






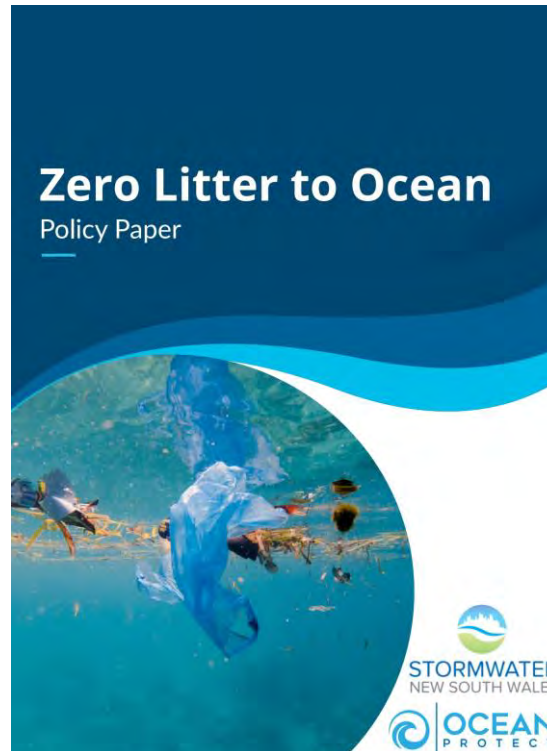
"Myth busting" regulatory authority concerns about proprietary stormwater treatment assets

Ocean Protect Webinar
6 April 2022

Brad Dalrymple & Michael Wicks

- ④ We stop pollution entering waterways
- ④ ~ 20 years in Australia
 - ~50,000 assets
 - Servicing ~10,000 filters
 - >13,000 tonnes of pollution stopped to date
 - >7 tonnes of pollution stopped every day

-  Innovation
-  Education
-  Advocacy



Previous Webinars



Ensuring Bioretention Media Performance Success
Engineered media is the heart of bioretention system performance, optimised to filter and/or infiltrate stormwater through a plant-soil-microbe complex. Physical, chemical, and biological treatment removal mechanisms capture sediment, nutrients, heavy metals, bacteria, and oil and grease among other contaminants. Qualification and protection of the media components ensure the bioretention media can meet overall performance objectives. A successful bioretention installation involves oversight of media production, not just onsite construction and installation.

[Read More](#)[Downloads](#)

Learning from ecosystem management to overcome challenges affecting vegetated stormwater assets
Vegetated stormwater assets are a type of infrastructure asset used to protect waterways from the impacts of urban development by improving the quality and reducing the quantity of stormwater that drains into waterways from urban areas. They include bioretention systems, constructed wetlands, sediment basins and swales. Vegetated stormwater assets are often managed by local governments using an infrastructure asset management approach.

[Read More](#)[Downloads](#)

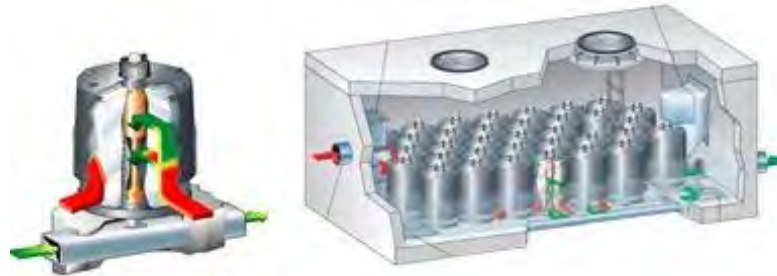
Best Practice Design & Management of the OceanSave GPT

The OceanSave is a vortex type engineered stormwater treatment asset designed to remove litter, gross pollutants, sediment and associated pollutants from stormwater runoff as either a stand-alone technology or as part of a 'treatment train' (with stormwater treatment assets located downstream to provide further treatment).

[Read More](#)[Downloads](#)



OceanGuard



StormFilter



Filterra



Jellyfish Filter

Gross Pollutant Traps



VortSentry HS



VortCapture



Vortechs



OceanSave



ESK – Oil Separator





1. Parts/ components of proprietary STAs can not be sourced if the STA proprietor went “belly up”
2. Non-proprietary STA's STAs (e.g. bioretention) are much less likely to ‘fail’ (e.g. if not maintained) (relative to proprietary STAs)
3. Non-proprietary are much less expensive to maintain
4. Non-proprietary STAs provide other benefits (e.g. amenity, cooling, habitat, hydrology)
5. Non-proprietary STAs are much better at removing nutrients (particularly dissolved nutrients)

QUESTION

- Is there any particular issues/ concerns that you would like to have reviewed/ discussed as part of the webinar ?

RESPONSES:

Maintenance

- "Operations and Maintenance"
- "Maintenance of devices" (x 2)
- "access to and into the units"
- "maintenance compliance"
- "Maintenance and life span of assets"
- "What feedback have you received from Council regarding maintenance of Ocean Protect devices and have you made any modifications"
- "maintenance for prop STA's aren't easily quantified (councils biggest concern)":
- "Maintenance requirements for "in OSD" water quality treatment measures and how OSD can be designed to make this easier."
- "Ability for Council staff to maintain these assets - is maintenance training offered to others outside Ocean Protect?"
- "typical maintenance periods, specialisation of maintenance contractors"
- "How to ensure that proprietary STAs are maintained"
- "What provides Council's the legal right to enforce compliance on private properties? Now Blacktown Council are using the Positive Covenants and Restrictions on the Use of Land (Section 88Bs), but I would be curious to know what other opportunities and options are out there."



RESPONSES (Cont'd):

Costs

- 🌀 "Lifecycle costs"
- 🌀 "Compare Life Cycle Costing for proprietary products against non proprietary"
- 🌀 "Where can I find maintenance costs on STAs that require periodic replacement of proprietary components (cartridges, membranes) ?"
- 🌀 "Third Party Contractor Pricing"
- 🌀 "Operation and Maintenance Plan advice for Developer handover to Council"

Performance

- 🌀 "Removal of nitrogen"
- 🌀 "Removal of dissolved nitrogen species"
- 🌀 "Independent research demonstrating nutrient removal of devices"
- 🌀 "Ways to monitor STA water quality performance"
- 🌀 "The 'real efficiency' of proprietary STA rather than the stated or academically assessed efficiency."
- 🌀 "To what extent has there been a third-party/peer-review validating the effectiveness of non-proprietary STA?"



