

The Business Case

On-site versus off-site stormwater treatment

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Content

- Talk about 2 different WSUD policy approaches
 - Describe **previous on-site approach**
 - Issues with on-site approach
 - Present an alternative – i.e. **precinct scale (i.e. off-site) offset approach**
 - Describe:
 - costs and benefits of the proposed alternative approach
 - Discuss how the approach is being used at Blacktown
- Ask for your questions



**Talking about infill development – infill areas shown here
NWGC is greenfield – with a local approach**





Policy

- Blacktown protects its creeks & rivers from new development through application of Part J(ex R)
- Part J did require new developments to treat stormwater **on-site** to best practice
- Best practice = retention of 85% TSS, 65% TP and 45% TN
- Part J also requires waterway stability, OSD and water conservation to be addressed -> good example of an integrated water cycle policy

Policy

- Water quality is about protection of creeks from changes in chemical & physical & biological quality
- Waterway stability is about making sure those creeks aren't scoured/eroded every time it rains
- SEI makes no attempt to address eco-hydrology (i.e. habitat preference) & probably misses the mark ecologically
- At Blacktown – each million m² paved area = 0.5 gigalitre of water down the creek – water quantity is a major ecological & economic stressor

Future Development



Future Development

- → 55,000 extra people in 4 urban renewal precincts
- Densification → another 2 million m² impervious area
- + **1,139,000,000** litres of polluted stormwater runoff/a
- Critical to mitigate this impact - but where?
- Local creeks already highly degraded, armoured, revegetated, adjusted – e.g. B'fast Creek
- larger first order creeks – Eastern Creek and Ropes Creek etc should be focus of protection – not armoured, adjusting now & need protection.

Increased URNP loads

Parameter	Blacktown	Seven Hills	Mt Druitt	Rooty Hill	Total
Flow (ML/yr)	640 (+14%)	132 (+15%)	200 (+8%)	167 (+20%)	1,139 (+13%)
Suspended Solids (kg/yr)	158,000 (+21%)	30,000 (+21%)	41,000 (+11%)	35,000 (+26%)	264,000 (+19%)
Phosphorus (kg/yr)	210 (+17%)	46 (+19%)	71 (+11%)	58 (+25%)	385 (+16%)
Nitrogen (kg/yr)	1,430 (+15%)	310 (+17%)	500 (+11%)	420 (+24%)	2,660 (+15%)
Gross Pollutants (kg/yr)	16,000 (+13%)	3,300 (+14%)	4,600 (+7%)	4,500 (+19%)	28,400 (+12%)

Previous on-site requirements

- Part J required all new developments of a certain size to treat their stormwater on-site, **at source** before discharge
- Two main development responses to this were either:
 - **Bioretention** – use plants and sand to filter stormwater
 - **Filter cartridges** – use a filter media – such as zeolite, perlite and GAC etc to filter stormwater inside cartridges



Image by Steve Arraj

Example of cartridge filter system



Issues

- Council received complaints - complex & **lengthy DA assessment**
- On-site approach can be **costly**
- On-site systems “**shoe horned**” into developments
- Not the holistic result Council originally wanted
- **High risk of On-site systems not being maintained**
- Council resolved to comprehensively review its DCP

