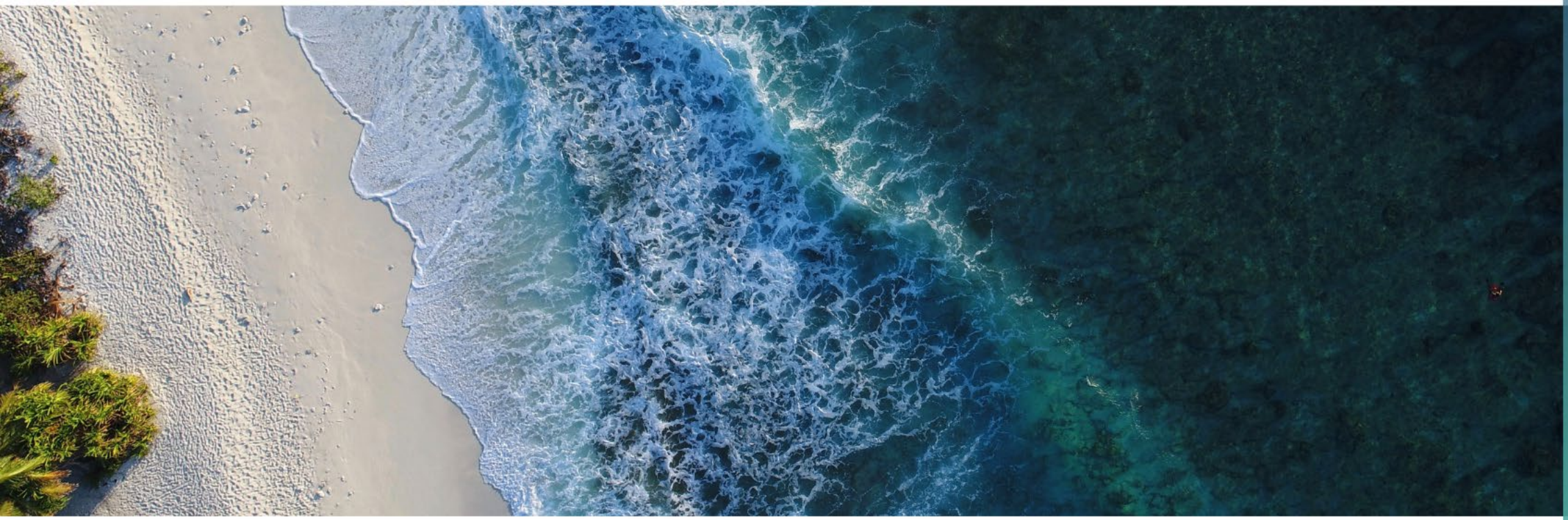
Stormwater Treatment 101

Brad Dalrymple



Australian Water School, 24 October 2025

Agenda

- What?
- Why ?
- How ?
- Challenges

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Conflict of interest declaration

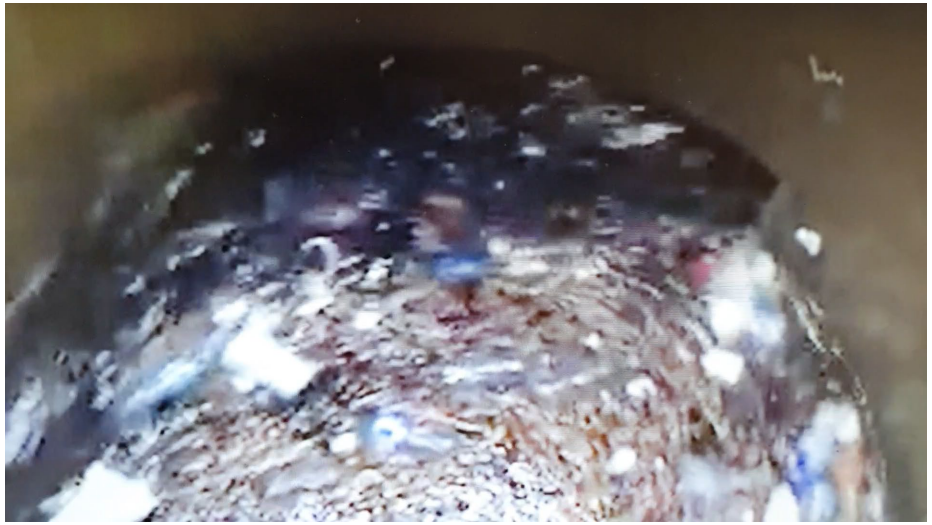

What ?

Definitions

- **Stormwater:** *Rainwater excess (after losses have been absorbed) which is shed from surfaces like roofs, roads, and gardens* NSW SQID Taskfoce (2025)

- **Stormwater treatment:** *The process of removing pollutants from stormwater before they discharge downstream (e.g. to waterways, ocean)*

Source: Global Water Group



Source: Murray Powell

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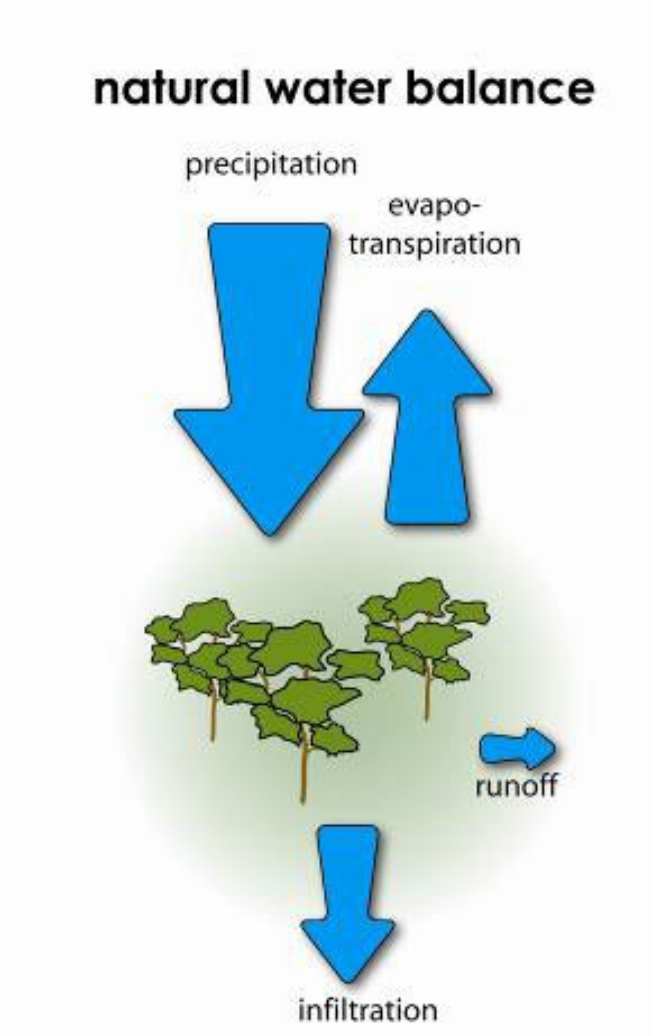

Source: Hoban and Wong (2006)

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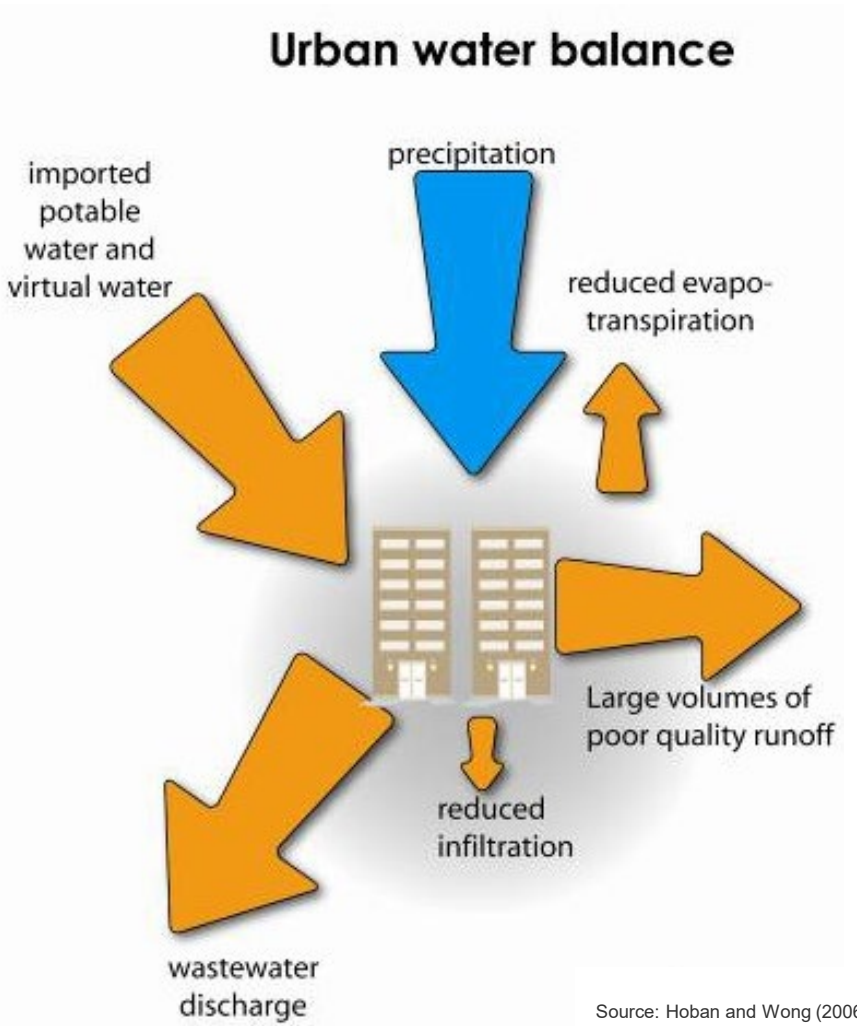

Source: Hoban and Wong (2006)

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Urbanisation

- Increases the amount of many contaminants in catchments

AND

- Introduces a large number of potentially toxic contaminants that are not found at all in undeveloped catchments

AND

- Increases the frequency & volume of stormwater flows

SO …

- Increases the flow of stormwater pollution into downstream waterways (&/ or infrastructure, oceans etc)

Source: UniNSW (2024)

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How do we make this… function like this?

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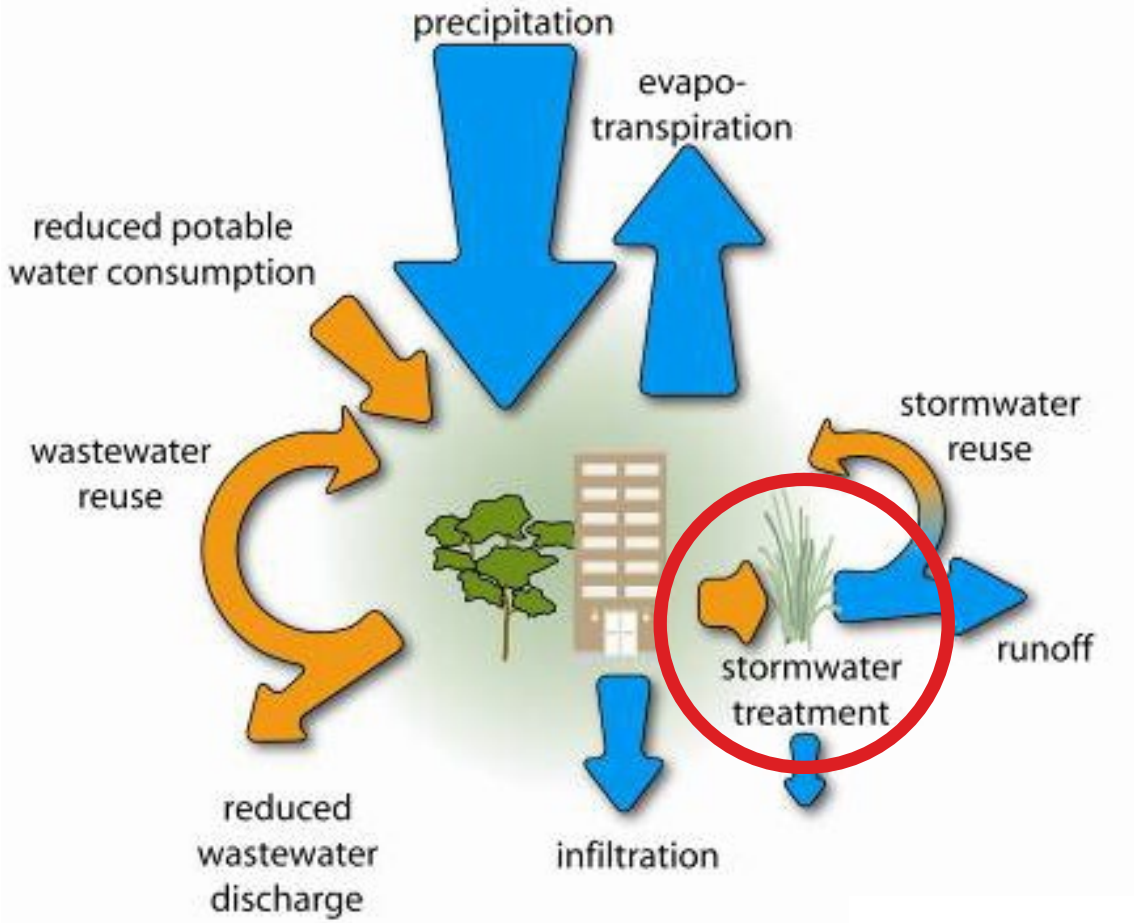
WSUD water balance



Source: Hoban and Wong (2006)

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How does stormwater become polluted ?

