready to assist the Australian Government in implementing best practice stormwater management that protects community and environmental values. To this end please contact me should we be able to assist with this senate enquiry in other ways.

Yours sincerely,

Professor Chris Daniels
PRESIDING MEMBER

Date: 23 / 4 / 2015

[7] Young, M. and McColl, M. 2006. Stormwater: Expensive nuisance or an opportunity? Droplet No. 1