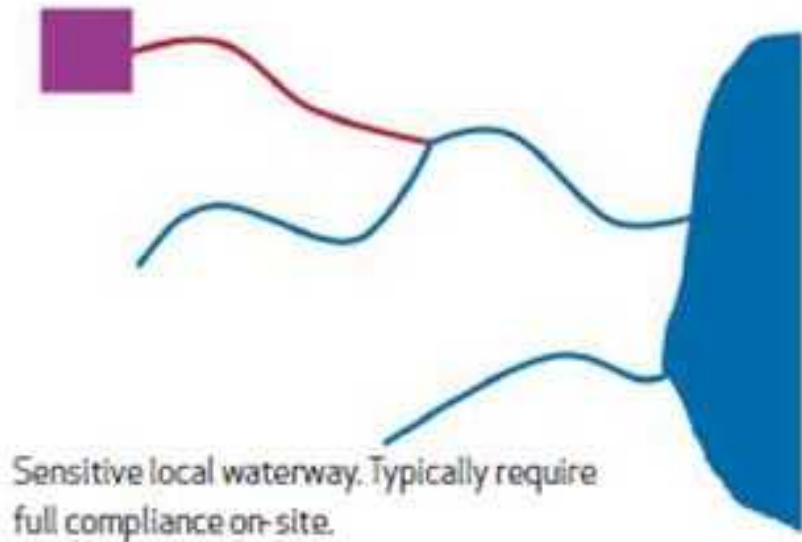


Image by Steve Arraj

Action undertaken

- Engaged **expert panel** - review Part J of DCP
- They **endorsed Council's water quality standards**
- Identified opportunities to improve assessment process
- Council's own **staff recognised opportunities** for an **off-site precinct approach** as an alternative
- **Feasibility Study** commissioned - analysed costs and benefits of individual on-site versus precinct scale off-site schemes
- Feasibility study – was a detailed study - full concept designs & LCA of 20 sites which was refined to 11 Council owned sites

Where is an offset scheme appropriate?

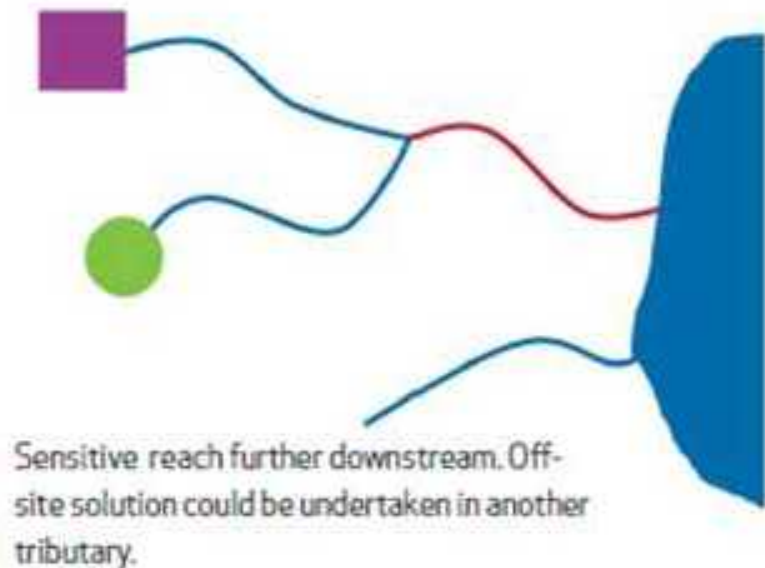


Example – Marsden Park
greenfield industrial
development discharging into a
in tact, stable tributary of Little
Creek.

Treatment close to the source
to protect the creek
immediately downstream

Source: Off Site Stormwater Quality Solutions Discussion Paper –
Healthy Waterways QLD 2014.
Hoban, Patschke, Gooding, O’Neil, Mullaly, Binney

Off-Site Versus on-site



Source: Water By Design – Off Site Stormwater Quality Solutions Discussion Paper – Healthy Waterways QLD 2014.
Hoban, Patschke, Gooding, O’Neil, Mullaly, Binney

