REDUCE STORMWATER RUNOFF

INCREASE RETAINMENT

Submission to the Independent Pricing and Regulatory Tribunal

> By Michael Mobbs August 2015

WHY IS IT IMPORTANT TO REDUCE STORMWATER RUNOFF?



21.6 of stormwater runoff pollutes Sydney's rivers and harbours every year

Tree canopy CANNOT reach its natural height

due to the combined effects of insufficient ground and rainwater

Increased Heat Island Effect

(partially caused by a reduced tree canopy) results in unnaturally high temperatures, evaporation, and poor soil quality.

THEREFORE, THIS SUBMISSION PROPOSES THAT THE NSW GOVERNMENT...

• <u>Create an incentive</u> • <u>for landowners</u>

to stop their contribution to stormwater pollution by exempting those landowners from stormwater levies

2. Implement a cost effective and efficient method of stormwater management

by carrying out the Chippendale Leaky Drains Sustainability Project

ISSUE

There are currently <u>no government incentives for landowners who</u> <u>detain or retain stormwater on their properties</u>. Sydney Water and

Sydney Council both charge house owners two separate stormwater levies even if they do not contribute to the city's stormwater volume.

SOLUTION

Sydney Water's levy should not apply to any landholder, whether a household or business, who invests in on-site retention of stormwater by any one or more of the following:

- a. A rain tank of 10,000 litre capacity where the water is used for household or business purposes
- b. A retention device capable of holding, storing, and absorbing over 1,000 litres a day

IS COMPLETE RAINFALL RETAINMENT POSSIBLE?



- No stormwater has left the house since the pond was built in 2000.
- Over 1.9 million litres of stormwater has been kept on site since 1996.
- Even during the Sydney storm in April 2015 all rainwater was retained in the house's tank and sunken pond.



- Chippendale's Leaky Drains save roughly 5,000L of runoff for every dollar spent while the city's conventional approach only saves 633L per dollar spent.
- The Leaky Drains approach results in a return on investment almost eight times greater.



2. Implementing a cost effective and efficient method of stormwater management

ISSUE

The City of Sydney's <u>conventional stormwater treatment processes</u> and raingardens <u>result in high capital and maintenance costs</u>. For example, sucker trucks are regularly required to pump out built up gravel and silt in the raingarden sumps in order to restore their efficiency.

SOLUTION

The Chippendale Leaky Drains Sustainability Project develops and implements a cost effective and efficient method of

stormwater management. This method provides many benefits:

- Improves the security of supply for irrigating green verge areas
- Helps mitigate the urban heat island effect
- Relieves the capacity of stormwater drainage systems, thus providing more capacity for the system to cope with frequent flooding

These benefits are key outcomes of the City's Decentralised Water Master Plan.



Leaky drains harvest rainwater and direct it into street verges to irrigate plants and trees. Since 2008 approximately <u>20 leaky drains have been</u> <u>constructed</u> in Chippendale at a <u>cost of less than \$300</u> each. Over <u>4 million litres of rainwater have been kept</u> to irrigate road gardens and halt the pollution of Sydney Harbour.



ATTACHMENT A Detailed Description for Incentivising Landowners

SUMMARY

The levy by Sydney Council and the stormwater charge by Sydney Water offer landowners (including those not connected to Sydney Water) no incentive for detaining or retaining stormwater on their properties. This report proposes that both these levies be phased out in 2015 and not apply to any landholder, whether a household or business, who invests in on-site retention of stormwater by any one or more of the following:

- 1. A rain tank of 10,000 litre capacity where the water is used for household or business purposes
- 2. A retention device capable of holding, storing and absorbing over 1,000 litres per day

PROPOSAL BACKED BY CREDIBLE RESEARCH

South Australian research by Epke van der Werf, John R Argue and David van de Pezanitti shows that infiltration devices (gravel pits, leaky drains, absorption and soak pits) are capable of absorbing large quantities of water into clay soils¹. Their research was conducted on an urban block where gravel drainage absorption pits were installed and water was injected to an amount equal to one year's average rainfall on the house's 345-square-metre roof. Their results proved no direct link could be established between the water injected and flows downstream, which suggested that the clay soils absorbed the water through 'leaky' devices such as sunken ponds, which landowners could easily build.