RESPONSES (Cont'd):

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- ④ "Bringing Council's onboard with the application of proprietary products"
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RESPONSES (Cont'd):

Other

- ⦿ "What is the most robust (but maybe not most theoretically effective) system available"
- ⦿ "Will materials shortages and price rises affect your RRP?"
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- ⦿ "when discussing other benefits maybe worth discussing hydrological benefits"
- ⦿ "Interested in the amenity, cooling question..."
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- ⦿ "Nothing particular, our company specify Ocean Protect a lot and i just want to be kept informed"
- ⦿ "Advantages / Disadvantages of proprietary STAs over non-proprietary ones"
- ⦿ "frequently councils are insisting designers also solve existing treatment issues upstream to gain approvals for their development"
- ⦿ "bioretention basins and floating wetlands"
- ⦿ "Traditional bio life span"
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- ⦿ "How easy is it to swap between different proprietary STAs (e.g. swap a SPEL Filter with a StormFilter). "



**CONFLICT
OF
INTEREST**

- ④ There is a wide range of non-proprietary STAs
 - Webinar focusses on 'conventional' biofiltration

- ④ There is a wide range of proprietary STAs
 - Webinar focusses on Ocean Protect STAs

Claim 1:

Parts/ components of proprietary STAs can not be sourced if the STA proprietor went “belly up”



- ④ Extremely low risk of going 'belly up'
 - ~20 years operation in Australia
 - Very financially sound
- ④ If we did ...
 - Contech can provide all OP STAs (& parts/ components), & Contech is very financially sound
 - New Australian licensee would likely very quickly occur

Claim 1:

Parts/ components of
proprietary STAs can not
be sourced if the STA
proprietary or went "berry up"

BUSTED



Claim 2:

Non-proprietary STA's
(e.g. bioretention) are
much less likely to 'fail'
(e.g. if not maintained)
(relative to proprietary
STAs)