Situation is most common :
Urban renewal focussed on brown field

Seven Hills → Parramatta River again to be swimmable

Blacktown CBD → Breakfast Creek – not sensitive but Eastern Creek is

Protect Little Creek even though no development in catchment

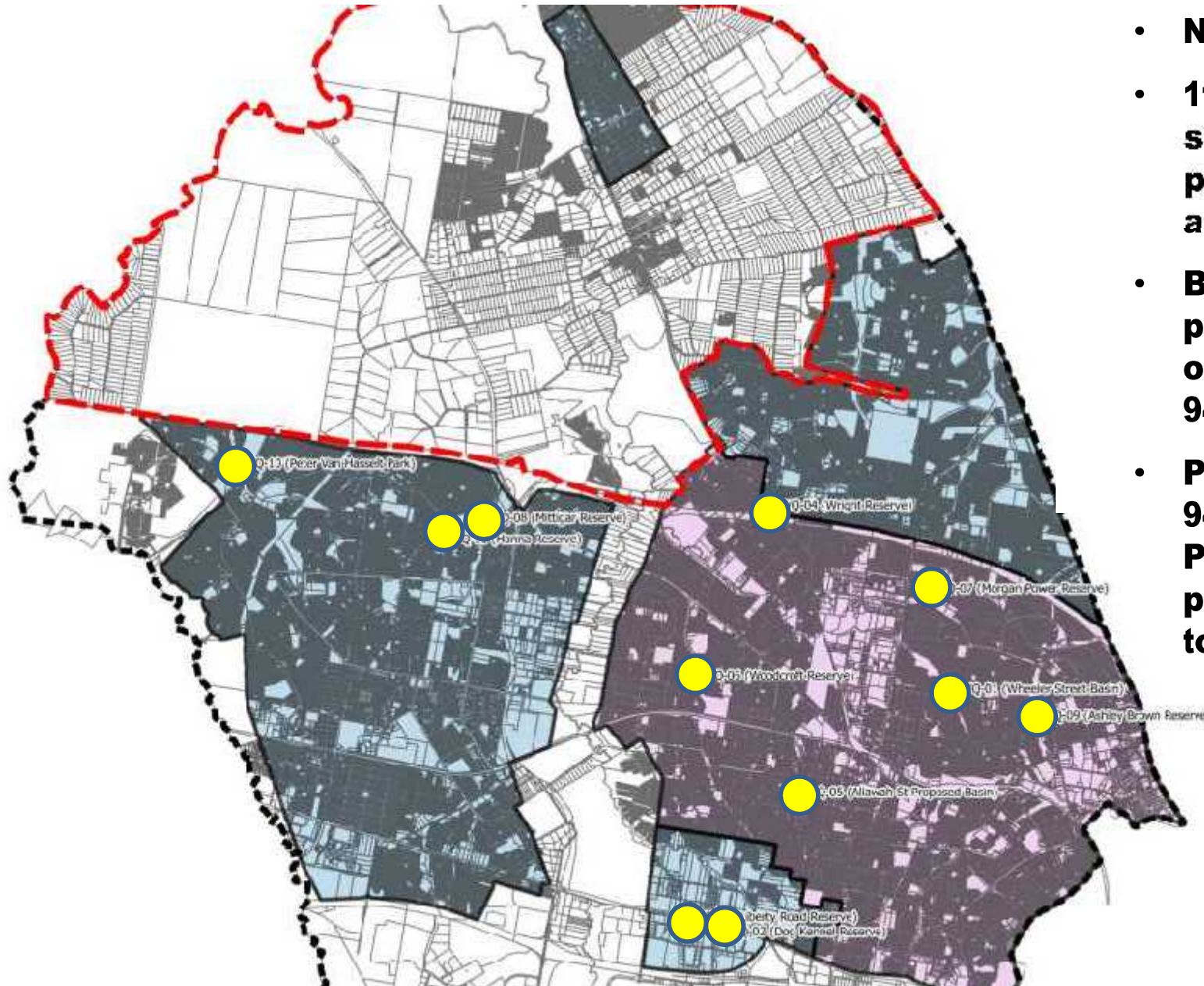
Bells Creek – not sensitive for some distance downstream – protect downstream component

Mount Druitt – local tribs degraded but Ropes Creek is sensitive.