Given this compelling scientific research, this report proposes three incentive options for the NSW government to offer landowners:

- 1. Council could offer a rate rebate to property owners who invest in rain tanks and on site absorption pits.
- 2. Sydney Council could cease charging the \$25 environmental levy to those property owners.
- 3. Sydney Water could cease charging a stormwater charge to property owners who keep stormwater on their sites.

By investing in on-site retention, landowners provide a public benefit beyond including reduced depreciation and clean out costs for roads, gutters, and drains, and reduced pollution of waterways and receiving waters such as the Sydney Harbour.

It is estimated that a government shift from high cost works to smaller monetary incentives to encourage landowners to carry out simple property retrofits to retain stormwater would save millions of dollars in capital works and maintenance of gutters, pipes, and booms that catch garbage carried by stormwater runoff.

CHIPPENDALE ACHIEVEMENTS IN STORMWATER

RETAINMENT

The suburb of Chippendale has a record of retaining rainwater and decreasing the area's stormwater runoff volume:

- At Sydney's Sustainable House, no stormwater has left the property since the installation of an absorption pit in the year 2000, even during the once in a century storm in April 2015. Over 1.9 million litres of stormwater has been kept on-site since 1996.
- For a one-time cost of less than \$300, businesses and residents of Chippendale have kept over 4 million litres of stormwater in road gardens and prevented it from polluting Blackwattle Bay in Sydney Harbour.



Rainfall from the April 2015 storm accounted for 29% of Sydney's average yearly rainfall. Regardless of high volumes, it was all contained at the Sustainable House.

¹ Van der WERF, E., ARGUE, J.R. and PEZZANITI, D. (1999). "Some unexpected results from infiltration tests in shallow clay over rock." Proc. 8th Int'l Conf. On Urban Storm Drainage, I.E.Aust./IAHR/IAWQ (Joliffe and Ball, Eds), Sydney, Aug/Sept pp555-562, ISBN 0 85825 718 1. -)



PROPOSED PRICING DETERMINATION AND TRIBUNAL INQUIRY

This report proposes that:

- 1. The Tribunal review the environmental levy by Sydney City Council, and all NSW Councils, for effectiveness, including overlapping and duplication with stormwater charges by Sydney Water and other water monopolies including council water monopolies
- 2. The Tribunal determine whether the stormwater charges by Sydney Water are taxes (and therefore unlawful) and duplicates of environmental levies by local councils
- 3. The Tribunal recommend to the NSW government that it oblige councils to offer rate rebates and other financial incentives to property owners who carry out works that could be done by Council or water bodies such as Sydney Water

RELEVANT DEFINITIONS AND GOVERNMENT ACTS

The word 'detention' is used in the stormwater industry to describe rainwater that is detained by works carried out by a property owner at their cost under Council direction and, after being detained for a while, the water is then released from the property to the roads and gutters. The word 'retention' means the water is kept on site.

Landholders who invest in retaining rainwater at their land are entitled by law to expect their rates to be reduced according to the Local Government Act of 1993. This Act invites local councils to offer their communities and ratepayers 'financial incentives to carry out their own works and services instead of or in place of the local council'. The legitimate expectation a landholder has to be exempted from council's environmental levies to fund private works carried out is contained in the Act's definition of the principles of ecologically sustainable development:

Ecologically sustainable development requires the effective integration of economic and environmental considerations in decision-making processes. Ecologically sustainable development can be achieved through the implementation of the following principles and programs:

(a) the precautionary principle-namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options,

(b) inter-generational equity-namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations,

(c) conservation of biological diversity and ecological integrity-namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,

(d) improved valuation, **pricing and incentive mechanisms**-namely, that environmental factors **should be included in the valuation of assets and services**, such as:

(i) polluter pays-that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.



ATTACHMENT B Detailed Description of the Chippendale Leaky Drains Sustainability Project

SUMMARY

According to the City of Sydney's Decentralised Water Master Plan, the estimated stormwater runoff volume within the Local Government Area (LGA) is 21.6 GL/year². The majority of this is wasted and ends up polluting rivers and harbours. Additionally, the existing tree canopy cannot reach its natural height due to the combined effects of insufficient ground and rainwater. This contributes to the urban heat island effect, which causes unnaturally high temperatures, evaporation, and poor soil quality.

The city's current stormwater treatment processes and the installation and maintenance of raingardens result in high costs. For example, sucker trucks are regularly required to pump out built up gravel and silt in Chippendale's raingarden sumps in order to restore their efficiency.