Build-up

- Accumulation of pollutants on surfaces, via:
  - Dry deposition or fallout (the settling of fine particles from the atmosphere)
  - Accumulation of pollutants (e.g. fine particles, gross pollutants) from local sources
  - Redistribution of surface pollutants by wind & traffic
- Depends on:
  - Rate of deposition
  - Any removal by redistribution, decomposition, street sweeping/ wash-off

Wash-off:

- Removal of accumulated pollutants by rainfall & runoff, via:
  - Rain-drop impact & flowing water loosens particles, which become suspended in water and conveyed downstream
  - Pollutants washed out from the atmosphere by rainfall

(Source: Chiew et al, 1997)

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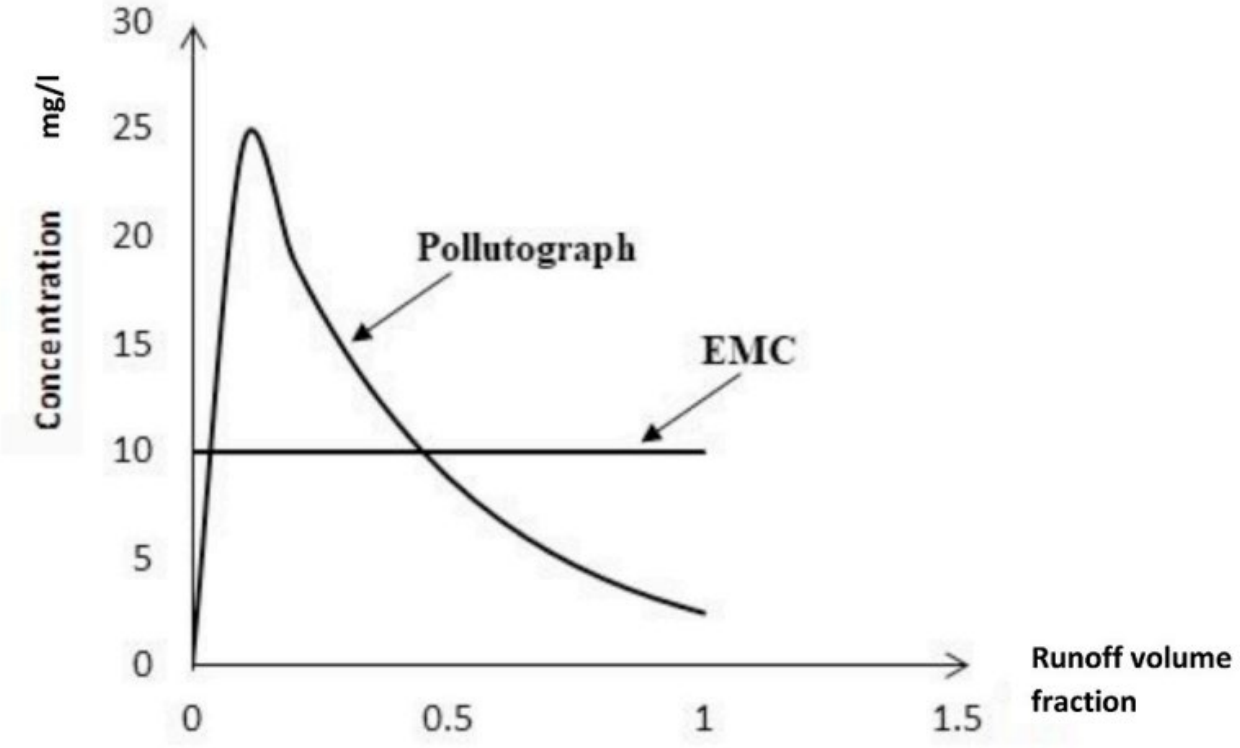

Fig. 1. Pollutogrpah and the EMC of a typical storm runoff event.

(Source: Perera et al, 2021)

Note:

- "First flush" impacts are diluted with increasing catchment size
- Pollutant concentrations are **highly** variable

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Why is stormwater treatment important ?

Stormwater pollution is ...

- #1 source of pollution in our waterways & oceans
- #1 cause of ecological degradation in urban waterways
- A major concern to public
- A problem that can be effectively managed
- A potentially growing problem

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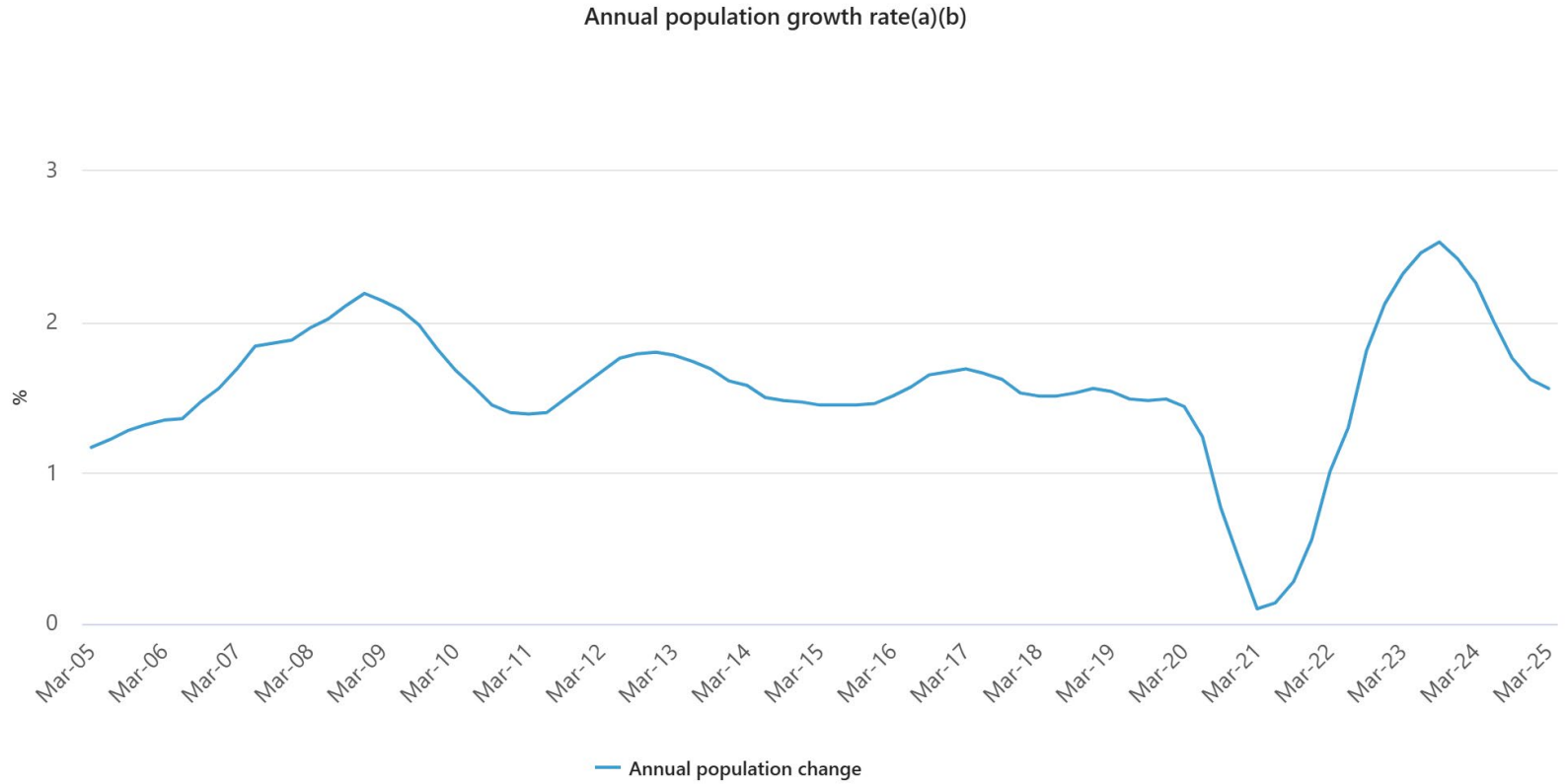
Population growth in Australia



a. Annual growth calculated at the end of each quarter.
b. All data after 30 June 2021 are subject to revision.

Source: Australian Bureau of Statistics, National, state and territory population March 2025

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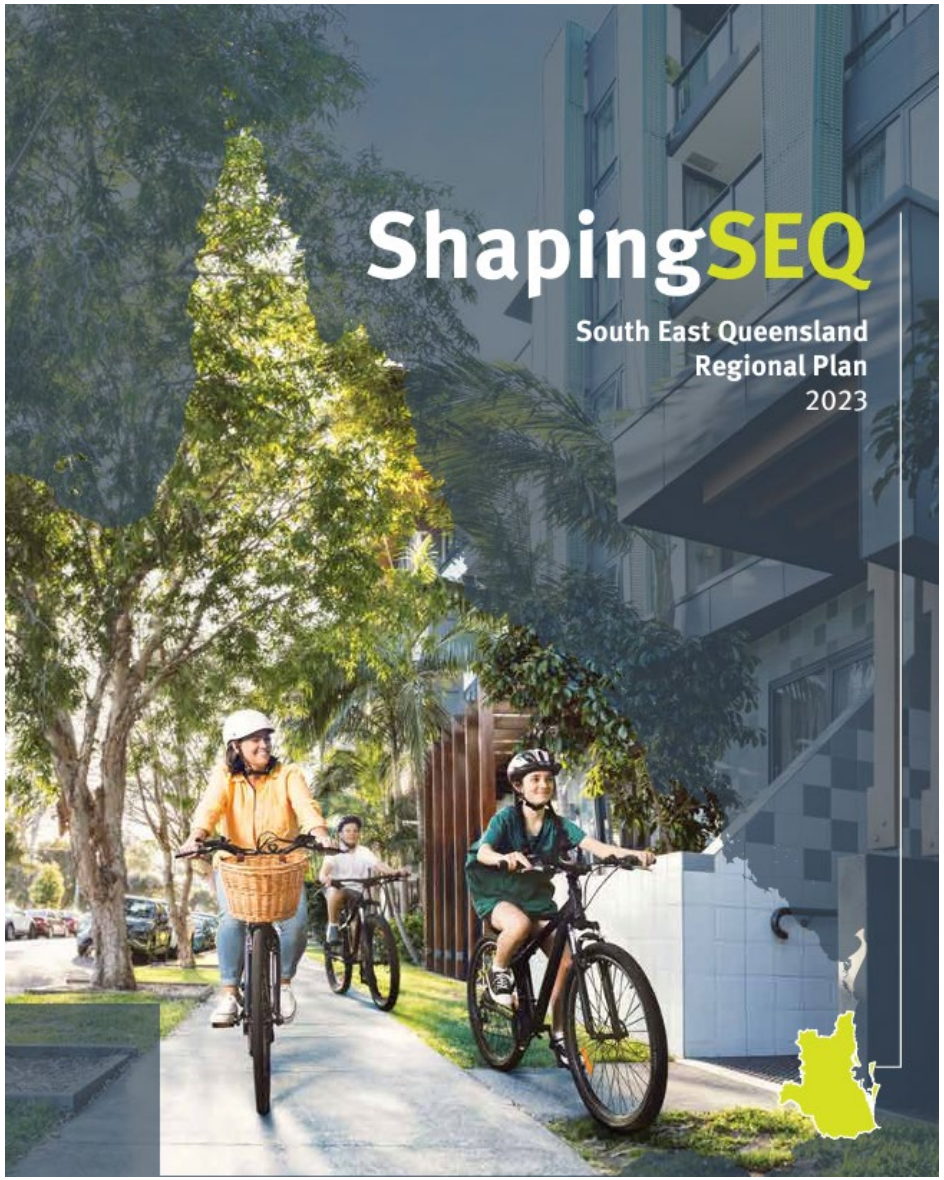
- SEQ Regional Plan 2023:
  - *"By 2046, our population is expected to be about six million. That's an additional 2.2 million people requiring almost 900,000 new homes…"*



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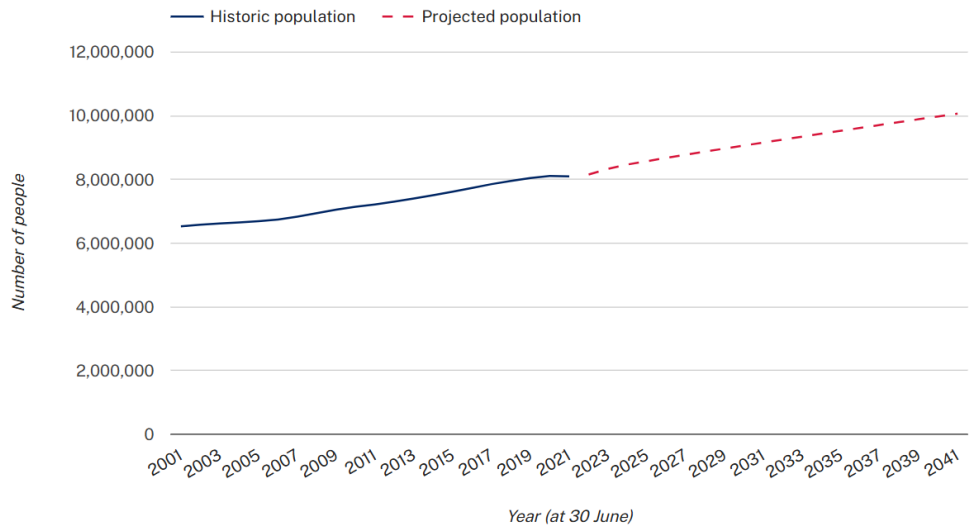
Planning

NSW historic and projected population 2001–2041



- The 2024 NSW Population Projections show:
  - NSW is expected to grow on average by over 85,000 people each year until 2041.
  - Based on recent trends regional NSW's population will increase by 6000,000 to 3.8 million in 2041.
  - Greater Sydney's population will grow to approximately 6.3 million by 2041 – 1.4 million more people than currently

Source: https://www.planning.nsw.gov.au/data-and-insights/population-projections/key-findings#-highlights-of-the-2024-projections-


What does stormwater pollution look like ?


CARTON PICK HEADER LABEL
NO SUGAR


DO NOT
OVERTAKE
TURNING VEHICLE
CL·05·CT

What is being captured?