Alternative Approach

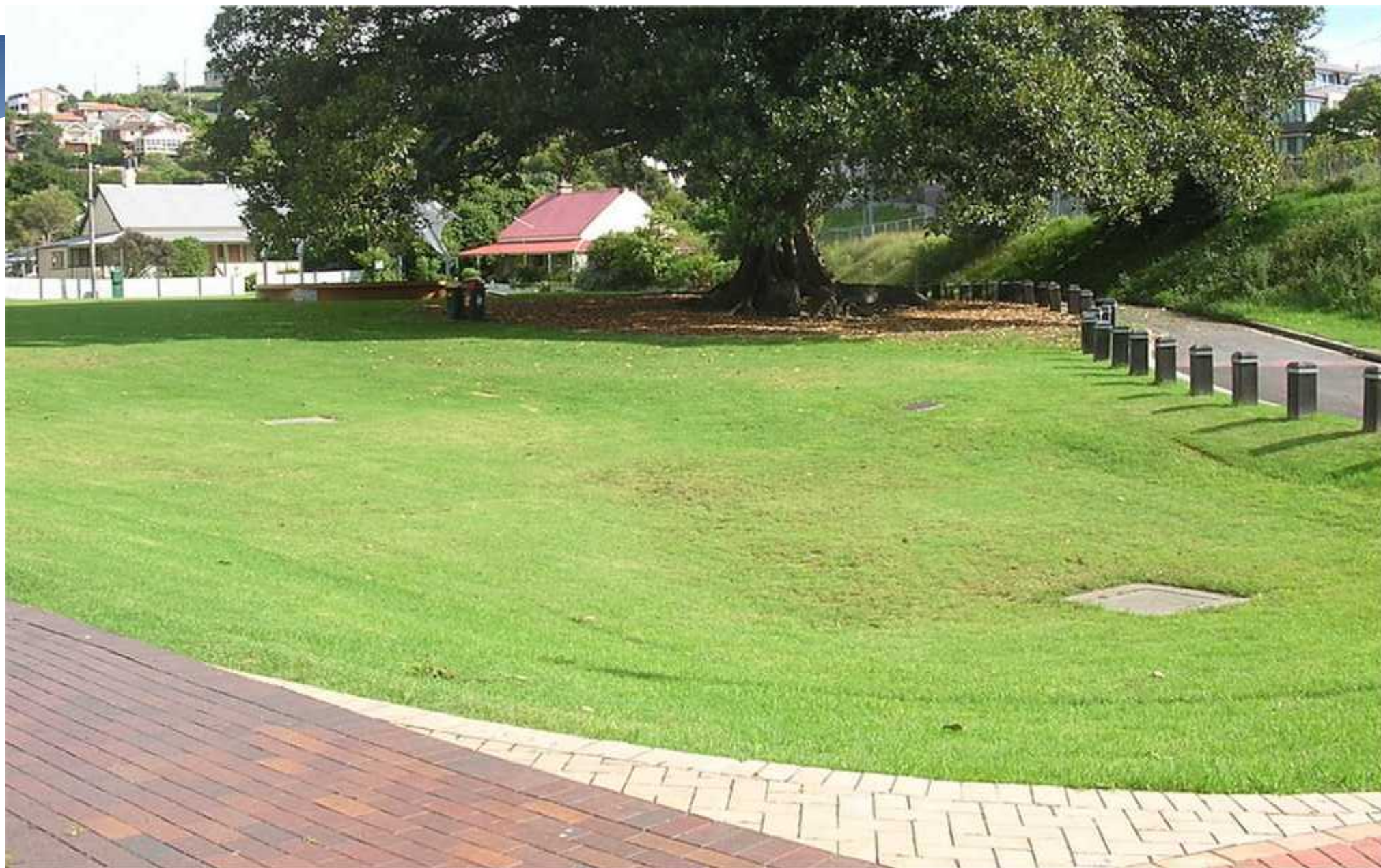
- Feasibility study showed it is both economically viable and physically possible to construct precinct scale offset stormwater treatment systems
- A precinct scale off-set treatment approach
 - Would be funded by developments
 - would apply only to infill development – in the four main urban renewal precincts – Blacktown, Seven Hills, Rooty Hill & Mount Druitt and other areas which would have minor development



- **Not in NWGC**
- **11 precinct scale stormwater treatment projects proposed across the LGA**
- **Blue area – voluntary planning area to operate until Section 94 plan adopted**
- **Pink area – Section 94 Contribution Planning (CP19) proposed – reported to Council in June.**

Off-site Treatment

- 11 projects – all located on Council owned land next to creeks
- All take dirty water from the creeks & direct to treatment systems
- Return clean stormwater to the creeks
- Sometimes co-locating treatment systems on sports fields
- Convert the fields into large grassy well drained bioretention systems
- Store water on their surface in wet weather only
- Most existing fields are based on clay – closed for days after rain
- Improve the drainage on the fields so that playability is actually improved