Sediment basin – Brisbane, QLD




Swale – Brisbane, QLD



Biofiltration – Silverdale, NSW



Biofiltration – Brisbane, QLD



Biofiltration – Brisbane, QLD



Biofiltration – Brisbane, QLD



Biofiltration – Caloundra, QLD



Biofiltration – Brendale, QLD



Biofiltration – Springfield, QLD



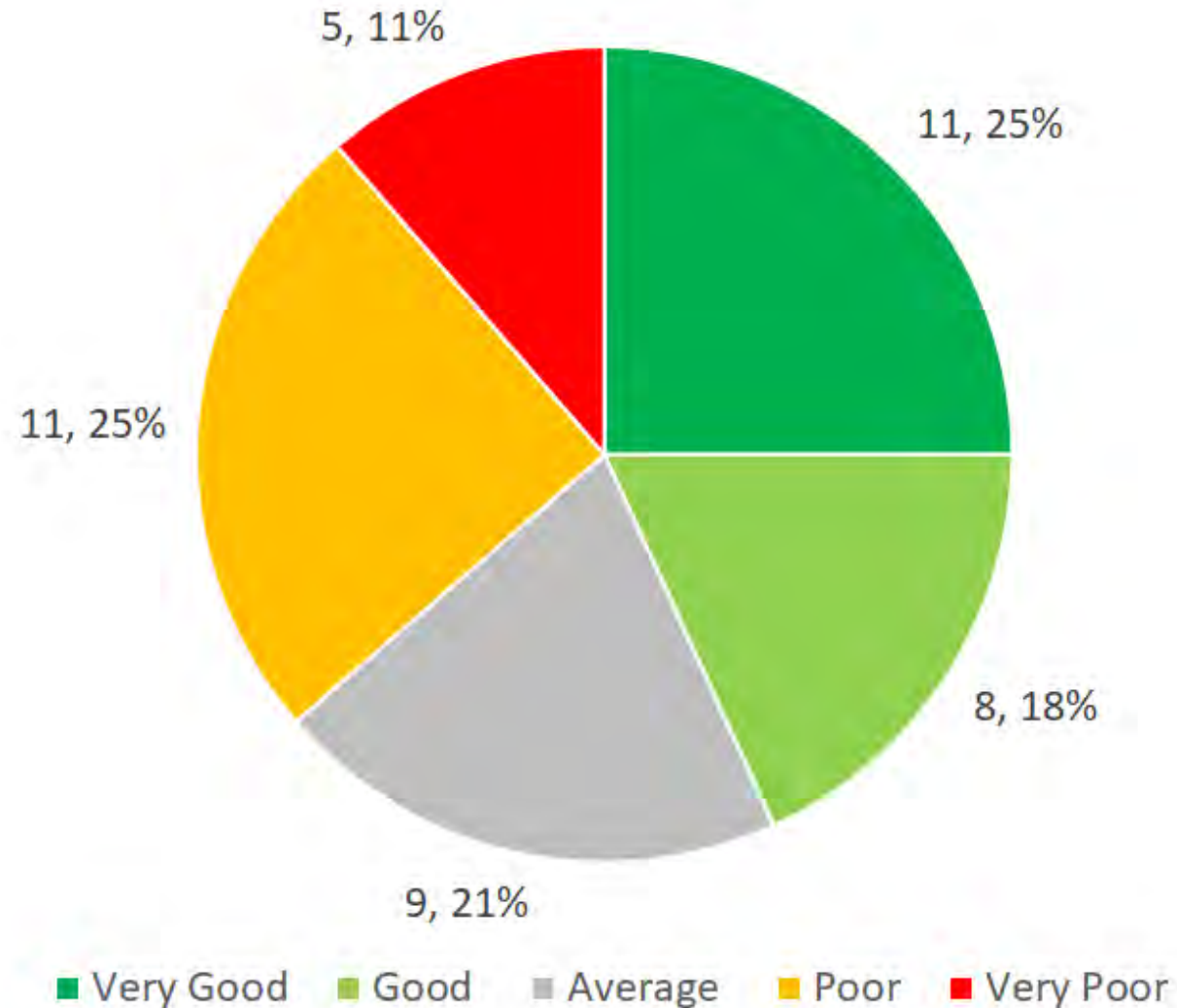
Robina, QLD



Lytton, QLD

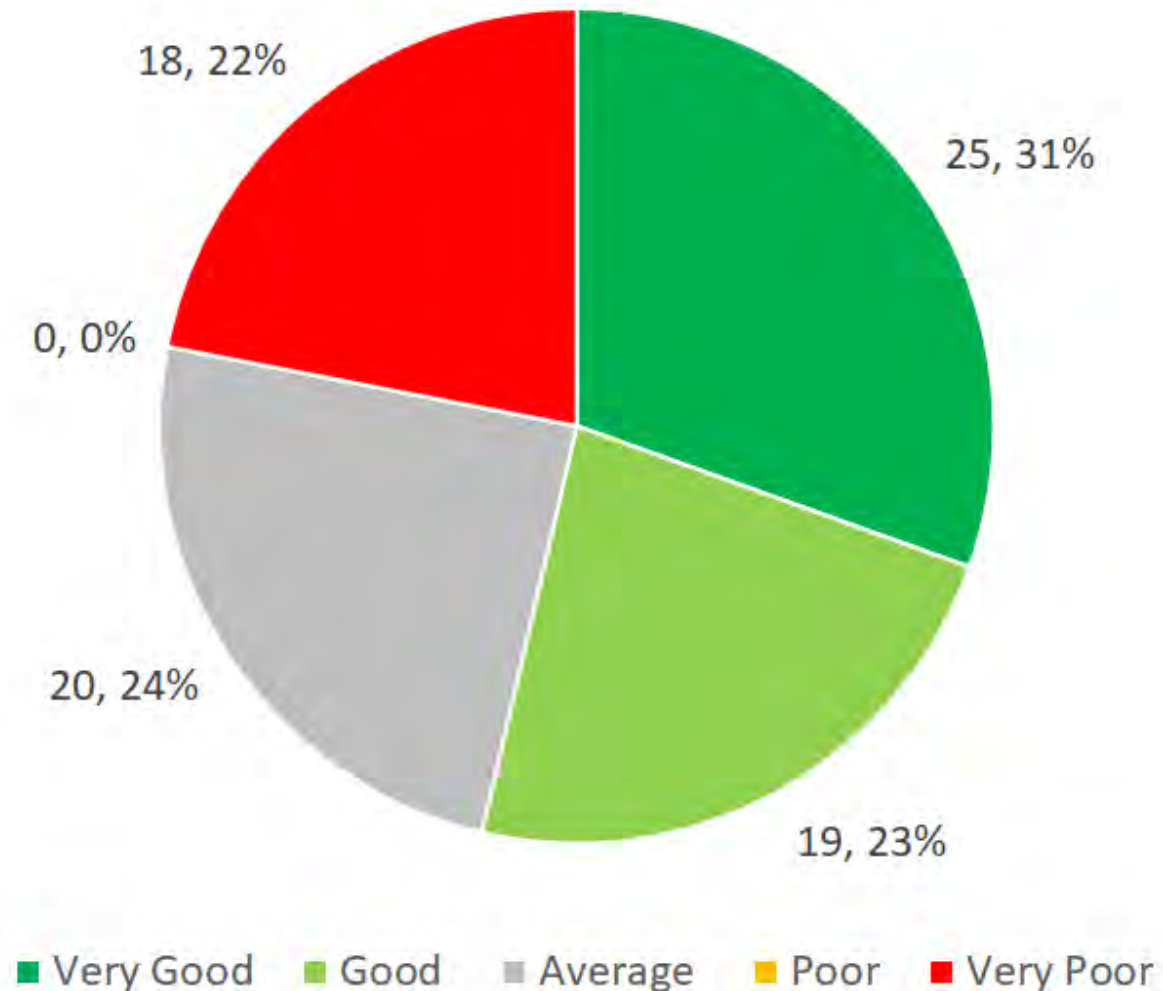
Wetlands

- Condition assessments on 44 wetlands, undertaken in September & October 2016