The Chippendale Leaky Drains Sustainability Project is about developing and implementing a cost effective and efficient method of stormwater management that involves capturing and recycling locally generated stormwater and using this to irrigate green verge space. This method has been reviewed by Associate Professor John Argue (whose work was cited on page five of this report) who considers them robust and proven.

Leaky drains not only improve the security of supply for irrigating and maintaining greener verge areas, but they also help mitigate the urban heat island effect and relieve the capacity of stormwater drainage systems, thus providing more capacity for the system to cope with frequent flooding predicted with climate change. All of these benefits are key outcomes of the City's Decentralised Water Master Plan.

RECOMMENDED SOLUTION

Leaky drains harvest rainwater by intercepting it from roofs and down drainage pipes, which then direct it into the street verge to irrigate plants and trees. According to figures compiled by sustainability consultant Michael Mobbs, the implementation of these drains in Chippendale could avoid nearly 50 million litres of polluted water reaching Black Wattle Bay each year. Figure 1 provides a visual representation of the leaky drains concept.



A leaky drains trial project will be completed, and its performance will be monitored by a water specialist qualified by authoring primary research into the performance of existing leaky drains and wells. This specialist is proposed to be Associate Professor John Argue OA from the University of South Australia.

² http://www.cityofsydney.nsw.gov.au/__data/assets/pdf_file/0013/130513/130218_EC_ITEM02_ATTACHMENTD4.PDF



PROJECTED COST SAVINGS WITH LEAKY DRAINS PROJECT

The most practical way of reducing nutrient discharge is to reduce stormwater runoff. Sydney's Water Sensitive Urban Design & Stormwater Infrastructure Report (June 2012) includes content about existing pollution control devices, which focuses entirely on gross pollutant traps (GPTs) and trapped gully pits, which are acknowledged to have a negligible effect on nutrient discharge. Therefore, we can assume that a 15% reduction in nutrient discharge is intended to be achieved through a 15% reduction in total stormwater discharge.

According to the February 2013 Environment Committee papers there is a \$5 million estimated cost to Council to deliver the reductions in stormwater pollution targets³. If runoff in the City LGA is 21.6 GL/year; reducing this runoff by 15 per cent would equate to 633 L/year of runoff being saved for each \$1 spent.

It is proposed that each year approximately 50 million litres of storm water runoff can be utilised in Chippendale at a capital cost of less than \$6,000, with a total project cost of \$10,000 with zero maintenance costs by working with the residential and business community. Given these figures of litres retained and total project costs, this equates to 5,000L saved for each \$1 spent; a far greater return on investment than the city's conventional stormwater reduction methods. This difference is outlined in Figure 2 below.



CALCULATING TOTAL WATER CAPTURED BY LEAKY DRAINS IN CHIPPENDALE

Assumptions:

- 1. 1,215 L/m² of rainfall harvested per year in Sydney (average Sydney rainfall = 1,215 mm/yr)
- 2. Average roof area of 345 m² (Chippendale has a mix of terrace roofs of about 90m² and large warehouse roofs of over 1000m²)

In order to divert 50 million litres of stormwater a year coming off of Chippendale roofs, it would take 120 houses to be connected to a leaky drain.

In addition to diverting water off of roofs, rainwater from footpaths is also absorbed and retained by the leaky drains. Footpaths are typically 1.8 m wide, and city blocks are about 100 m long, making a harvesting area of about 200 m² on one side of a block, or some 200,000 litres a year per block. It's reasonable from observations made since the drains were installed in 2008 to assume that up to 50% of this water (100,000 litres) would be retained by the leaky drains as most water falls gradually and can be absorbed if there is a leaky drain available.

³ http://www.cityofsydney.nsw.gov.au/__data/assets/pdf_file/0018/130482/130218_EC_ITEM02.pdf



Chippendale's Leaky Drains Sustainability Project Budget Outline

STAGE 1

MATERIALS	Qty	Unit	\$/unit	Cost(\$)	Notes
60mm slotted Agi pipe	60	Lm	2	120	
Crushed aggregate	10	m3	70	700	Sourced from local building site
Agi Pipe adapter	20	units	6	120	
LABOUR	30	hrs	30	900	Contributed in kind by local building owners

STAGE 2

60mm slotted Agi pipe	150	Lm	2	300	
Crushed aggregate	25	m3	70	1750	Sourced from local building site
Agi Pipe adapter	50	units	6	300	
LABOUR	50	hrs	30	1500	Contributed in kind by local building owners