Example site – Peter Van Hasselt Reserve

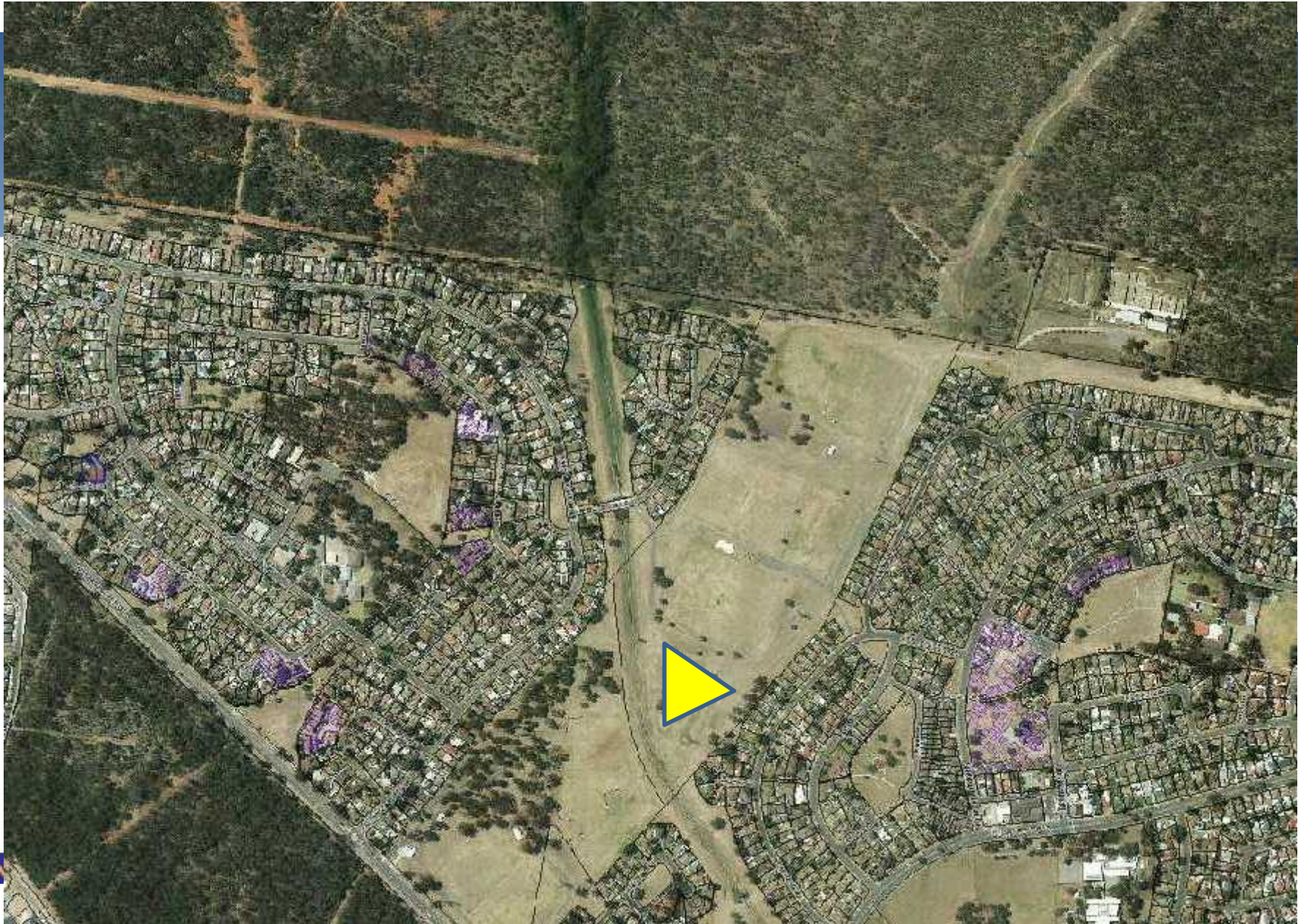
System type – Pumped bioretention

Catchment area – 778ha

Located just above sensitive reach of Little Creek which Council would like to protect