- Source:** Un-named Council (2018: Pers.Comm.)
- Paper:** Dalrymple et al (2019), *Point Break for the WSUD Asset Wave*, OzWater, Melbourne



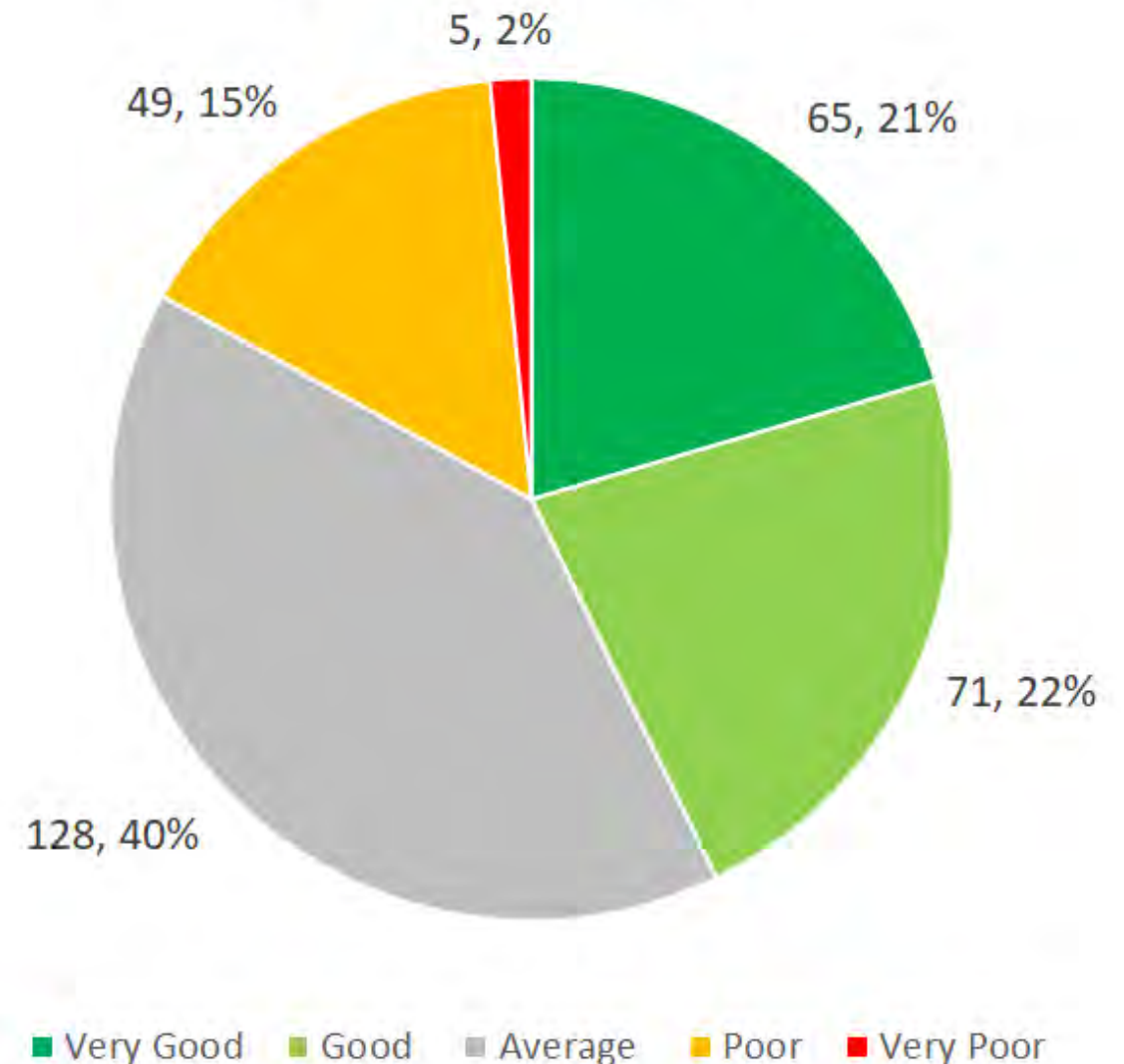
Bioretention

- Condition assessments on 82 bioretention basins, undertaken in September and October 2016
- Source:** Un-named Council (2018: Pers.Comm.)
- Paper:** Dalrymple et al (2019), *Point Break for the WSUD Asset Wave*, OzWater, Melbourne.