8 Gully pit baskets in Western Sydney

~2720m^2 urban road catchment

5 months (2019)

850 bits of plastic, including:

- 228 cigarette butts
- 88 plastic drink lids
- 44 cans
- 22 plastic cups
- 21 plastic straws

130kg of sediment

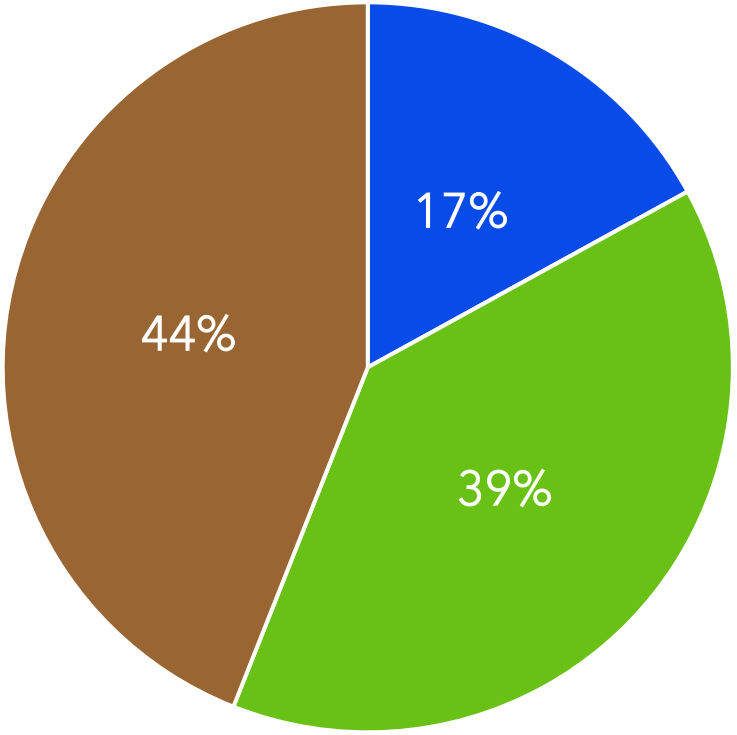
What is being captured in GPTs ?

158 GPTs
in a NSW LGA

1,044 GPT cleans

35 months
(2014-2016)

1,693m^3 removed



- Litter
- Organics
- Sediment

% by volume

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Source: Dalrymple et al (2017)


Before
After




7

Key stormwater pollutants

Key pollutants in urban stormwater ?

- Sediments
- Nutrients
- Heavy metals
- Bacteria
- Litter

❖ …. ‘emerging’ contaminants ?

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Sediments

- ‘Sediments’ = soil & other fine particles
- Type:
  - Inorganic/ organic particulates
- Key sources:
  - Erosion
  - Land degradation

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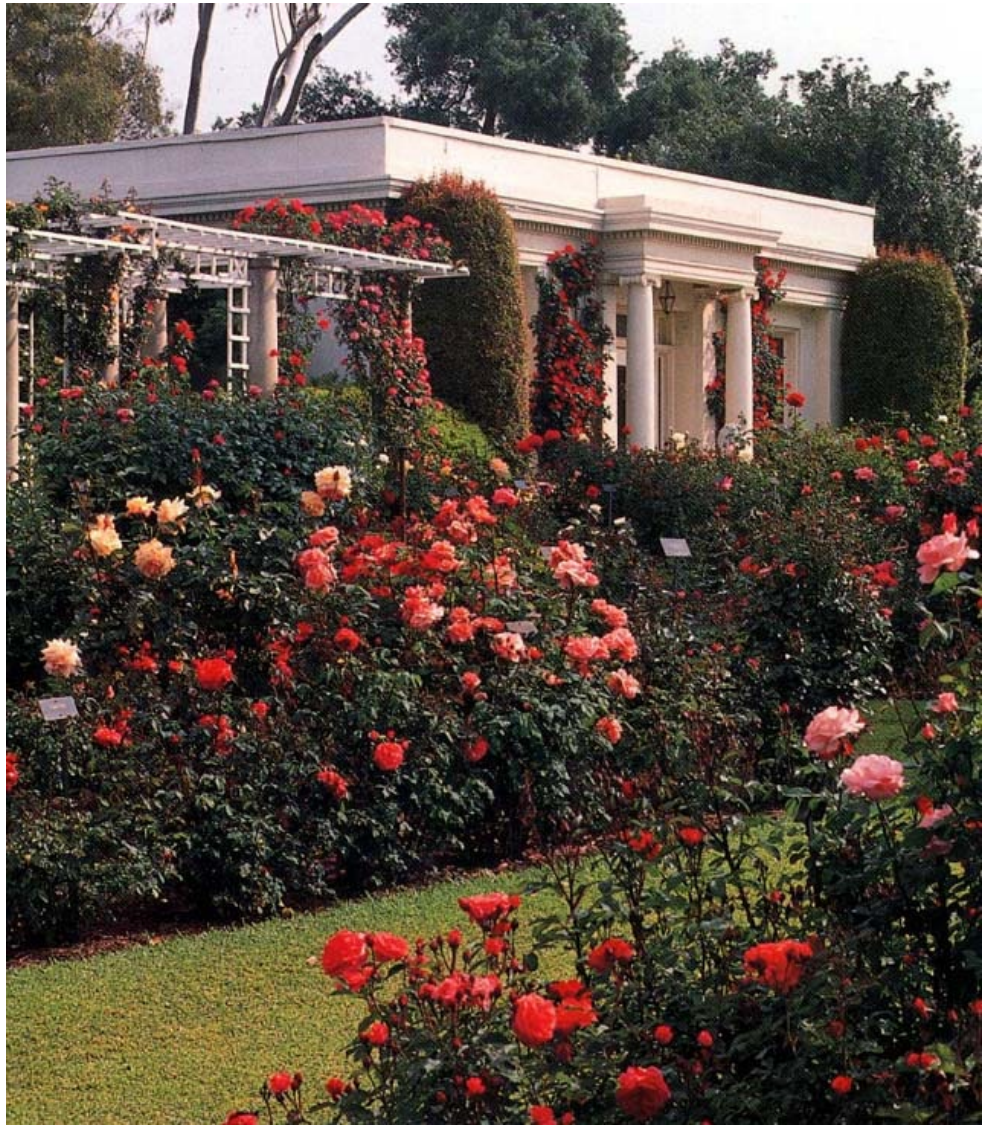
Nutrients

- Type:
  - Mainly nitrogen (N) & phosphorus (P)
- Key sources:
  - Erosion/ land degradation
  - Roads
  - Sewer overflows
  - Industrial discharges
  - Animal waste
  - Fertilisers
  - Domestic detergents
  - Septic tank seepage
  - Rainfall



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Heavy metals

- Type:
  - Cd, Cr, Ni, Pb, Zn
- Key sources:
  - Roads
    - Vehicle emissions
    - Wear from vehicle components (eg. tyres, brakes)
  - Road/ pavement degradation
  - Roofs
  - Erosion/ land degradation
  - Atmospheric deposition (e.g. air pollution)
  - etc.

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Bacteria

- Type:
  - Faecal coliforms, pathogens
- Key sources:
  - Animals (domestic pets & birds)
  - Sewer/ septic overflows/ leakage

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Gross pollutants

- Type:
  - Litter, vegetation
  - Anything bigger than ~ 5mm
- Key sources:
  - Humans
  - Vegetation

~15,000 cigarette butts collected by small group of volunteers on Gold Coast, December 2023

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music BY eWater

- Models the generation, transport & treatment of:
  - Total Suspended Solids
  - Total Nitrogen
  - Total Phosphorus
  - Gross Pollutants

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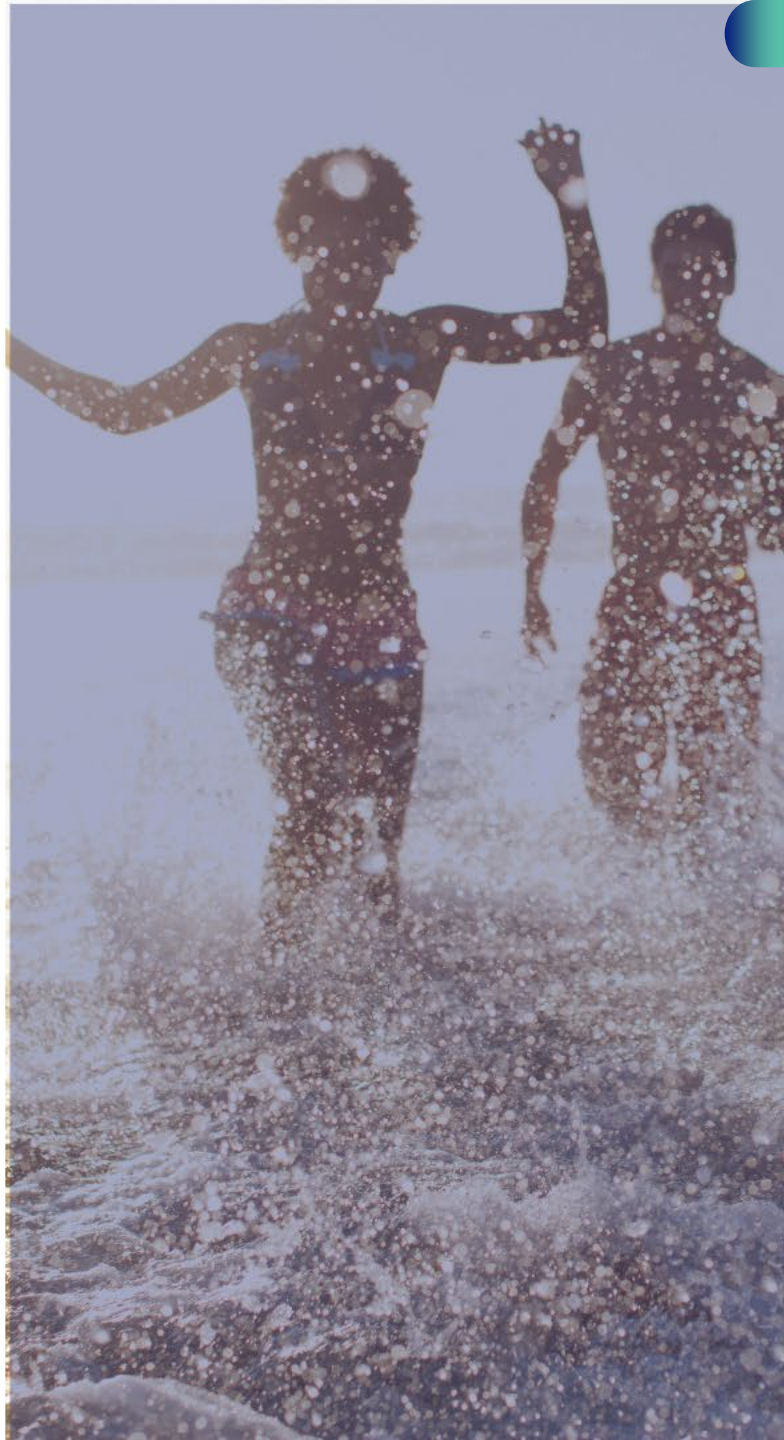

Stormwater pollution impacts

Sediment

- Increased turbidity
  - Reduced light penetration
  - Reduced aquatic growth/ biodiversity
  - Reduced aesthetics
- Smothering aquatic habitat
- Reduced drainage/ channel capacity
- Contaminants attached to sediment
  - Nutrients
  - Toxins
  - 'Oxygen depleting substances' (eg. organic matter) etc

(Source: Healthy Waterways)

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Nutrients

- Eutrophication
  - Excess nutrients promote the growth of one species of aquatic plant (eg. algae), to the exclusion of others
  - Reduced light penetration
  - Reduced oxygen due to algal death (& decomposition), plant respiration at night & reduced atmospheric exchange

(Source: Great Southern Reef Foundation)

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WARNING
BLUE-GREEN ALGAE ALERT
Blue-green algae has been detected in these waters
Contact can be harmful
Regular water testing and treatment is underway. For further information please call 1800 819 912 or visit www.derm.qld.gov.au
Do not drink, swim/wade, fish or allow pets near water.
These waters are being tested regularly.


WARNING
HARMFUL ALGAE MAY BE PRESENT IN THIS WATER
CONTACT MAY CAUSE SERIOUS HARM TO
HUMANS AND ANIMALS
FOR MORE INFORMATION CALL
THE ALGAL INFORMATION LINE


RIVERSTONE RISE

Water quality impacts (cont'd)

- Heavy metals:
  - toxic impacts (chronic & acute)
- Bacteria:
  - disease, death
- Litter:
  - Reduction in flow capacity of stormwater drainage
  - Physical impact on aquatic habitats & species
  - Contaminated with other pollutants
  - 'Plasticosis'
  - etc

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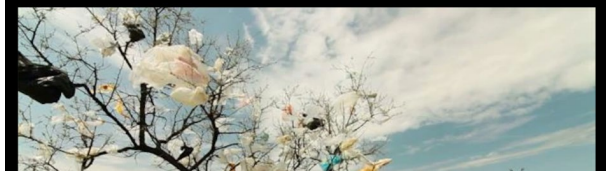
‘Emerging
contaminants’

Microplastics

ENVIRONMENT | PLANET OR PLASTIC?

In a first, microplastics found in human poop

As microplastics permeate remote places and species around the globe, people are no exception.



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Randomized Controlled Trial > Lancet. 2020 Jul 18;396(10245):167-176.
doi: 10.1016/S0140-6736(20)30539-0.

Urgent endoscopic retrograde cholangiopancreatography with sphincterotomy versus conservative treatment in predicted severe acute gallstone pancreatitis (APEC): a multicentre randomised controlled trial

Nicolien J Schepers [1], Nora D L Hallensleben [2], Marc G Besselink [3], Marie-Paule G F Anten [4], Thomas L Bollen [5], David W da Costa [5], Foke van Delft [6], Sven M van Dijk [7], Hendrik M van Dullemen [8], Marcel G W Dijkgraaf [9], Casper H J van Eijck [10], G Willemien Erkelens [11], Nicole S Erler [12], Paul Fockens [6], Erwin J M van Geenen [13], Janneke van Grinsven [3], Robbert A Hollemans [7], Jeanin E van Hooft [6], Rene W M van der Hulst [14], Jeroen M Jansen [15], Frank J G M Kubben [16], Sjoerd D Kuiken [15], Robert J F Laheij [17], Rutger Quispel [18], Rogier J J de Ridder [19], Marno C M Rijk [20], Tessa E H Römkens [21], Carola H M Ruigrok [18], Erik J Schoon [22], Matthijs P Schwartz [23], Xavier J N M Smeets [13], B W Marcel Spanier [24], Adriaan C I T L Tan [25], Willem J Thijs [26], Robin Timmer [27], Niels G Venneman [28], Robert C Verdonk [27], Frank P Vleggaar [29], Wim van de Vrie [30], Ben J Witteman [31], Hjalmar C van Santvoort [32], Olaf J Bakker [7], Marco J Bruno [33], Dutch Pancreatitis Study Group

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Microplastics detected in placentas, infant feces, breastmilk, and infant formula

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By Dr. Liji Thomas, MD Sep 21 2022
Reviewed by Benedette Cuffari, M.Sc.