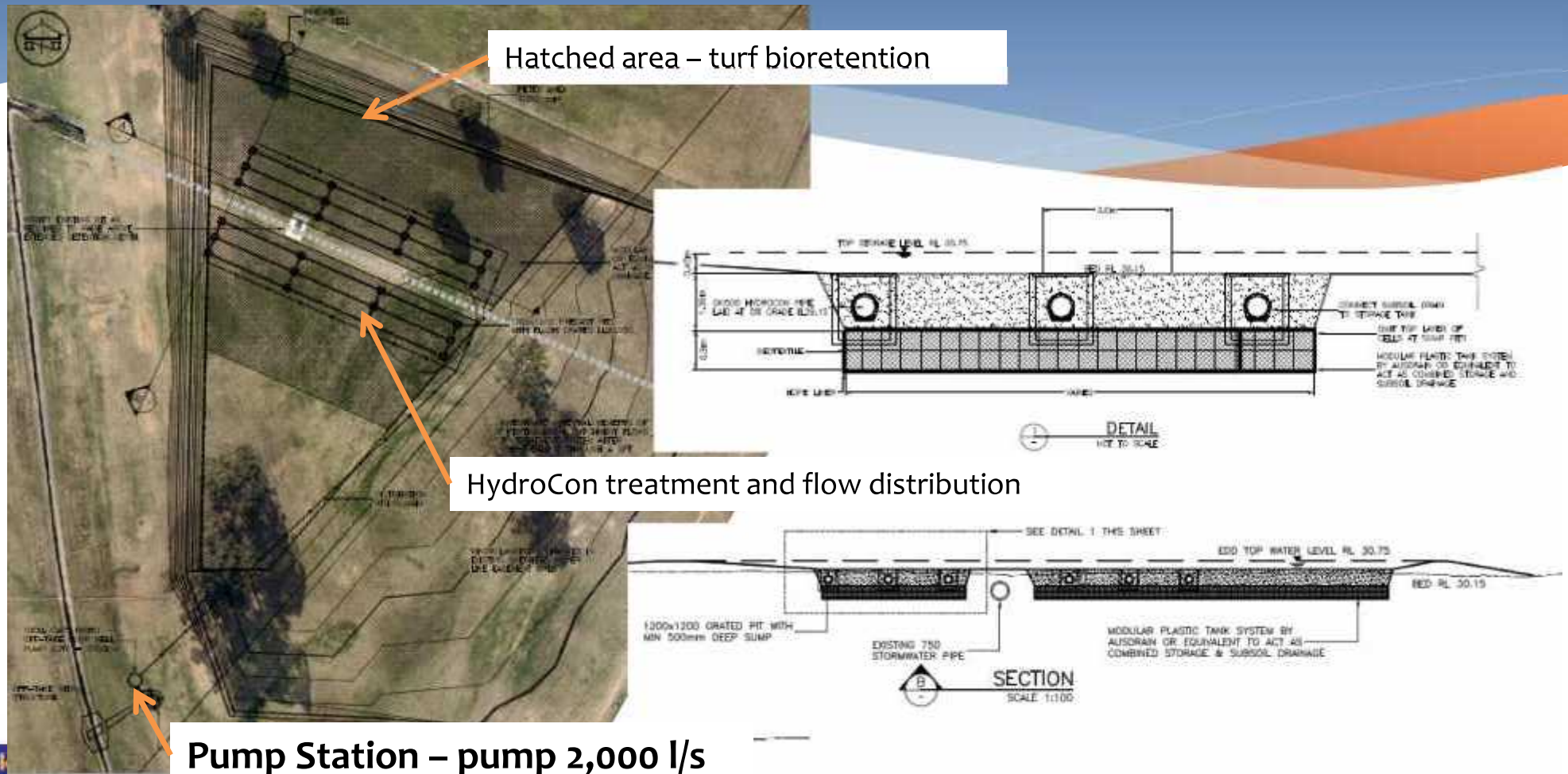
Little no development in this catchment – without offset scheme reliant on STW levy funding