- Condition assessments on 318 Council-owned bioretention systems in the Moreton Bay Region), undertaken in August to October 2017
- Source:** Jonathon Whitcombe (MBRC, 2018: Pers.Comm.)
- Paper:** Dalrymple et al (2019), *Point Break for the WSUD Asset Wave*, OzWater, Melbourne.

Bioretention





Biofiltration – Narangba Heights, QLD

- Highly resilient
- Commercial interest in ensuring low likelihood (& cost) of STA rectification
- Rectification works easily undertaken



- Cartridge can be easily disassembled
- All cartridge components 100% reusable
- 'Swap-&-go' for ease of maintenance
- Predictable maintenance frequency – with proven performance





- ☉ Menai, NSW
- ☉ StormFilters in operation for 20 years
- ☉ Maintained once or twice ?
- ☉ Simple/ easy maintenance required (including cartridge replacement)





Filterra biofiltration – Warwick Farm, NSW

Claim 2:

Non-proprietary STAs
(e.g. bioretention) are
much less likely to 'fail'
(e.g. if not maintained)
(relative to proprietary
STAs)

BUSTED



Claim 3:

Non-proprietary STAs
are much less expensive
to maintain

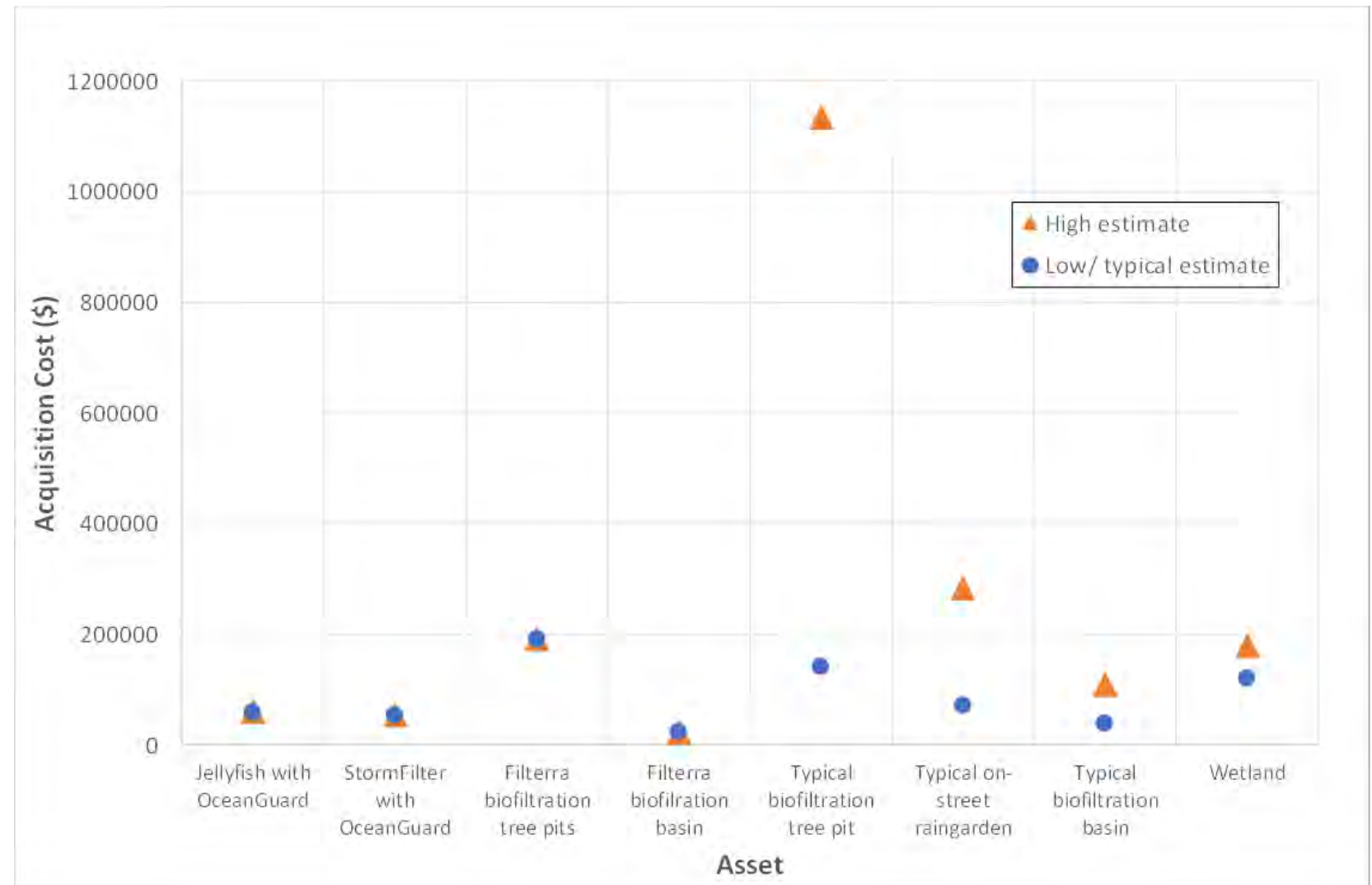


Life cycle cost analyses

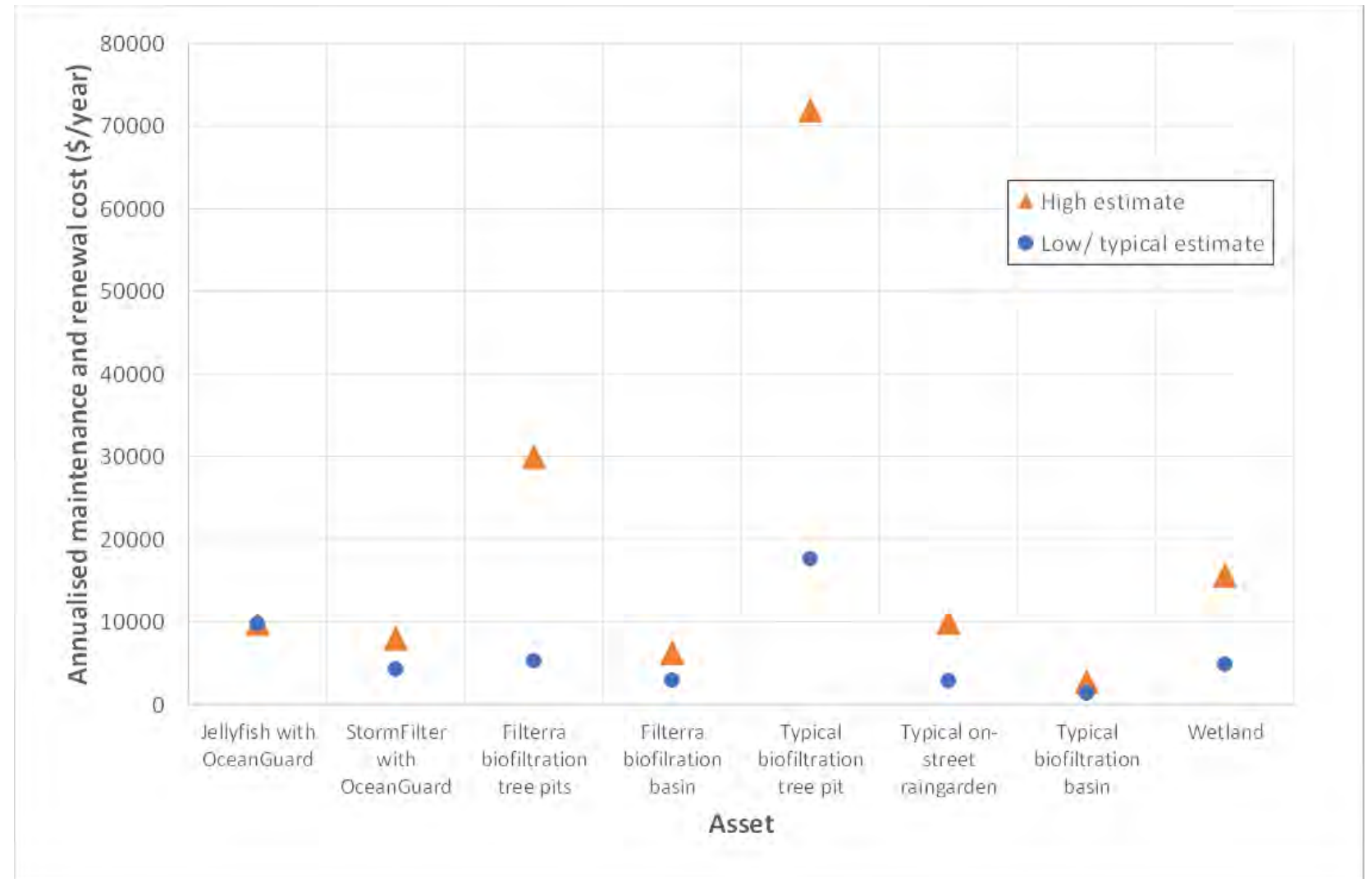
- 🌀 Example scenario:
 - Medium density residential
 - Brisbane climate
 - Designed to achieve SPP targets
- 🌀 Cost data:
 - Ocean Protect cost database
 - Melbourne Water (2015) costs for typical biofiltration and wetlands
- 🌀 Excludes land costs