Due to the exponential increase in the manufacturing, use, and disposal of plastics, the pollution of these products continues to overwhelm ecosystems throughout the world. Following their release into the environment, these places eventually degrade into microplastics (MPs) that can cause significant harm to organisms.

A new *Science of the Total Environment* journal paper reports the presence of this unknown and potentially life-threatening class of contaminants in uterine and infant tissues, breastmilk, and infant formula.

ELSEVIER

Science of The Total Environment
Volume 854, 1 January 2023, 158699

Detection of various microplastics in placentas, meconium, infant feces, breastmilk and infant formula: A pilot prospective study

Shaojie Liu [a, 1], Jialin Guo [c, 1], Xinyuan Liu [a, 1], Ruoru Yang [a], Hangwei Wang [a], Yongyun Sun [a], Bo Chen [a, b], Ruihua Dong [a, b]

ELSEVIER

Science of The Total Environment
Volume 807, Part 2, 10 February 2022, 150817

Microglial phagocytosis of polystyrene microplastics results in immune alteration and apoptosis *in vitro* and *in vivo*

Wookbong Kwon [a, b, 1], Daehwan Kim [a, b, 1], Hee-Yeon Kim [b, c], Sang Won Jeong [a], Se-Guen Lee [a], Hyun-Chul Kim [a], Young-Jae Lee [a], Mi Kyung Kwon [a], Jun-Seong Hwang [a], Jee Eun Han [c], Jin-Kyu Park [c], Sung-Jun Lee [a], Seong-Kyoon Choi [a, b]

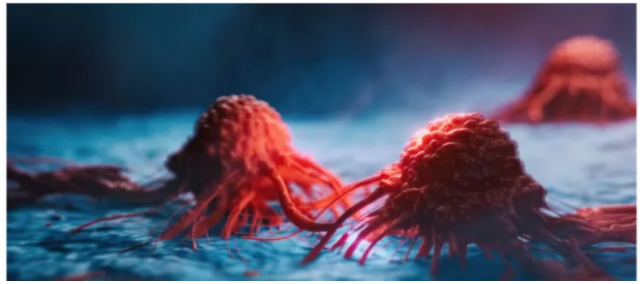
Health > Viruses, Infections & Disease > Cancer

'Very concerning': Microplastics can accumulate in cancer cells and may help them spread, study hints

News By Sneha Khedkar published March 22, 2024

An early lab-dish study in cancer cells suggests microplastics can persist through cell division and may contribute to cancer spread, when they're in tumors.

Comments (0)



ELSEVIER

Chemosphere
Volume 353, April 2024, 141463

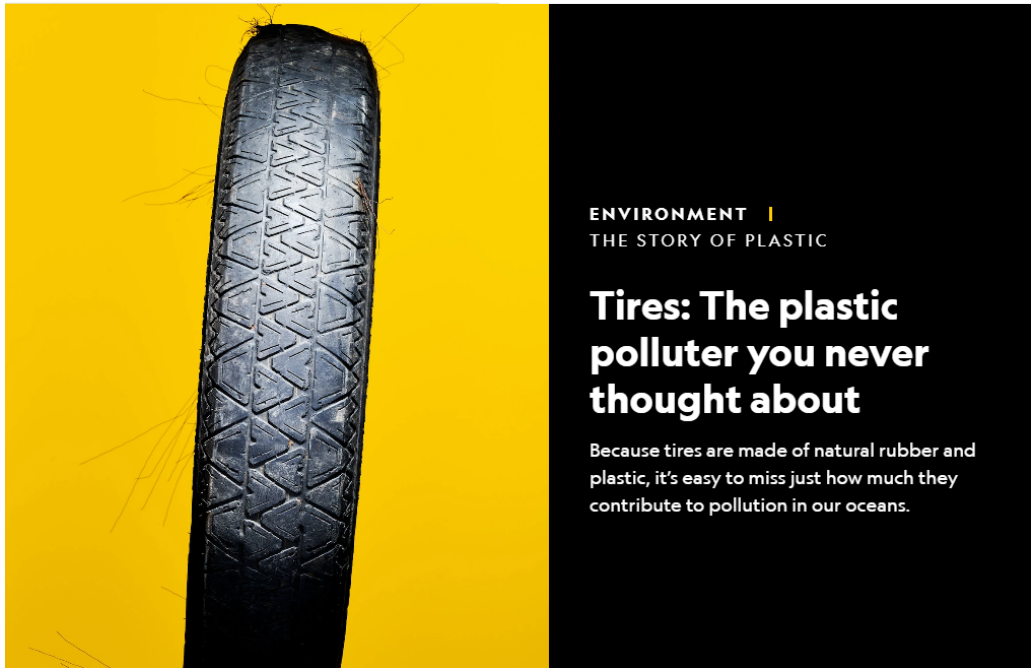
Microplastics role in cell migration and distribution during cancer cell division

Ekaterina Brynzak-Schreiber [a], Elisabeth Schögl [a b], Carolin Bapp [a], Klaudia Cseh [c], Verena Kopatz [d e f g], Michael A. Jakupec [c], Andreas Weber [b], Tobias Lange [h i j], José L. Toca-Herrera [b], Giorgia del Favero [k l], Wolfgang Wadsak [e m], Lukas Kenner [d e g n o], Verena Pichler [a e]

Show more

Microplastics – Vehicle tyre wear & tear

NATIONAL GEOGRAPHIC



ENVIRONMENT |
THE STORY OF PLASTIC

Tires: The plastic polluter you never thought about

Because tires are made of natural rubber and plastic, it's easy to miss just how much they contribute to pollution in our oceans.

IUCN

Primary Microplastics in the Oceans:

a Global Evaluation of Sources

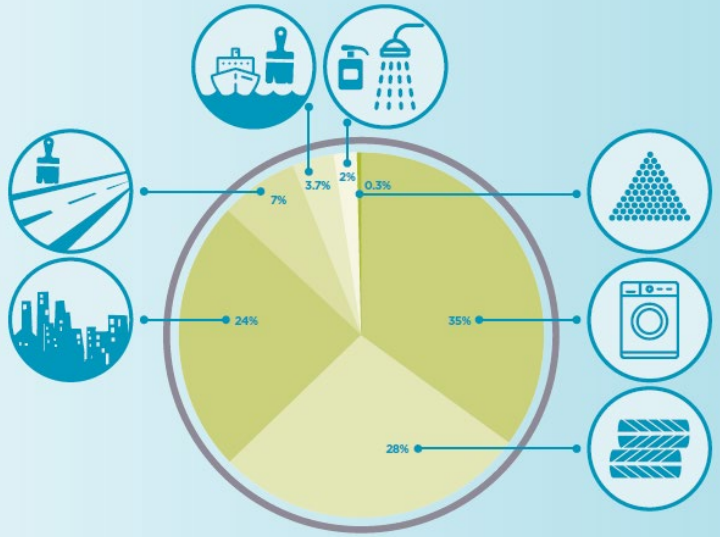
Authors: Julien Boucher, Damien Friot

INTERNATIONAL UNION FOR CONSERVATION OF NATURE

MAVA · ea · SVENSKA POSTKODLOTTERIET · GALLIFREY FOUNDATION

GLOBAL RELEASES OF PRIMARY MICROPLASTICS TO THE WORLD OCEANS

BY SOURCE (IN %).



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Environmental Science & Technology

pubs.acs.org/est

Article

Concentrations of Tire Additive Chemicals and Tire Road Wear Particles in an Australian Urban Tributary

Cassandra Rauert,* Nathan Charlton, Elvis D. Okoffo, Ryan S. Stanton, Alon R. Agua, Michael C. Pirrung, and Kevin V. Thomas

Cite This: *Environ. Sci. Technol.* 2022, 56, 2421–2431

Read Online

ECOTOXICOLOGY

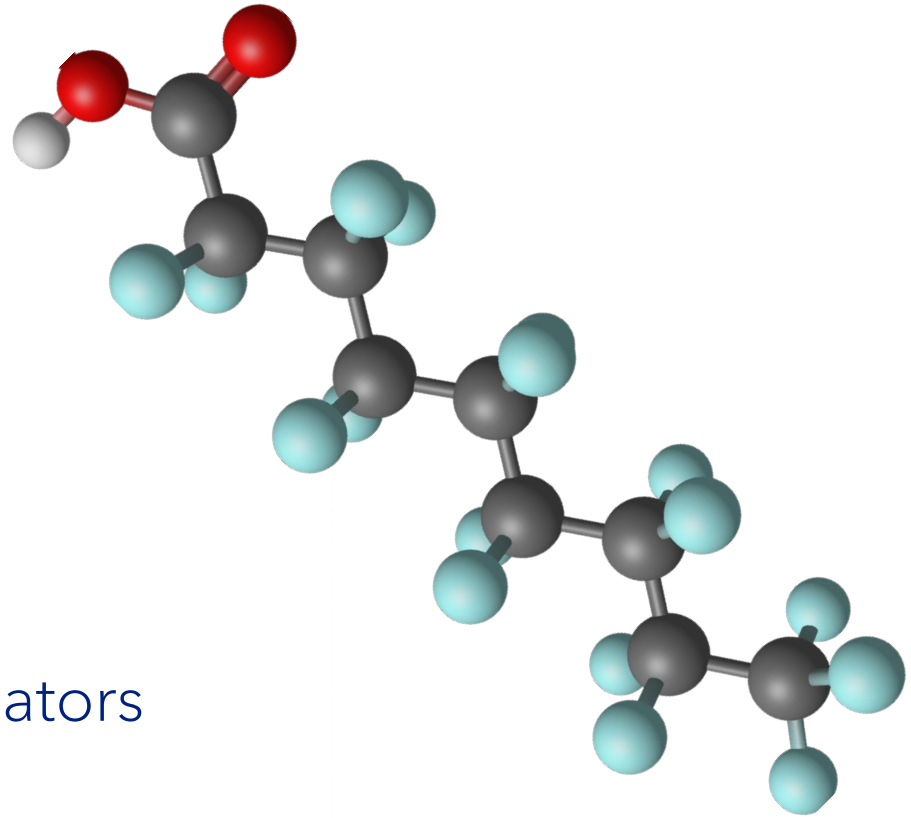
A ubiquitous tire rubber–derived chemical induces acute mortality in coho salmon

Zhenyu Tian[1,2], Haoqi Zhao[3], Katherine T. Peter[1,2], Melissa Gonzalez[1,2], Jill Wetzel[4], Christopher Wu[1,2], Ximin Hu[3], Jasmine Prat[4], Emma Mudrock[4], Rachel Hettinger[1,2], Allan E. Cortina[1,2], Rajshree Ghosh Biswas[5], Flávio Vinicius Crizóstomo Kock[5], Ronald Soong[5], Amy Jenne[5], Bowen Du[6], Fan Hou[3], Huan He[3], Rachel Lundeen[1,2], Alicia Gilbreath[7], Rebecca Sutton[7], Nathaniel L. Scholz[8], Jay W. Davis[9], Michael C. Dodd[3], Andre Simpson[5], Jenifer K. McIntyre[4], Edward P. Kolodziej[1,2,3]*

In U.S. Pacific Northwest coho salmon (*Oncorhynchus kisutch*), stormwater exposure annually causes unexplained acute mortality when adult salmon migrate to urban creeks to reproduce. By investigating this phenomenon, we identified a highly toxic quinone transformation product of *N*-(1,3-dimethylbutyl)-*N*′-phenyl-p-phenylenediamine (6PPD), a globally ubiquitous tire rubber antioxidant. Retrospective analysis of representative roadway runoff and stormwater-affected creeks of the U.S. West Coast indicated widespread occurrence of 6PPD-quinone (<0.3 to 19 micrograms

Per & poly-fluoroalkyl substances (PFAS)

- Manufactured ‘forever chemicals’
- Produced since 1940’s
- Used in various products
- Persistent
- Toxic
- Bio-accumulative
- Everywhere
- High priority for environmental regulators



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Summary – Stormwater quality impacts

- Toxicity
- Reduced oxygen levels
- Disease/ stress
- Reduced aesthetics
- Blockage of drainage systems

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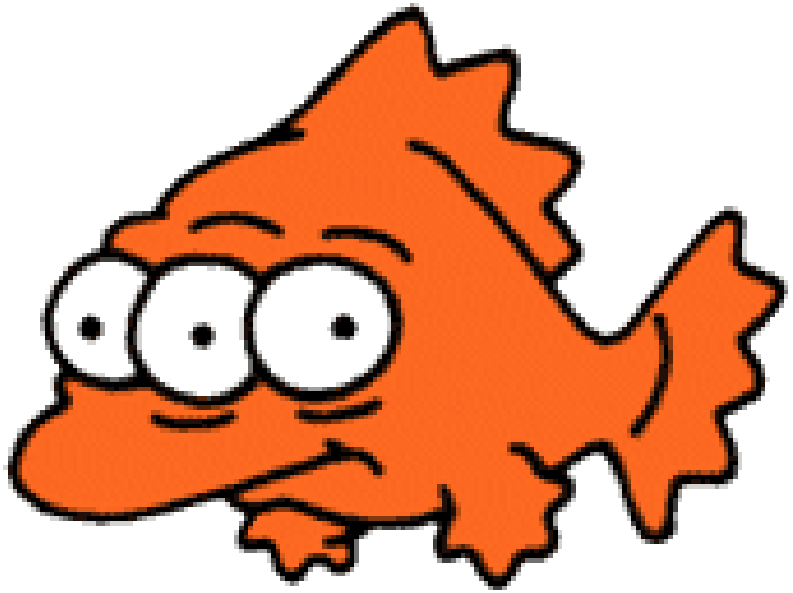
‘Urban stream syndrome’ symptoms

- Hydrology
  - Decreased low flow volume
  - Increased frequency & magnitude of peak flow
  - Decreased groundwater recharge & lower water table
- Channel Form
  - Increased channel erosion/ incision
- Water Quality
  - Increased contaminant loads & concentrations
- Ecology/ Biodiversity
  - Decreased biodiversity
  - Habitat simplification
  - Decreased nutrient retention & altered patterns of nutrient energy cycling



(Source: Walsh et al, 2004)

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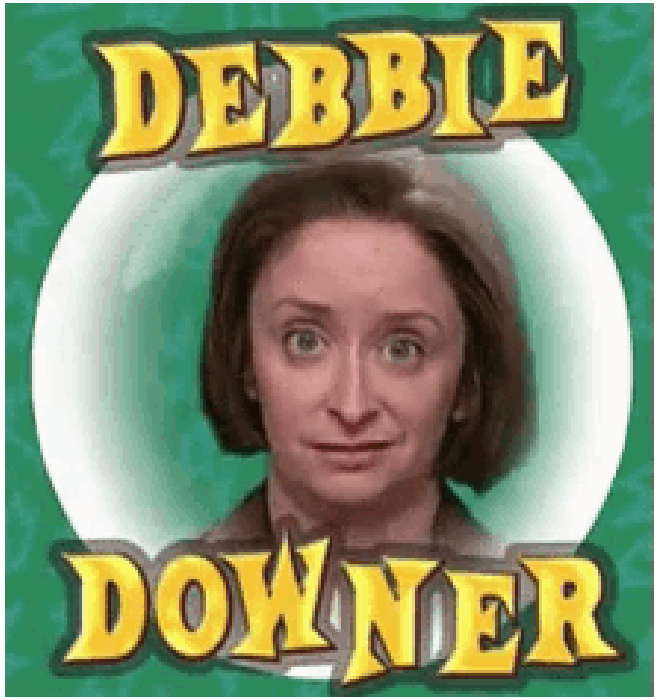

Source: www.tenor.com


What can we do ?