COMMUNITY ENGAGEMENT

MANAGEMENT

Project Management fee	1	unit	800	800	M. Mobbs
Project Coordination fee	70	hrs	21.57	1510	J. Caparrotta

TOTAL

\$10,000 Incl GST

MANY COUNCILS DON'T IDENTIFY THEIR STORMWATER MANAGEMENT COSTS

"Many councils have not specifically identified their stormwater management costs. This is because many of their stormwater management activities can be related to other council activities such as:

- Environmental management
- Road construction and maintenance
- Waste management
- Land use planning

Where a council has a dedicated and inclusive stormwater management budget, the costs for these activities have not normally been attributed to managing stormwater runoff from private and other land (eg public and non-rateable land). Therefore the costs of providing a stormwater management service to private land have often not been specifically identified."⁴

⁴ https://www.olg.nsw.gov.au/sites/default/files/Stormwater-Guidelines.pdf



Responding to Sydney Council's criticisms about the Leaky Drains Project and incentivising landowners

CRITICISMS	OUR RESPONSES
The Chippendale area consists of impermeable clays not suitable for infiltration. Slow rate of infiltration in clay soils could lead to increased water volume and may damage underground infrastructure and exacerbate rising damp problems in Chippendale.	South Australian research by Epke van der Werf, John R Argue and David van de Pezanitti shows that infiltration devices (including leaky drains) are capable of absorbing large quantities of water specifically into clay soils. Their research was conducted on an urban block where a year's worth of water (off an average roof size) was injected into a gravel drainage absorption pit. Results showed that all water was absorbed.
The volume of water likely to be diverted by leaky drains in Chippendale is considered to	Volume is not overstated; staff calculations are unclear. 120
be overstated and would have little impact on local flooding. The volume of stormwater modeled to be diverted is one twentieth of the stated 50 million litres. To achieve 50 million litres diverted, 5,000 roofs would need to be connected.	Assumptions and calculations used by staff to come up with 5,000 houses needed are unclear. Using the accepted average of 1,215 L/m ² of rainfall harvested per year in Sydney and an average roof area average of 345 m ² , it would take 120 houses (not 5,000) to be connected to a leaky drain to divert 50 million litres of stormwater per year.
	Firstly, when making this statement, staff assumed our stated volume of 50 million litres redirected was not possible, which we
Leaky drains would have minimal impact on downstream stormwater quality because they treat roof water, which is considered clean in an urban environment. Intercepting street runoff through raingardens is considered more effective.	have clarified above. Secondly, stating that roof water is clean and therefore redirecting it wouldn't have a significant impact on stormwater quality is incorrect. Although roof water may start out clean (as all rainwater does), it greatly contributes to the water volume that ends up running down streets picking up litter and pollutants along the way.
Leaky drains would be prone to clogging with leaves and debris causing leaking, flooding, and potential damage to houses, the nature strip and footpath. Maintenance would be the responsibility of residents as the City of Sydney does not	We have worked with Chippendale residents in the past, and they have all taken full responsibility for the maintenance of their leaky drain pipes. We have had no issues with pipes clogging, leaking, or flooding so far. If we implement the Chippendale Leaky Drains project, we would make it clear upfront that
maintain private stormwater pipes.	
Alternative solutions are considered to be more appropriate in Chippendale. These options include: small rainwater tanks within residents' properties and above ground planter beds connected to the downpipes for irrigation before flowing to street drainage.	This report does not discredit other initiatives that may also be effective. We are introducing the leaky drains project as another low-cost, easy to implement and maintain solution to further manage urban stormwater volume and pollution.
A rate rebate would result in an administrative burden to the City of Sydney. Although a rate rebate may incentivize residents to carry out maintenance on drains, the burden to the city would significantly outweigh any associated benefits to the community.	We understand the city council's position, but it does not discredit the fact that it is unlawful (under the EPA act, see page 6) to charge homeowners for stormwater managements services when , with proper monitoring and proof, those homeowners are not contributing to stormwater runoff . The Sydney Council's burden is exaggerated, and a similar rebate scheme has been done in the past. For example, Bendigo Council ran a successful rate rebate scheme for farmers who planted perennials to reduce salinization



A Goulburn Leaky Drains Project

HOW MUCH STORMWATER COULD GOULBURN DIVERT?