Acquisition costs



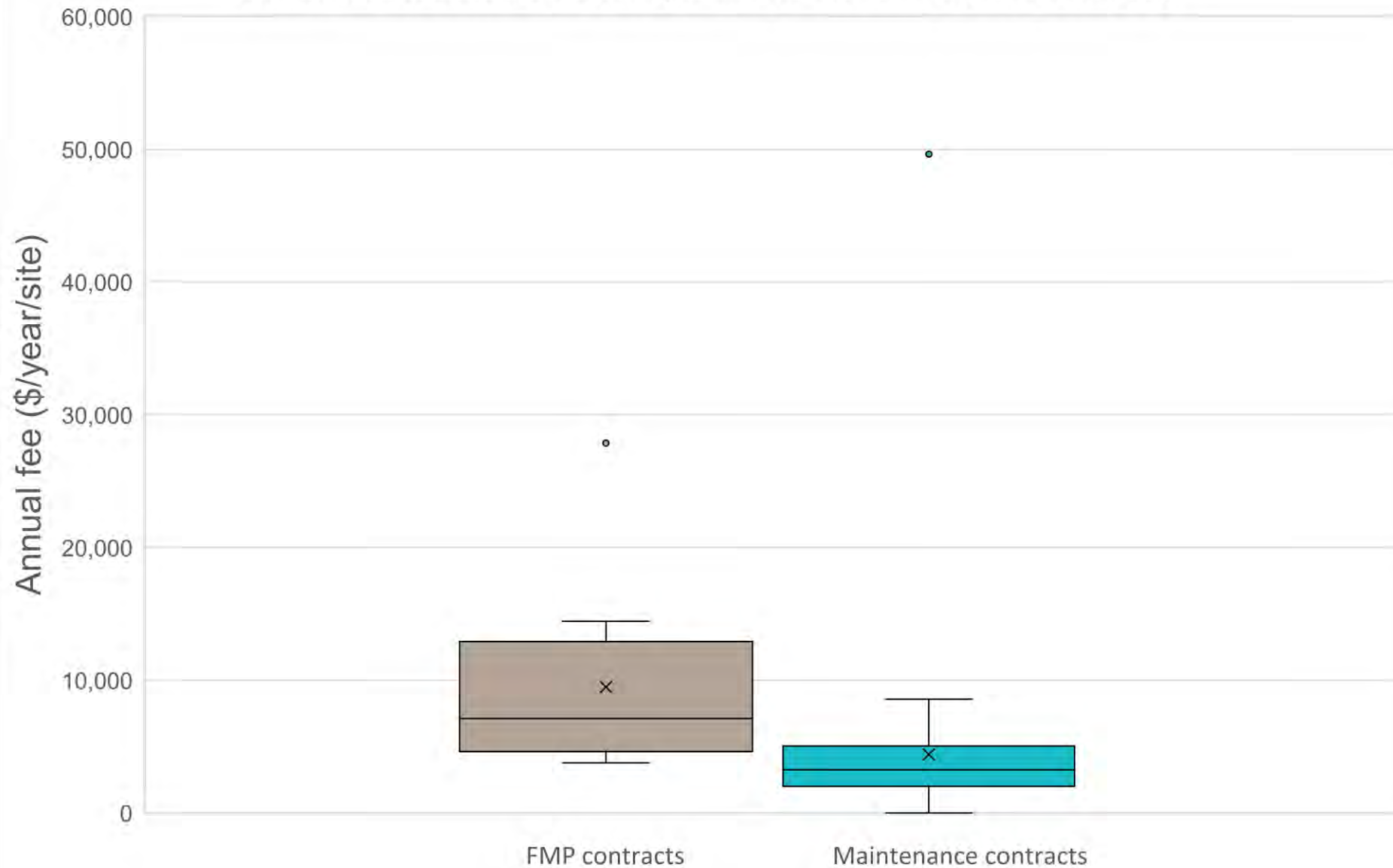
Maintenance & renewal costs

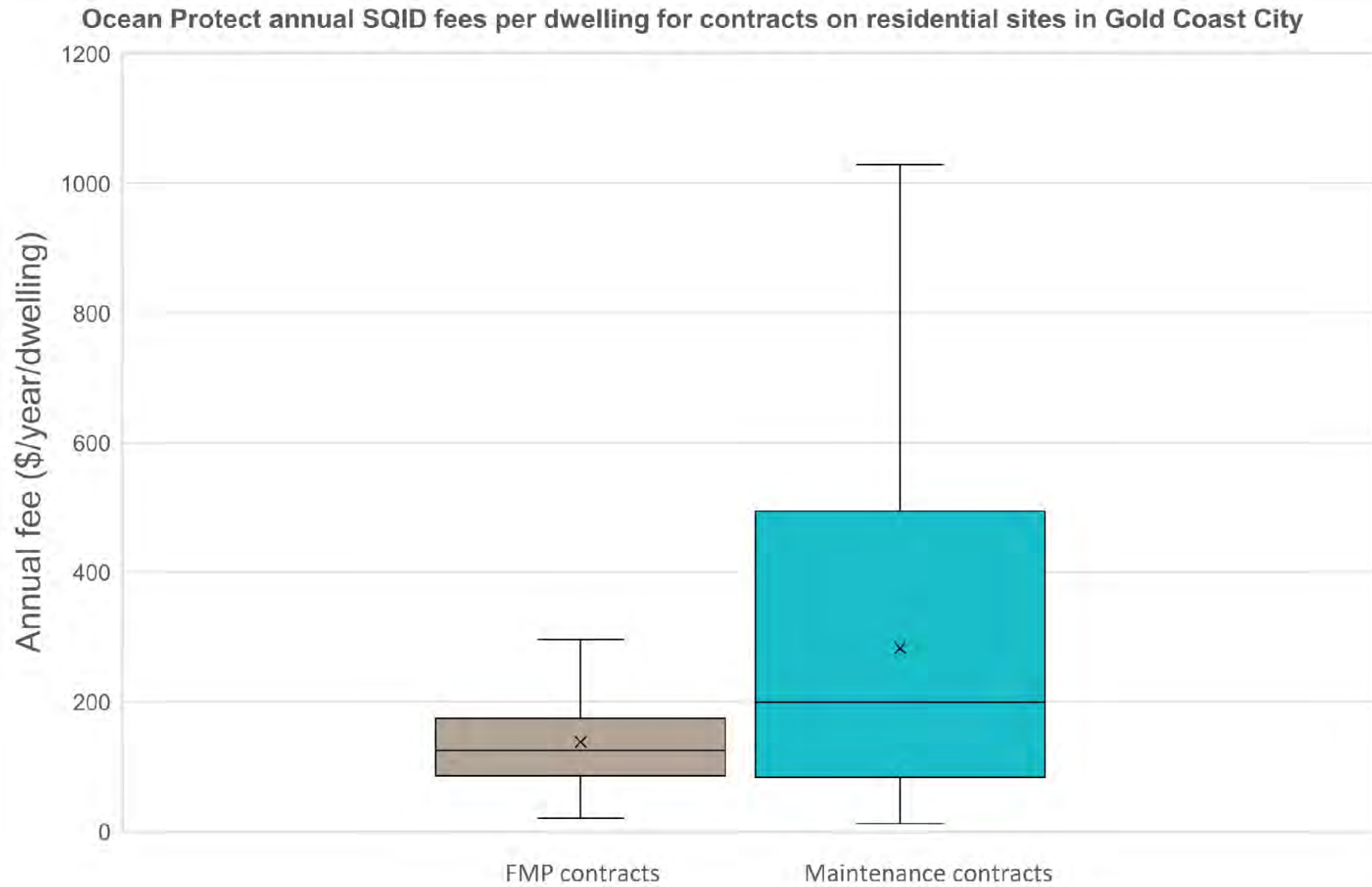


- ④ OP currently maintain OP STAs at a total of 60 sites in Gold Coast City
 - 12 facility management plans
 - 48 maintenance contracts
- ④ OP has agreed to manage STAs for a specific period (generally 1 to 15 years), for a fixed sum – typically charged monthly), in accordance with an agreement/ contract with the site owner/ body corporate
- ④ FMP contracts include BOTH full warranty and insurance (e.g. parts and labour) for the life of the contract for the STAs installed



Ocean Protect annual SQID fees per site for contracts in Gold Coast City



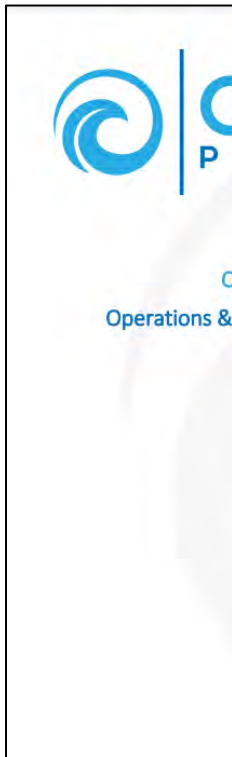


Average fees for residential sites:

- ☉ \$2.65/ dwelling/ week for FMPs
- ☉ \$5.43/ dwelling/ week for maintenance contracts



- Ocean Protect STAs can be maintained by other suitably qualified personnel
- Within Australia, only Ocean Protect can provide parts/ components for our STAs to others



Claim 3:

Non-proprietary STAs are
much less expensive to
maintain

Plausible



- ④ All STAs need maintenance to function properly
- ④ Preferred solution(s) (& costs) are site specific
- ④ Appropriately informed life cycle cost analyses should be undertaken for potential options



Claim 4:

Non-proprietary STAs
provide other benefits
(e.g. amenity, cooling,
habitat, hydrology)





Redbank, QLD



Varsity Lakes, QLD



Caloundra, QLD



Docklands, VIC



Stonnington, Victoria



Hobart, TAS



Yates Court, Kepnock



Thirlmere, NSW



Ipswich, QLD

Flow
distribution ?