Example ‘best practice’ stormwater treatment targets

Table B: Post construction phase – stormwater management design objectives

Application:

(1) A material change of use for an urban purpose that involves premises 2500 metres² or greater in size and:

(a) will result in six or more dwellings; or

(b) an impervious area greater than 25 per cent of the net developable area.

(2) Reconfiguring a lot for urban purposes that involves premises 2500 metres² or greater in size and will result in six or more lots.

Climatic region	Design objectives Reductions in mean annual load from unmitigated development (%)				
	Total suspended solids (TSS)	Total phosphorus (TP)	Total nitrogen (TN)	Gross pollutants >5mm	Waterway stability management
South East Queensland	80	60	45	90	Limit the peak 1-year ARI event discharge within the receiving waterway to the pre-development peak 1-year ARI discharge
Central Queensland (south)	85	60	45	90	
Central Queensland (north)	75	60	40[15]	90	
Cape York[14], wet tropics and dry tropics	80	60[16]	40	90	
Western Queensland[14]	85	60	45	90	

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Stormwater treatment asset types

Examples

- Pretreatment
- Swales (& buffer strips)
- Sediment basins
- Wetlands
- ‘Rain gardens’/ bioretention
- Proprietary assets

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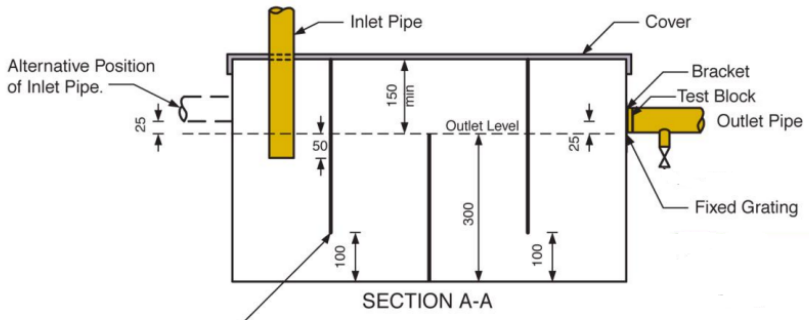
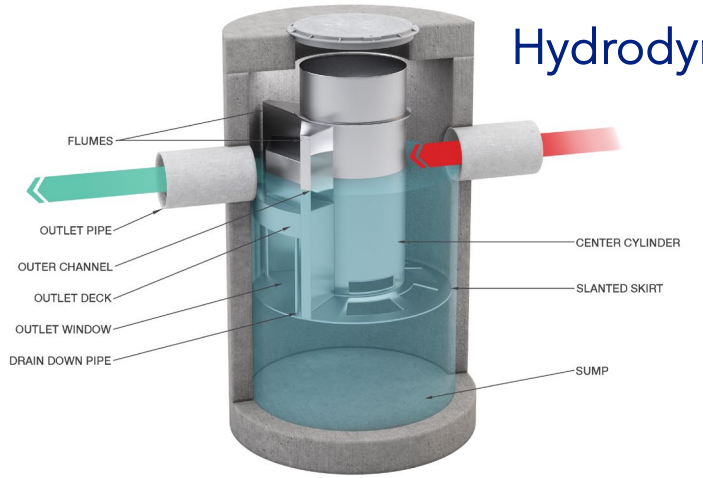
Pretreatment

Types of pretreatment

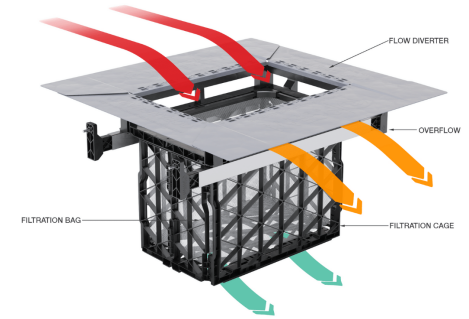


Gravity Separators

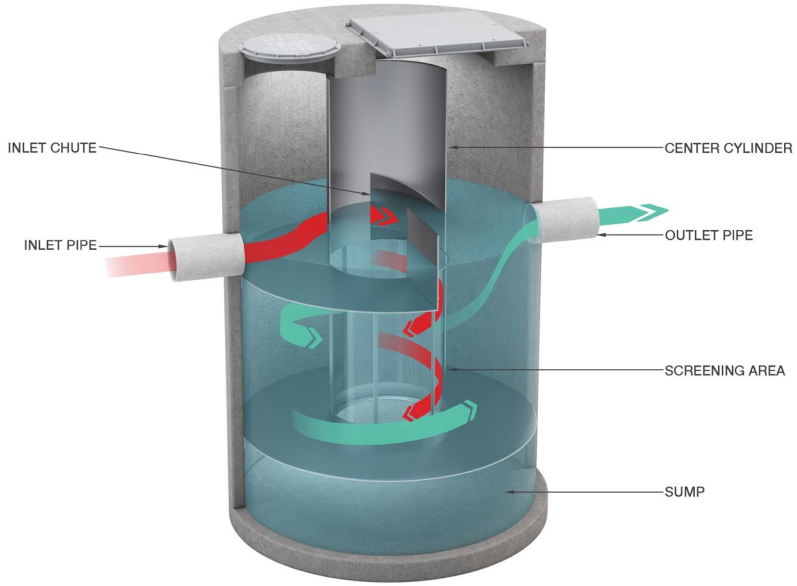
Source: Victorian Building Authority 2014



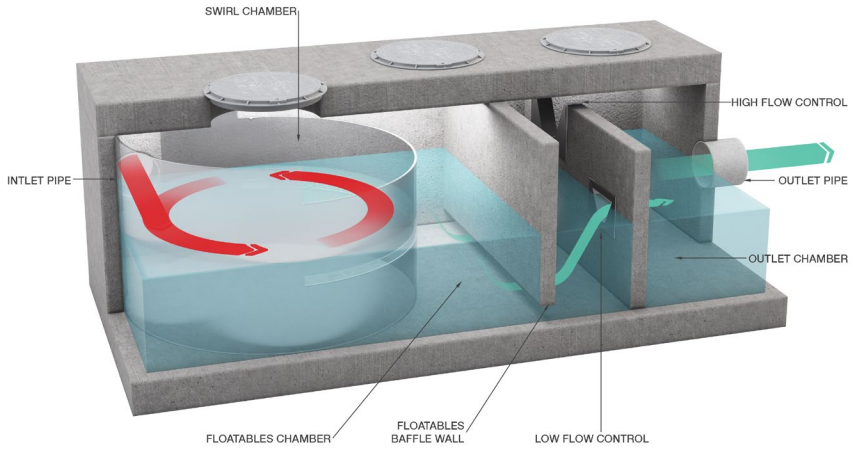
Hydrodynamic Separators



Direct Screens



Indirect Screens



Others or Combinations

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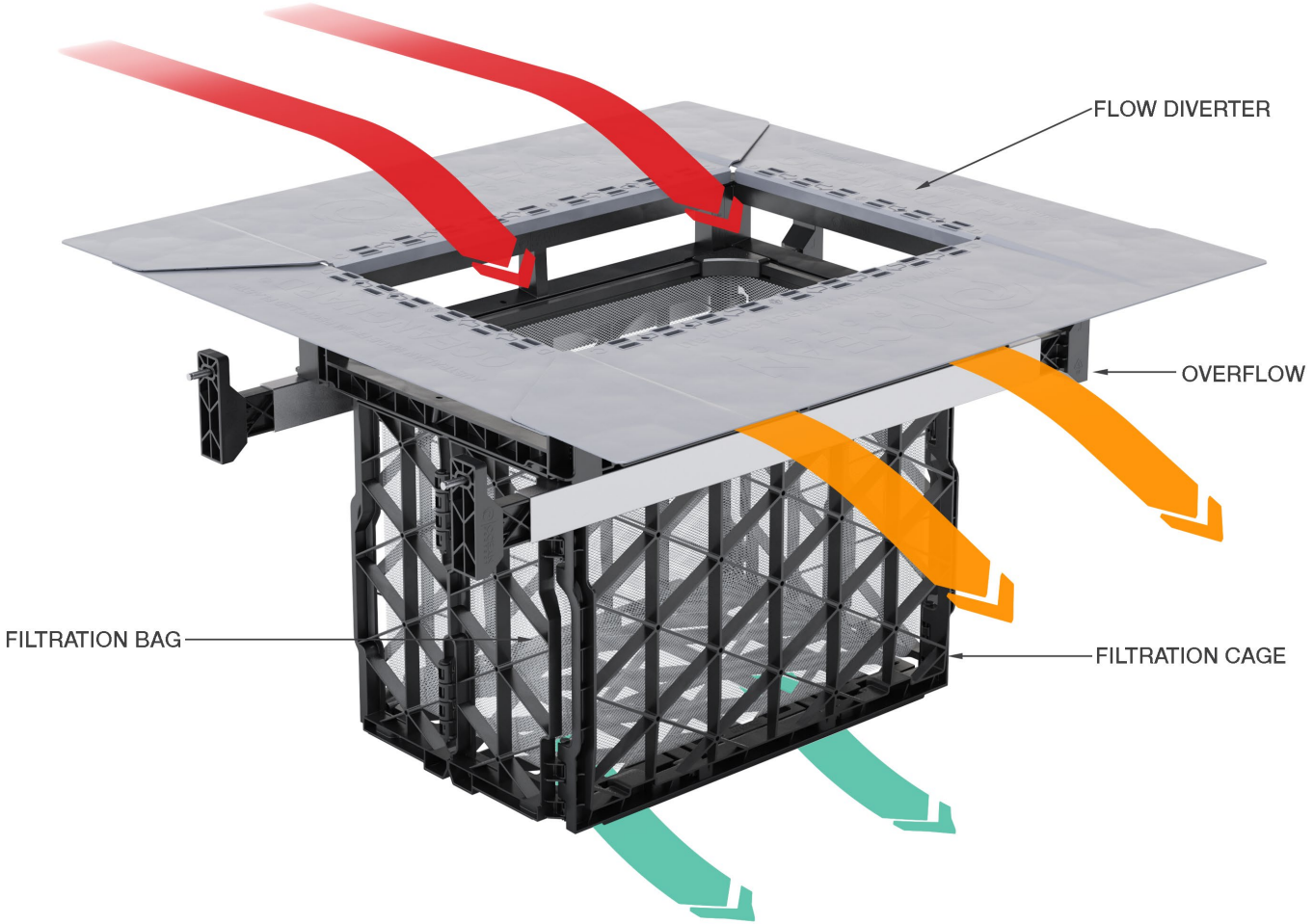
“At source” pre-treatment

- Gully pit basket
- Integrated into pits
- Different bag options
- Ideal for pre-treatment



The OceanGuard®

OCEAN PROTECT

“At source” pre-treatment - Application

- Commercial, industrial & residential areas
- Other projects (e.g. roads, airports)




Example OceanGuard® installations

OCEAN PROTECT

“At source” pre-treatment - Maintenance

- Manual lifting of bag & emptying
- Can use vacuum unit
- Replace bag (if damaged)