With a history of droughts and water shortages, it is extremely beneficial for Goulburn to implement infrastructures that will help the city retain its rainwater and use it to further vegetation growth instead of letting it run down streets as stormwater and pollute nearby rivers and lakes.

Assumptions:

- 1. 644 L/m² of rainfall harvested per year ⁵ (average Goulburn rainfall = 644 mm/yr)
- 2. Average roof area 200 m² (the surface area was calculated for a random sample of roofs in the city of Goulburn and the average was taken)
- 3. There are 10,452 classified houses in Goulburn 6
- 4. Typical length of city block is 250 m (measurement taken from map of the city)
- 5. Footpath width similar to Chippendale (1.8 m)

If just 10% of houses in Goulburn were connected to a leaky drain and diverted their roof runoff to promote vegetation growth, the city's stormwater volume would reduce by 135 million litres per year. The total volume potential represented by the houses in Goulburn is 1.3 billion litres of stormwater captured each year.

If you also consider footpaths and roads, Goulburn could save an additional 145,000 litres of road and footpath stormwater per block.

HOW MUCH MONEY COULD GOULBURN SAVE?

Assumptions:

- 1. Goulburn spends a similar amount on stormwater management per litre as Sydney does: \$0.00158/L
- 2. 10% of houses in Goulburn connect to a leaky drain (135 million litres diverted per year)

This represents an annual savings of \$213,300 plus an additional savings of \$230 per block. Total savings potential if all houses in Goulburn were connected to a leaky drain is \$2.1 million per year.

ADDITIONAL ENERGY SAVINGS

Urban temperatures are increasing due to the large amounts of paved and dark coloured surfaces like roads, roofs and car parks. On hot summer days, cities can be several degrees hotter than their rural surroundings. Because of the warmer temperatures, more energy is consumed to keep buildings cool which means higher electricity bills.

Leaky drains harvest stormwater to irrigate plants and increase urban vegetation cover. More trees means more shade and cooler ambient temperatures: a 15% increase in urban tree cover results in a 1°C decrease in ambient temperatures. Lower temperatures mean less energy used for cooling. Leaky drains can not only save Goulburn money on water, but they could also save Goulburn a huge amount on energy bills.

⁶ http://profile.id.com.au/goulburn/household-size



⁵ http://www.weatherzone.com.au/climate/station.jsp?lt=site&lc=70263

More water is wasted in Goulburn than is imported to irrigate lawns and gardens

22.5 BILLION LITRES OF RAINWATER PER YEAR

(assuming 35 km² for urban land area)

657 MILLION LITRES OF WATER IMPORTED PER YEAR TO IRRIGATE LAWNS AND GARDENS (25% of total Goulburn usage)

The wasted stormwater volume is almost thirty times larger than the amount of water Goulburn imports each year to water lawns and gardens.



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SUSTAINABLE SOLUTIONS HELP GOULBURN ACHIEVE COUNCIL GOALS

Michael Mobbs Sustainable Projects has been awarded a grant by the NSW Office of Environment and Heritage to make NSW cities and towns more sustainable and help cool our overheated urban areas by at least 2 degrees by 2020. Visit <u>http://www.streetcoolers.com.au/</u> to learn more about the sustainable project designs, products and solutions currently being implemented.

The goals listed below were taken from Goulburn's 2014 Annual Report.

	LEAKY DRAINS	HOME RAINWATER	HOME SEWAGE	COMPOSTING	ECOPOP*
Provide safe and secure potable water supply	Reduces demand for potable water		Reduces demand for potable water		
Advocate for integrated water catchment projects	\checkmark				Designed to trap roof runoff water
Provide and maintain efficient sewerage systems	\checkmark		\checkmark		
Enhance the distinctive qualities of existing public places	\checkmark				\checkmark
Identify opportunities for sustainable farming				\checkmark	\checkmark
Care for and protect waterways and catchments		>			
Protect, maintain and improve the diversity of native fauna and flora	\checkmark			 Image: A start of the start of	\
Implement initiatives that address climate change	\checkmark	>	\checkmark	\checkmark	<
Improve and maintain Goulburn's character	\checkmark				
Minimise the amount of organic waste entering landfill				\checkmark	Built-in worm farm for organic waste

* Visit <u>http://www.waverley.nsw.gov.au/residents/trees_and_gardens/ecopops</u> for information about ecoPOPs and an example of an installation in Bondi