Brisbane, QLD





Brighton, QLD





Noosa, QLD



Wakerley,
QLD



Toowoomba, QLD









OCEAN
PROTECT

OCEAN
PROTECT

OCEAN
PROTECT

OCEAN
PROTECT

Stopping

Pollution

Entering

Waterways

We don't inherit the earth from our parents. We borrow it.

DO NOT
OVERTAKE
TURNING VEHICLE

4L05



Western Sydney, NSW



Warwick Farm, NSW



Silverdale, NSW



Old Beach, TAS



Old Beach, TAS



Old Beach, TAS



Old Beach, TAS



Old Beach, TAS



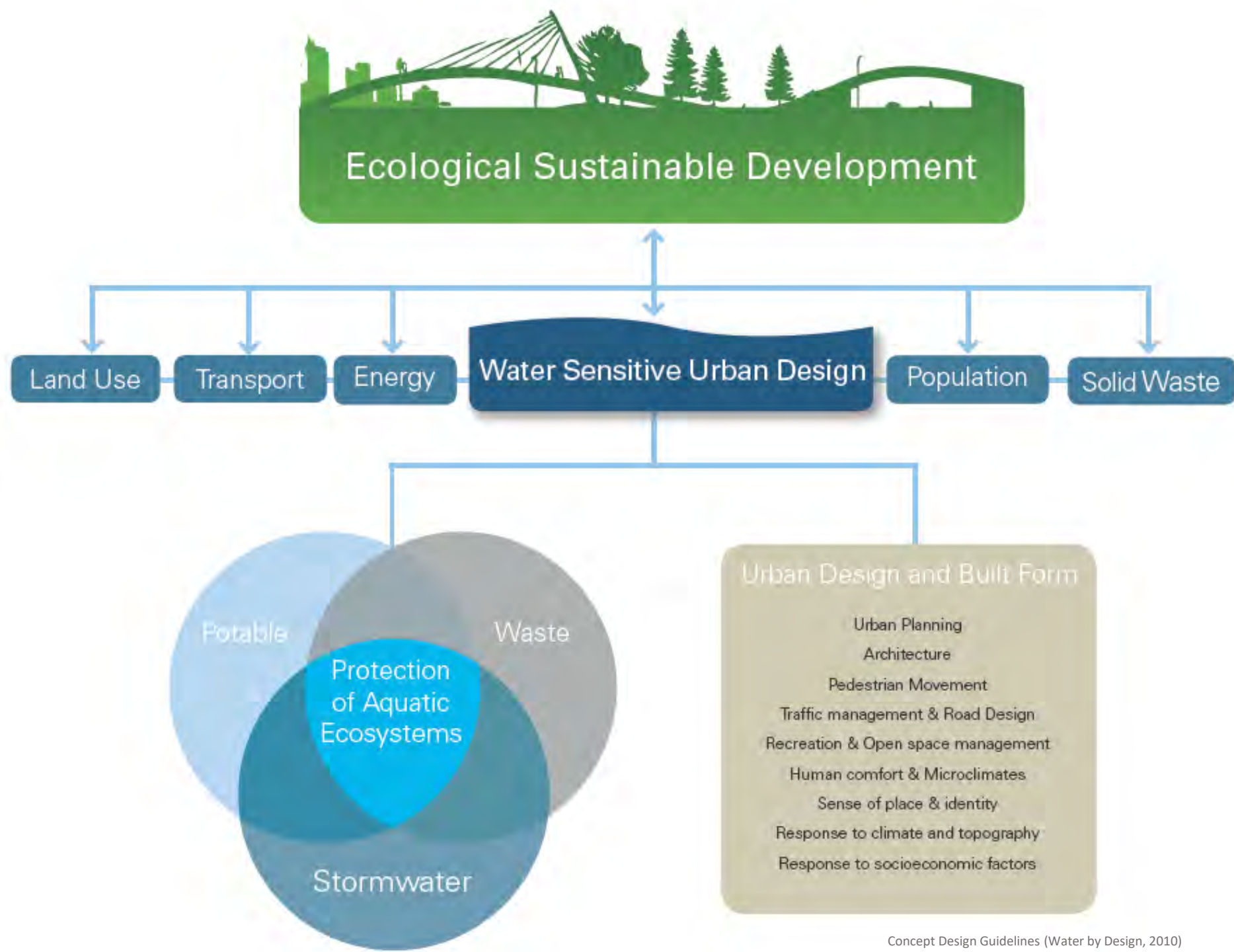
- ④ Bioretention act like 'filters' (and NOT 'sponges')
 - ④ Observed 'losses' in bioretention are dominated by exfiltration in most cases
 - ④ Exfiltrated water is not 'lost' but rather seeping into the surrounding soils or groundwater
 - ④ Losses evapotranspiration are reliably predicted by long-established equations
-
- ❖ MUSIC predicts ~2-5% ET 'loss' for bioretention (sized to achieve typical targets, modelling in accordance with guidelines)

Claim 4:

Non-proprietary STAs
provide other benefits
(e.g. amenity, cooling,
habitat, hydrology)

Plausible







Gold Coast, QLD

Claim 5:

Non-proprietary STAs
are much better at
removing nutrients
(particularly dissolved
nutrients)