OCEAN PROTECT

“End-of-pipe” Direct Screen Gross Pollutant Traps


Source: Blacktown City Council

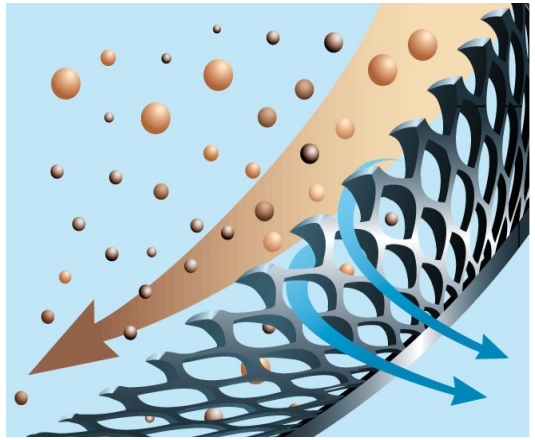

Source: Optimal Stormwater

OCEAN PROTECT

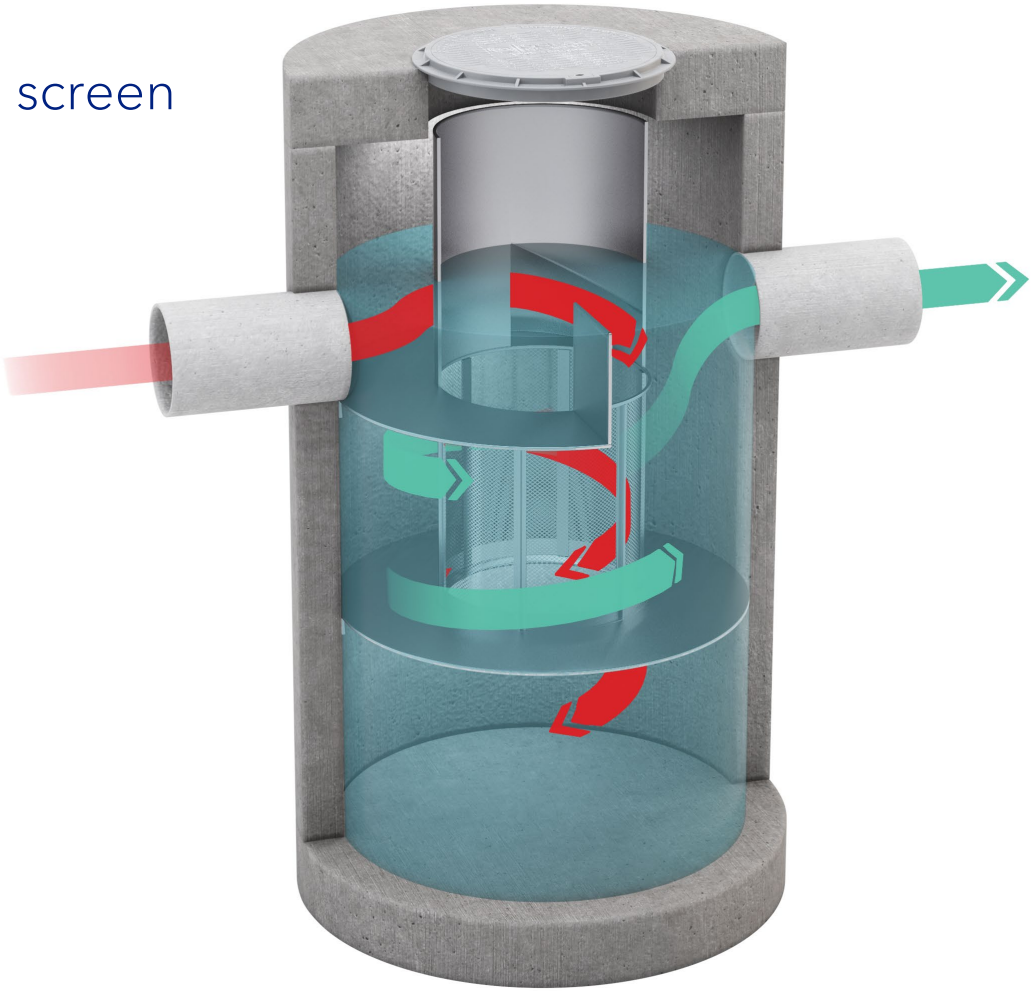
“End-of-pipe” Indirect Screen Gross Pollutant Traps

- Vortex -type treatment system
- Unique screen to maximise treatment whilst cleaning screen
- Large storage for pollution retention
- Simple installation

Source: Murray Powell



Source: CDS Technologies



The OceanSave®

OCEAN PROTECT

“End-of-pipe” Indirect Screen GPTs - Application

- Commercial, industrial & residential areas
- Other projects (e.g. roads, airports)

Example OceanSave® installations

OCEAN PROTECT

“End-of-pipe” Indirect Screen GPTs - Configuration

- Precast concrete structure
- On-line or off-line
- Multiple sizes

Online

Model	Pipe diameter range	Peak Flow *	Water quality flow rate	Typical Depth below Invert	Sump Volume *	Tank Diameter (ID)	Hydraulic Head Loss
	mm	m³/sec	m³/sec	m	m³	m	mm
OS-1500-60	300 to 750	0.58	0.06	1.748	1.4	1.5	282
OS-1500-105	450 to 750	0.9	0.105	2.363	1.44	1.5	220
OS-2300-200	600 to 900	1.2	0.2	2.948	6	2.31	283
OS-2300-250	600 to 900	1.2	0.25	2.948	6	2.31	356
OS-2300-360	750 to 900	1.2	0.36	3.583	6	2.31	476
OS-3300-450	900 to 1050	1.9	0.45	3.634	12.25	3.28	308
OS-3300-580	900 to 1050	1.9	0.58	3.634	12.25	3.28	401
OS-3300-870	900 to 1050	1.9	0.87	4.253	12.25	3.28	575

*Standard design

Offline

Model	Pipe diameter range	Peak Flow *	Water quality flow rate	Typical Depth below Invert	Sump Volume *	Tank Diameter (ID)	Hydraulic Head Loss
	mm	m³/sec	m³/sec	m	m³	m	mm
OS-2300-200-OT	Subject to diversion box size		0.2	2.948	6	2.31	283
OS-2300-250-OT	Subject to diversion box size		0.25	2.948	6	2.31	356
OS-2300-360-OT	Subject to diversion box size		0.36	3.583	6	2.31	476
OS-3300-450-OT	Subject to diversion box size		0.45	3.634	12.25	3.28	308
OS-3300-580-OT	Subject to diversion box size		0.58	3.634	12.25	3.28	401
OS-3300-870-OT	Subject to diversion box size		0.87	4.253	12.25	3.28	575
OS-4200-1250-OT	Subject to diversion box size		1.25	4.498	22	4.2	724
OS-4200-1600-OT	Subject to diversion box size		1.6	5.122	22	4.2	803
OS-4200-1750-OT	Subject to diversion box size		1.75	5.745	22	4.2	778

*Standard design

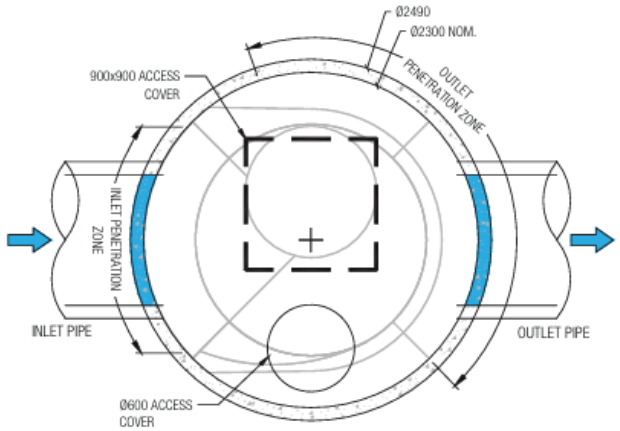


Figure 3: OceanSave® Manhole (OS-2300-200)

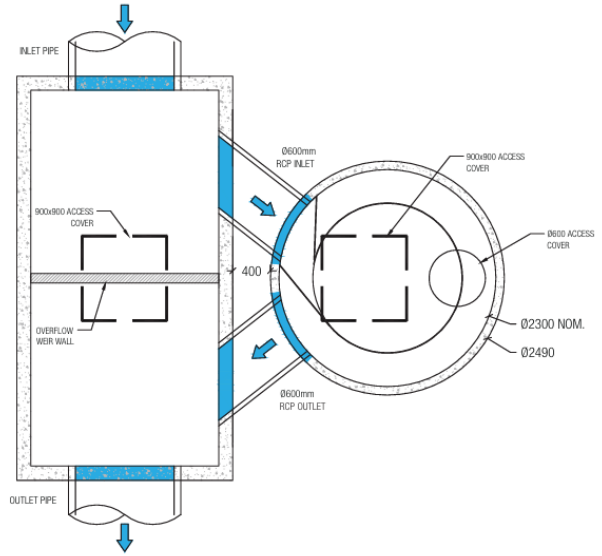


Figure 4: OceanSave-OT Offline (typical)

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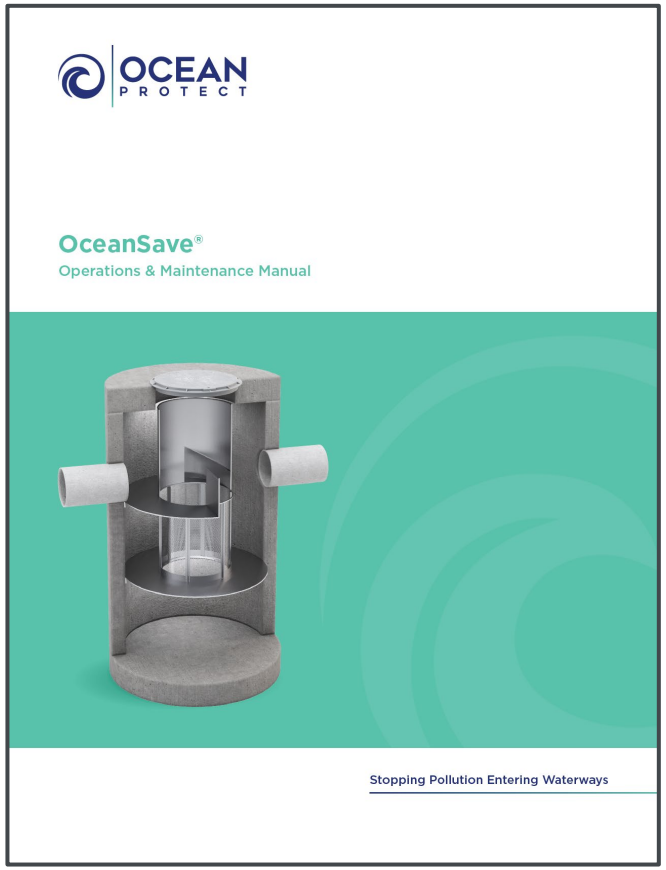
Maintenance



OCEAN
PROTECT

Swales & Buffer Strips


Noosa, QLD


Springfield Lakes, QLD


Brisbane, QLD


Coomera Waters, QLD


Coomera Waters, QLD


Kuraby, Brisbane, QLD


Kuraby, Brisbane, QLD


Kuraby, Brisbane, QLD

Sedimentation Basins


Coorparoo, Brisbane, QLD


Coorparoo, Brisbane, QLD
Trash rack upstream of sedimentation basin


Coorparoo, Brisbane, QLD


Coorparoo, Brisbane, QLD
Low flow outlet of sedimentation basin


Coorparoo, Brisbane, QLD
Excavator access track into sedimentation basin


Waterford, QLD

Maintenance/ rectification

Truganina, VIC

Source: Steve Darwent & Hugh Williamson (Optimal Stormwater, Pers.Comm.)

OCEAN PROTECT

Wetlands

Stormwater wetlands

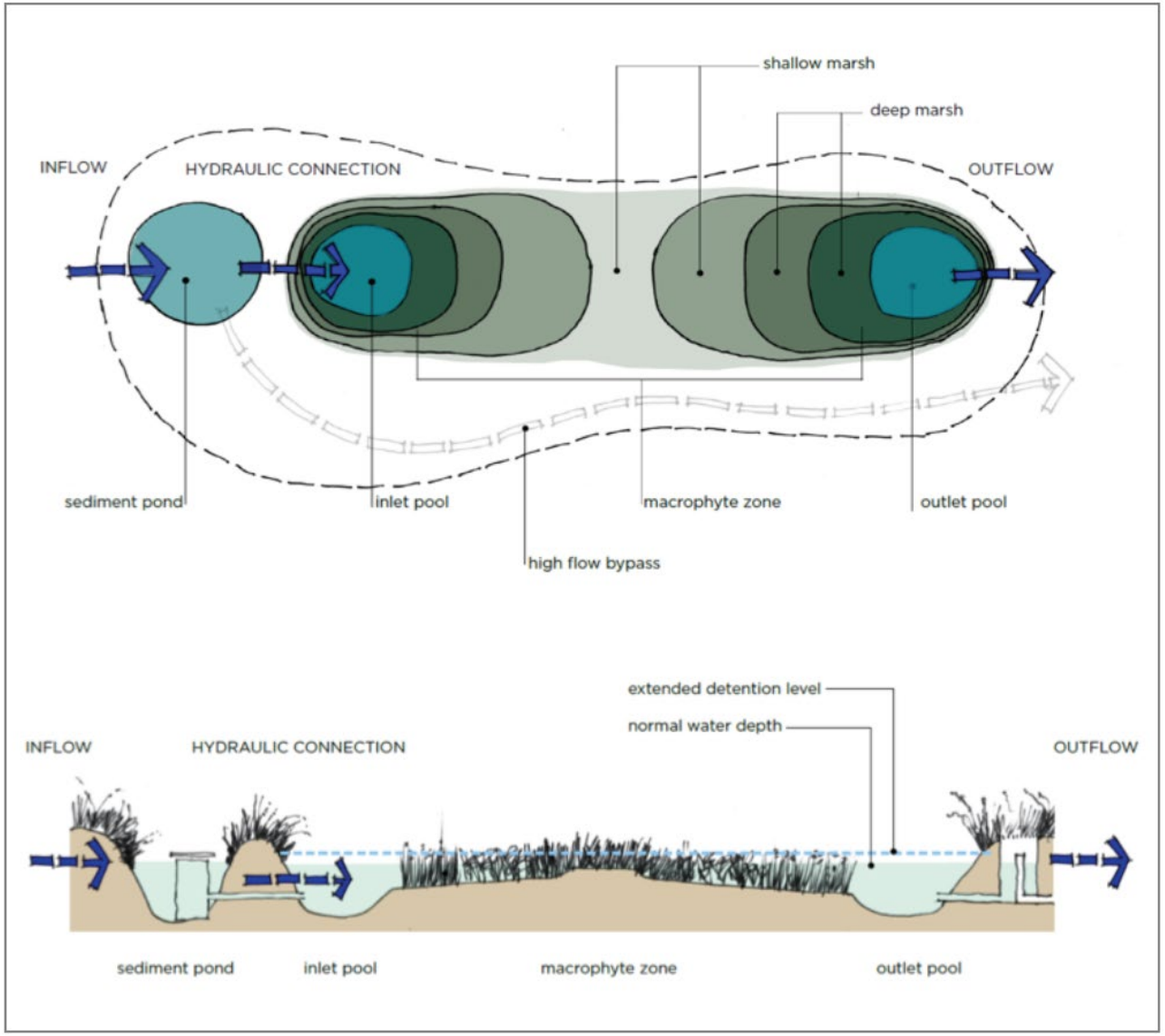


Image Source: Water By Design (2017) Wetland Technical Design Guidelines

Wetland @ Morayfield, QLD

Photo Source: Paul Dubowski (2014: Pers.Comm.)

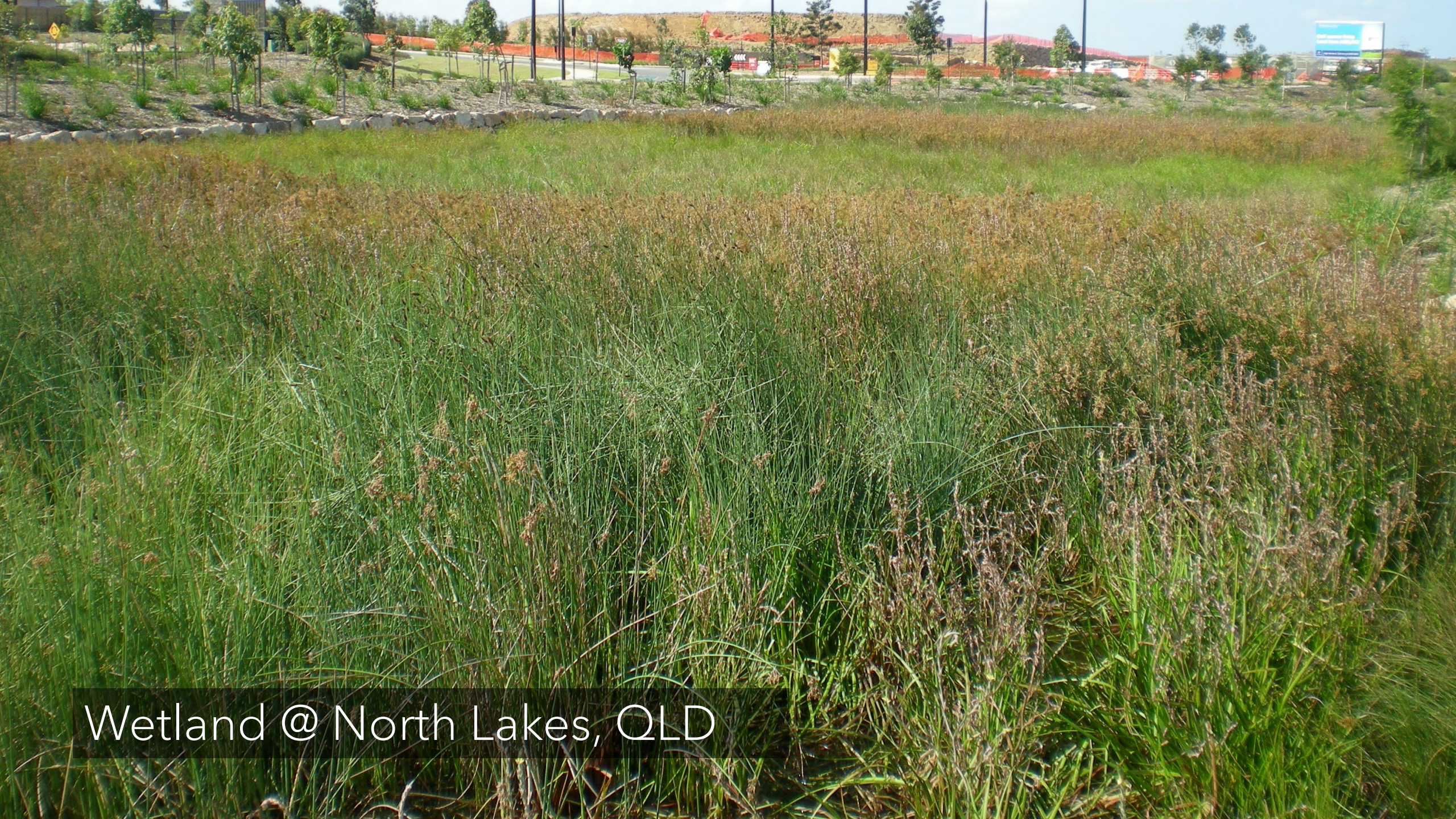

Wetland @ Morayfield, QLD

Wetland @ Waterford, QLD

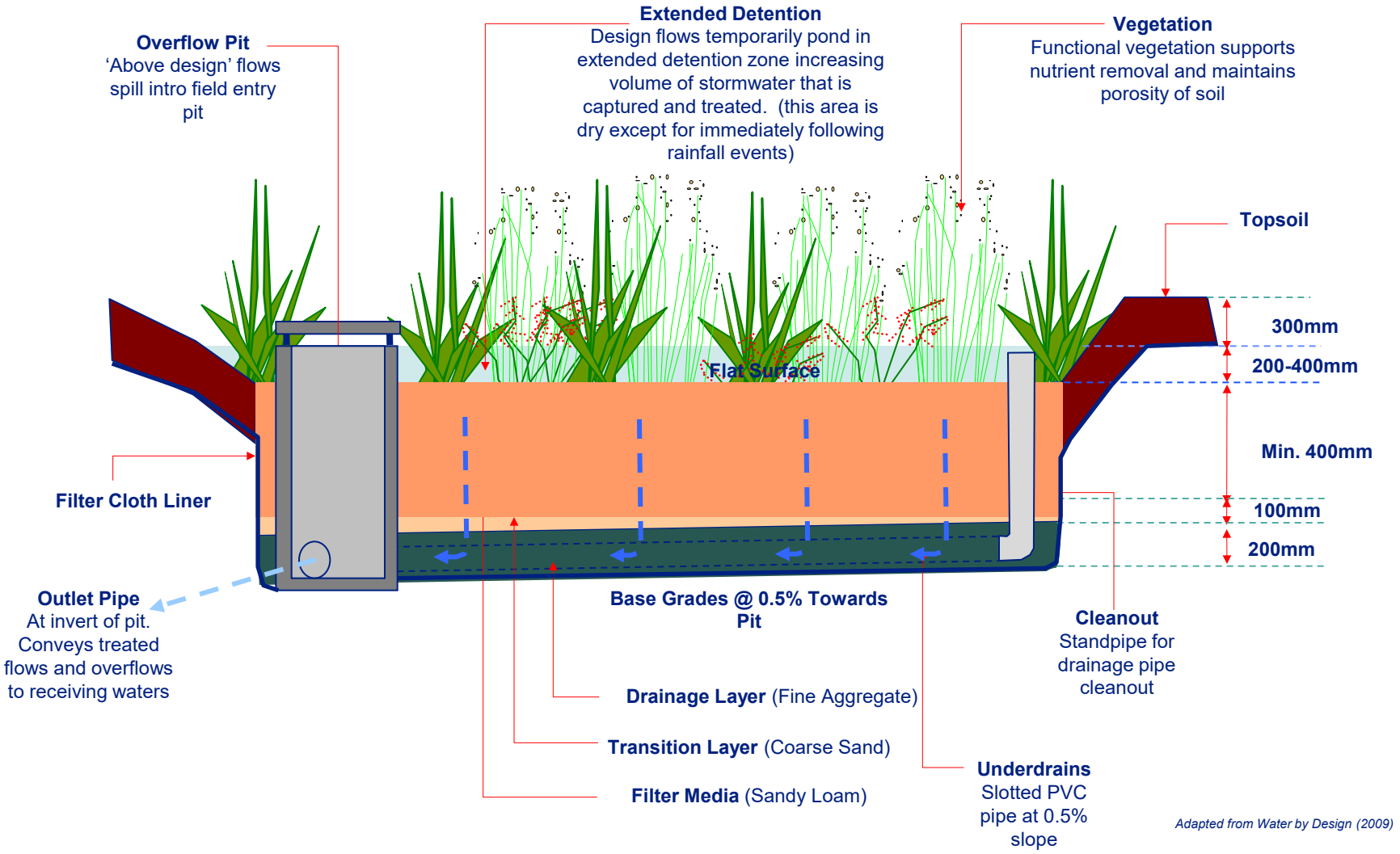

Wetland @ Coomera Waters, QLD

Wetland @ Varsity Lakes, QLD

Wetland @ Southport, QLD


Wetland @ North Lakes, QLD

Bioretention ('Rain Gardens')



Adapted from Water by Design (2009)


Hoyland Street, Bracken Ridge
(June 2001 – In Construction)


Hoyland Street, Bracken Ridge
(July 2001 – In Construction)

Hoyland Street, Bracken Ridge (December 2001 – Planted)


Bracken Ridge
(May 2002)


Bracken Ridge
(March 2005)


Bracken Ridge
(January 2007)

Bracken Ridge (November 2011)


Bracken Ridge, QLD
November 2023


Springfield Lakes, QLD


Springfield Lakes, QLD


Springfield Lakes, QLD

Redbank Plains, QLD

Source : Paul Dubowski (Pers.Comm.)

Helensvale, Gold Coast, QLD

Council Retrofit Project


Brisbane, QLD
Council Retrofit Project

Brisbane, QLD

Council Retrofit Project

Melbourne, VIC


Melbourne, VIC

Melbourne, VIC


Melbourne, VIC

Melbourne, VIC

Canberra, ACT


Caloundra, QLD


Caloundra, QLD

Caloundra, QLD


Birtinya Island, QLD

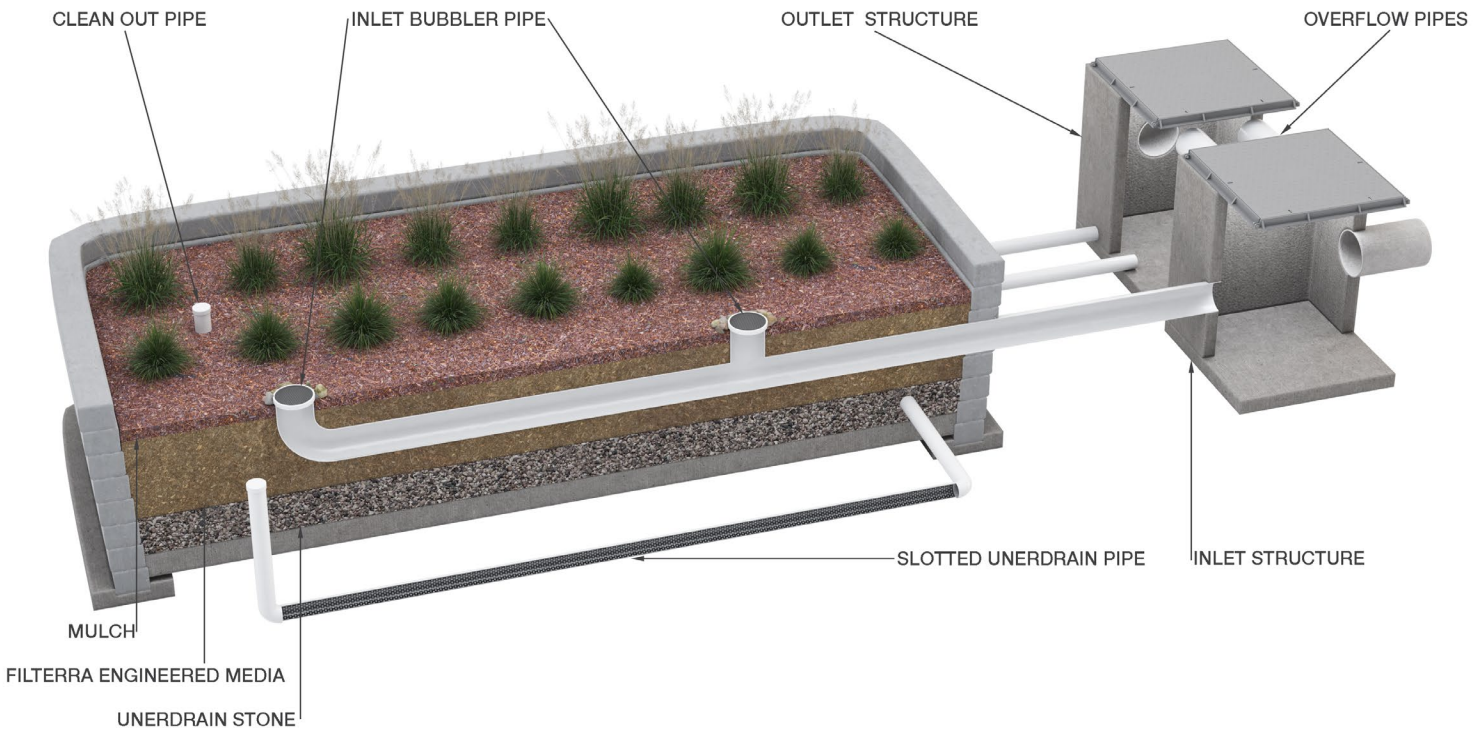

Forest Glen, QLD


Forest Glen, QLD


Noosa, QLD

High flow bioretention (Filterra)

- Just like ‘conventional’ bio, but smaller (& better ?)