Asset type	Location	Reference	ER (%)						
			TSS	TP	DP	TN	NOx	NH ₃ -N	DIN
OceanGuard	Western Sydney, NSW	Dalrymple et al (2021)	52	67	-10	41	13	23	19
Enviropod & ZPG StormFilter	Kuranda, QLD	Wicks et al (2011)	99	47	-	44	-6	54	16
Psorb StormFilter	North Carolina, USA	Wicks et al (2014)	90	86	74	56	10	63	41
Psorb StormFilter	Oregon, USA	Contech (2015)	89	77	0	61	15	-3	5
Jellyfish	West Ipswich, QLD	Goonetilleke et al (2017)	93	55	56	50	42	-	-
Filterra biofiltration	Western Sydney, NSW	Dalrymple et al (2022)	81	83	31	49	4	61	33
	Virginia, USA	Stanford et al (2006)	88	60	-	- (40 for TKN)	-	-	-
		Stanford (2009)	-	70	-	-	-	-	-
	Washington, USA	Herrera (2014)	94	70	-	-	-	-	-
	Virginia Beach, Virginia, USA	Contech (2016)	90	66	50	49	-	-	-
	North Carolina, USA	Smolek et al (2018)	95	64	44	27	-22	48	16
'Conventional' biofiltration	Sydney, NSW	Birch et al (2005)	50	65	-	N/A	-19	-	-
	Greensborough, North Carolina, USA	Hunt et al (2006)	-	-409 (G1), -2900 (G2),	- (Ortho P = -90 (G1), -3828 (G2))	-224 (G1), -312 (G2)	18 (G1), 40 (G2)	-1075 (G1), -1000 (G2)	-425 (G1), -156 (G2)
	Maryland, USA	Davis (2007)	22 (Cell A), 41 (Cell B)	74 (Cell A), 68 (Cell B)	-	-	79 (Cell A), 86 (Cell B)	-	-
	Monash University, VIC	Hatt et al (2009)	87 (Cell 1), 92 (Cell 2), 90 (Cell 3)	-2140 (C1), -1286 (C2), -1423 (C3)	-17 (Cell 1), -17 (Cell 2), -16 (Cell 3)	18 (Cell 1), 0 (Cell 2), 18 (Cell 3)	25 (Cell 1), 25 (Cell 2), 65 (Cell 3)	25 (Cell 1), 50 (Cell 2), 25 (Cell 3)	25 (Cell 1), 27 (Cell 2), 61 (Cell 3)
	Brisbane, QLD	Hatt et al (2009)	89	83	90	19	-60	96	-8
	Wakerley, QLD	Roberts et al (2012)	36 (Cell 1), 53 (Cell 2), 44 (Cell 3)	25 (Cell 1), 34 (Cell 2), 38 (Cell 3)	-	-28 (Cell 1), -11 (Cell 2), 19 (Cell 3)	-	-	-
	Chapel Hill, North Carolina, USA	Johnson et al (2019)	N/A	-21 (1st), 39 (2nd)	- (Ortho P = 29)	-38 (1st), 26 (2nd)	-20 (1st), 67 (2nd)	71 (1st), 68 (2nd)	28 (1st), 66 (2nd)
	Melbourne, VIC	Bonneau et al (2020)	93	84	82	73	-	24	-
*: standards vary over time/ area, & may not be representative of current recommended best practice in Australia									

- ④ STAs that only target solids removal (e.g. via sedimentation & filtration) likely to have low dissolved nutrient removal
 - e.g. GPTs, sediment basins, physical filters (with minimal adsorptive capacity)
- ④ Studies of 'conventional' biofiltration systems show performance is variable
 - ❖ Possibly no field study to date for 'real' events with currently recommended specifications for Australia
- ④ Studies of StormFilter & Filterra biofiltration systems show consistently high nutrient removal (including some removal of dissolved nutrients)

Claim 5:

Non-proprietary STAs
are much better at
removing nutrients

BUSTED



- Many of the cited concerns about proprietary STAs are not justified
 - At least with respect to Ocean Protect STAs



- ② Birch, G F, Fazeli, M.S, Matthai, C, 2005, Efficiency of an infiltration basin in removing contaminants from urban stormwater, Environmental Monitoring and Assessment, 101, 23-38.
- ② Contech (2015), The Stormwater Management StormFilter® - PhosphoSorb® Field Performance Summary.
- ② Dalrymple B, Wicks M, 2022, A review of the application of Filterra® Biofiltration Systems in Australia.
- ② Dalrymple B, Wicks M, 2021, A review of the application of StormFilter® in Australia.
- ② Dalrymple B, Wicks M, 2021, A review of the application of OceanGuard® in Australia.
- ② Dalrymple B, Wicks M, 2021, A review of the application of Jellyfish® in Australia.
- ② Dalrymple B, Wicks M, Jones W, Allingham B (2021), "Gully pit inserts" shown to reduce pollutants in stormwater, Australian Water Association Water e-Journal, Vol 6, No.1.
- ② Hunt, W. F., A. R. Jarrett, Smith J T, Sharkey L J, 2006, Evaluating bioretention hydrology and nutrient removal at three field sites in North Carolina. Journal of Irrigation and Drainage Engineering 132(6): 600-608.
- ② Davis, A.P., 2007. Field performance of bioretention: water quality. Environ. Eng. Sci. 24, 1048e1064.
- ② Goonetilleke A, Egodawatta P, 2017. Evaluation of treatment performance of the Jellyfish® filter installatino at Ipswich – Final report on the field monitoring program, for Humes Australia (17 February 2017).
- ② Hatt B E, Fletcher T D, Deletic A, 2009, Hydrologic and pollutant removal performance of stormwater biofiltration systems at the field scale, Journal of Hydrology.
- ② Roberts S J, Fletcher T D, Garnett L, Deletic A, 2012, Bioretention saturated zones: do they work at the large-scale? WSUD 2012 Conference, Melbourne, Australia.
- ② Johnson J P, Hunt W F, 2019, 2019, A Retrospective Comparison of Water Quality Treatment in a Bioretention Cell 16 Years Following Initial Analysis, Journal of Sustainability.
- ② Lucke T, Nichols P W B, 2015, The pollution removal and stormwater reduction performance of street-side bioretention basins after ten years in operation, Science of the Total Environment
- ② Lucke T, Dierkes C, Boogaard F, 2017, Investigation into the long-term stormwater pollution removal efficiency of bioretention systems, Journal of Water Science and Technology.
- ② Mangangka, I. R., Liu, A., Egodawatta, P., & Goonetilleke, A., 2015, Performance characterisation of a stormwater treatment bioretention basin. Journal of Environmental Management, 150, 173-178.
- ② McKenzie-McHarg A, Smith N, Chapman B, 2008, Stormwater Gardens to Improve Stormwater Quality in Brisbane.
- ② Peljo L, Dubowski P, Dalrymple B, 2016, The Performance of Streetscape Bioretention Systems in South East Queensland, Stormwater Australia Conference 2016, Brisbane.
- ② Wicks M, Lenhart J, Pedrick J (2014). Solid and nutrient pollutant removal by an engineered stormwater filtration media – Field evaluation of a radial cartridge media filter, Published in Water Journal, September 2014.
- ② Wicks M, Vigar N, Hannah M (2011), Nutrients and solids removal by an engineered treatment train – Field evaluation of a gully pit insert and cartridge media filter. Published in Water Journal of the Australian Water Association, September 2011.

- ② 'Opinions' (without proof) should not prevent best practice
- ② Ask Ocean Protect to compare options
 - e.g. Ocean Protect STAs v conventional biofiltration
 - Options, life cycle costs etc
 - Design & analyses at zero cost



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Evolution of Bioretention Research & Use in the US Mid-Atlantic

by Dr Bill Hunt (Professor, North Carolina State University)

Thursday 28th April, 12:30pm

<https://oceanprotect.com.au/webinars/>





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THANK YOU