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Filterra bioretention
@ Warwick Farm, NSW – 9 April 2025


Filterra bioretention
@ Silverdale, NSW – 14 August 2025


Filterra bioretention
@ Ingleburn, NSW – 15 August 2025

Filterra bioretention @ Bells Creek, QLD – 9 July 2025


Filterra bioretention
@ Bells Creek, QLD – 9 July 2025

Filterra bioretention @ Oakey, QLD – April 2024


Filterra bioretention
@ Redmond, Washington, USA

“Proprietary” assets

StormFilter

- Radial treatment technology
- Flexible configurations
- Multiple media options
- Self cleaning functionality
- Accessible & rechargeable cartridges

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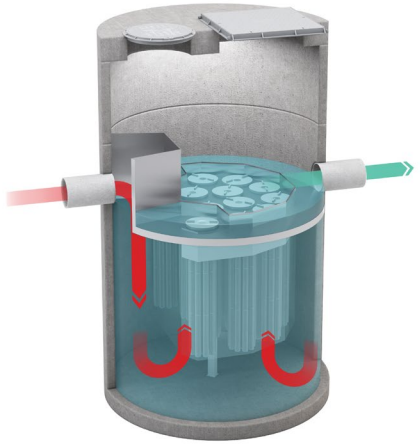
Jellyfish

- Membrane cartridge filtration
- Up-flow hydraulics
- Self cleaning functionality
- Flexible configurations
- Accessible & replaceable cartridges



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Key challenges

Key challenges

- Integration
- Water quality
- Hydraulics
- Mass load (longevity & maintenance)

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Integration

Key considerations

- Maintenance access
- Safety
- Area usage
- Amenity

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Conventional Bioretention
@ Brendale, QLD

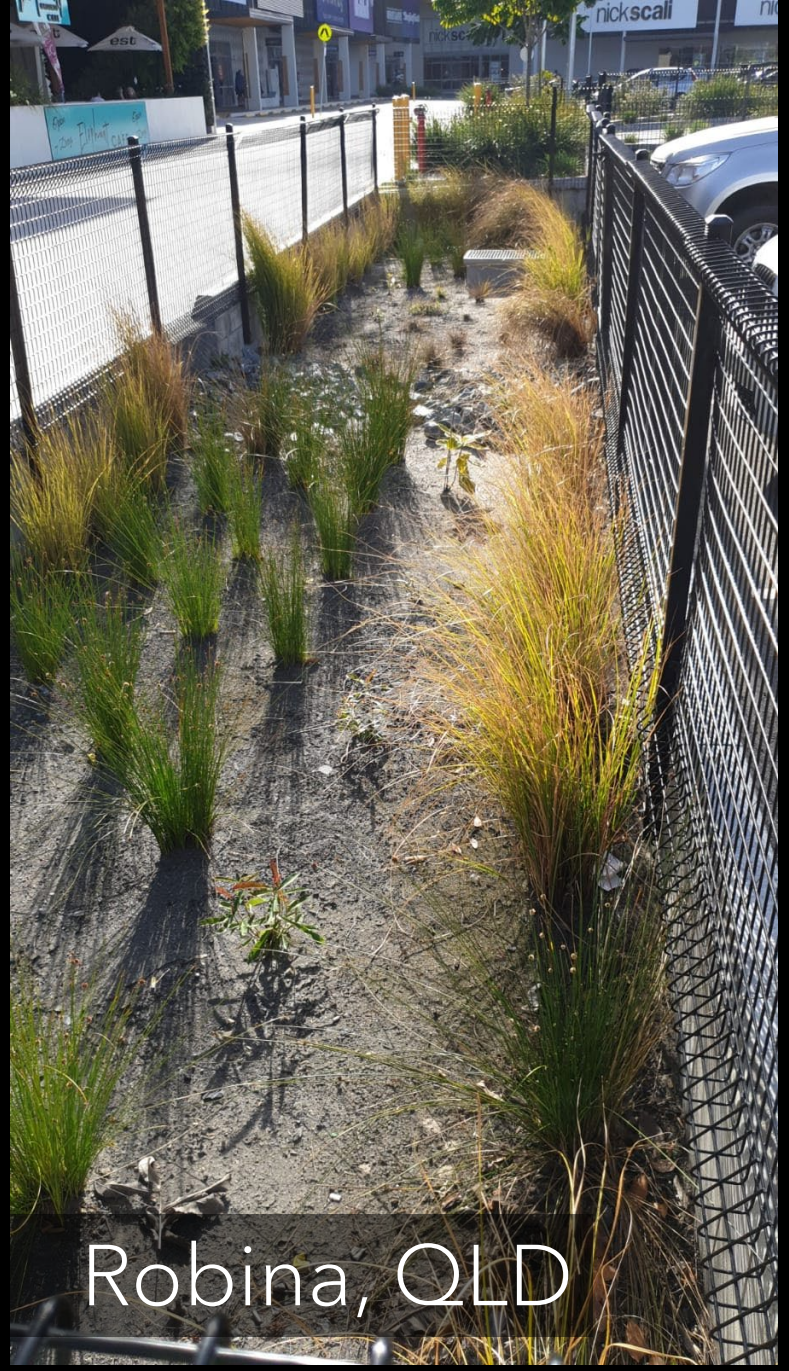

Conventional Bioretention
@ Kepnock, NSW


Conventional Bioretention
@ Thirlmere, NSW

Conventional Bioretention @ Brighton, QLD

Wakerley, QLD

Conventional Bioretention



Robina, QLD

Lytton, QLD

Conventional Bioretention
@ Toowoomba, QLD


CL·05·CT

Installation

After

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OCEAN PROTECT


OCEAN PROTECT
Stopping
Pollution
Entering
Waterways
DO NOT OVERTAKE TURNING VEHICLE

Water quality

Water quality & hydraulics

Key assumption

Key problems

- Sediment/litter accumulation
- Assumed treatment processes not fully realised
- Over-stated claims of proprietary SQIDs
- Inadequate maintenance

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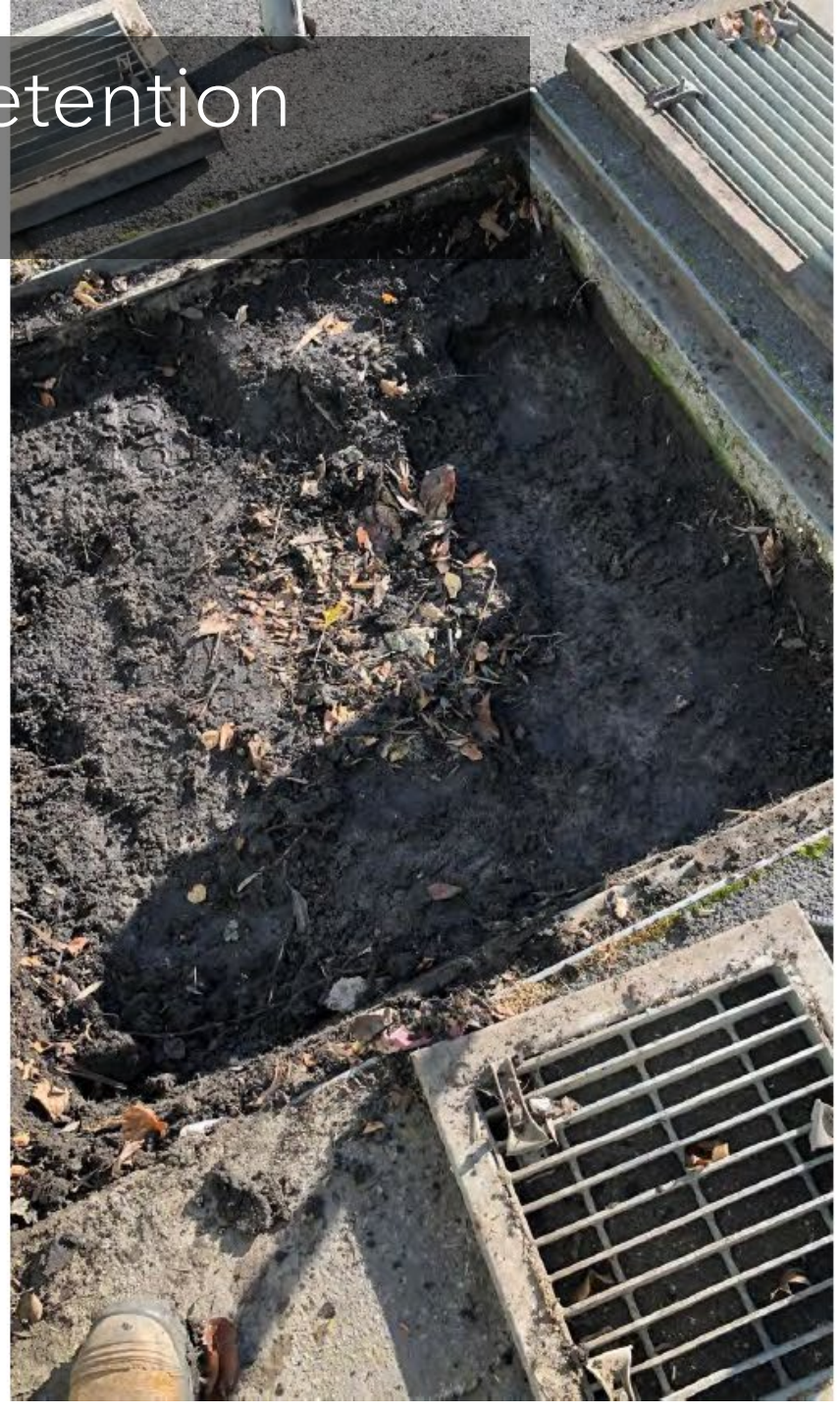
Conventional Bioretention @ Melbourne, VIC



Source of photos:
Ralf Pfleiderer (2020: Pers.Comm.)

Conventional Bioretention @ Hornsby Shire, NSW

Source of photo:
Craig Naughton (2025: Pers.Comm.)

Flow distribution ?

Conventional bioretention @ Caboolture, QLD

Flow distribution ?

Conventional bioretention @ Silverdale, NSW


Flow distribution & plant growth ?
Conventional bioretention @ Fitzgibbon Chase, QLD

Flow distribution ?

Conventional bioretention @ Fitzgibbon Chase, QLD

Exaggerated performance claims

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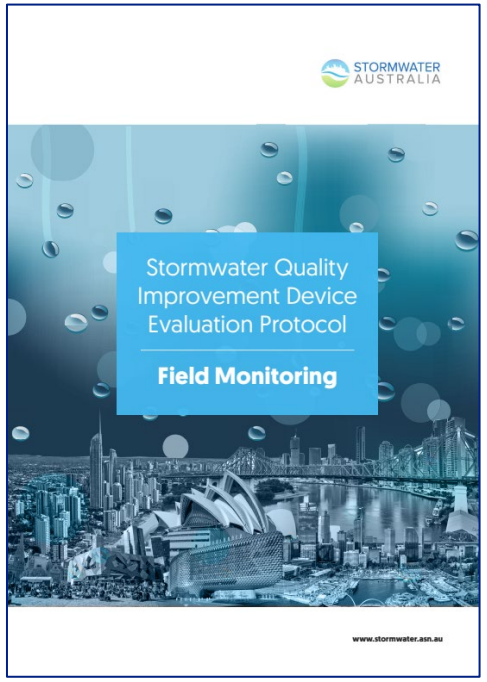
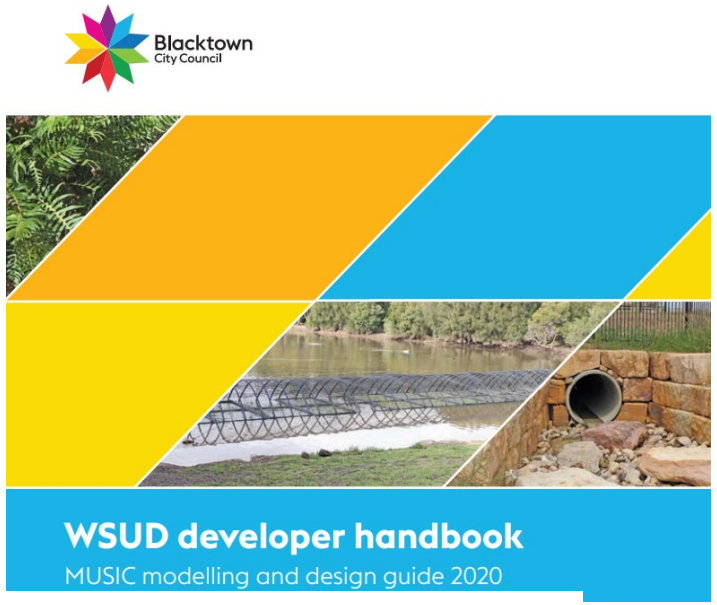
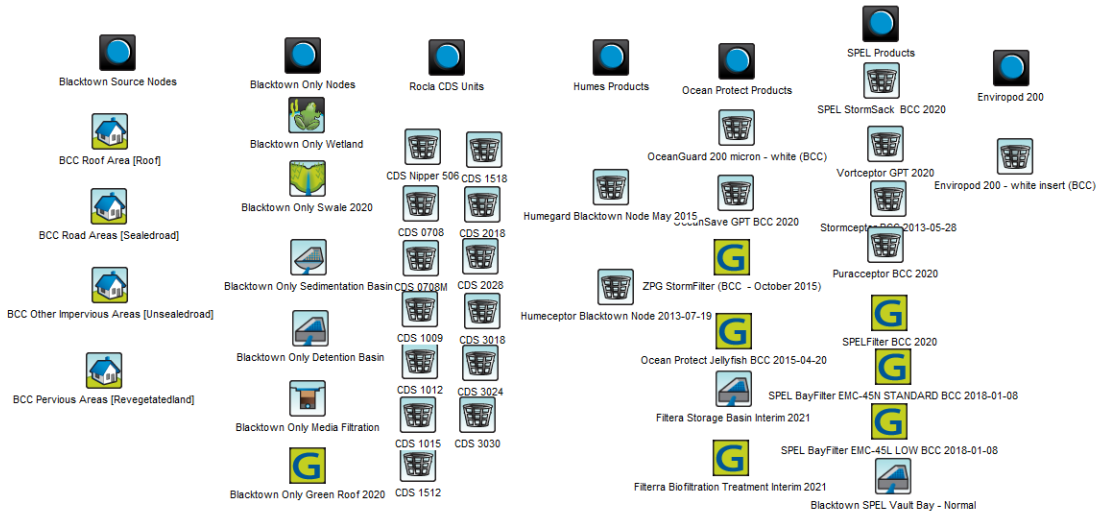
Independent verification



Blacktown City Council





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Maintenance = ESSENTIAL

- Regular removal of accumulated material
  - Know where assets are
  - Know what assets are
  - Resources (e.g. staff, equipment/ machinery, $$) to maintain/ manage

For both Council AND Privately owned assets

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WSUD MAINTENANCE COMPLIANCE FRAMEWORK

Recommendations

- Maximise resilience
  - Design, construction & establishment:
    - Ensure asset(s) will likely function as intended
    - Ideally, one group responsible for all aspects
    - Prior to approval for private development, require ongoing condition assessments & maintenance
  - Operation:
    - Ensure asset(s) is likely functioning as intended
    - Review & implement/ enforce condition assessment & maintenance requirements

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Conclusion

Summary

- What ?
  - Stopping pollution entering waterways & oceans
- Why ?
  - Stormwater pollution is an important issue that we can manage/ reduce/ prevent
- How ?
  - via range of practical, cost-effective asset types
- Challenges
  - … are an opportunity to do better ☺

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Want to learn more ?

aws Australian Water School

- "Stormwater Treatment Essentials"
  - Live & on-line
  - 3 x 2 hour sessions (from 10AM AEST)
    - Friday 14 November
    - Friday 21 November
    - Friday 12 December

https://awschool.com.au/training/stormwater-essentials

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