Blacktown

Peter Van Hasselt Reserve - Design



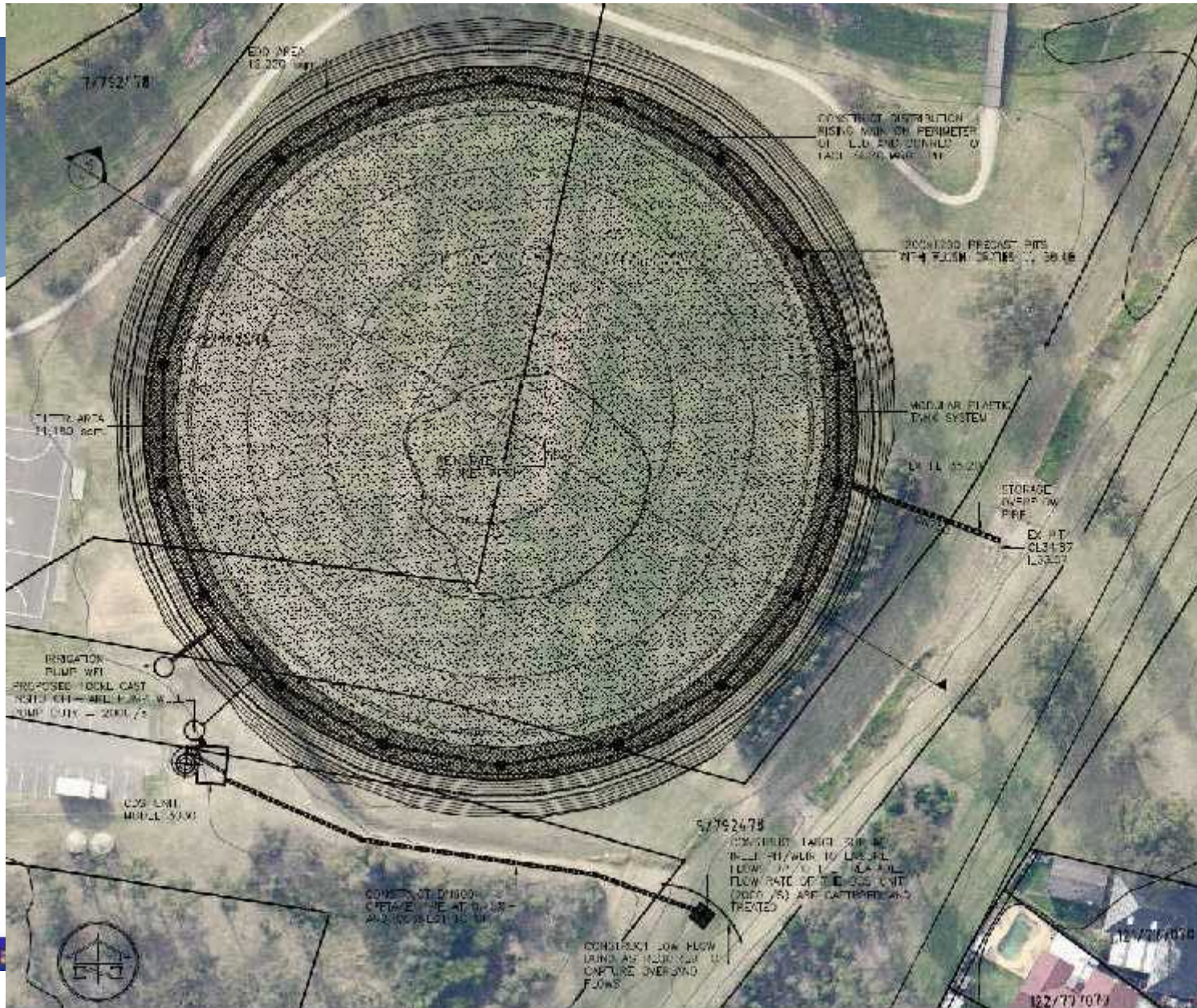
Peter Van Hasselt Reserve – Cost information

- Capital cost - \$7.4M
- Discounted Life Cycle Cost (\$2014) - \$12.4M
- **Annual Maintenance Cost about \$250k**

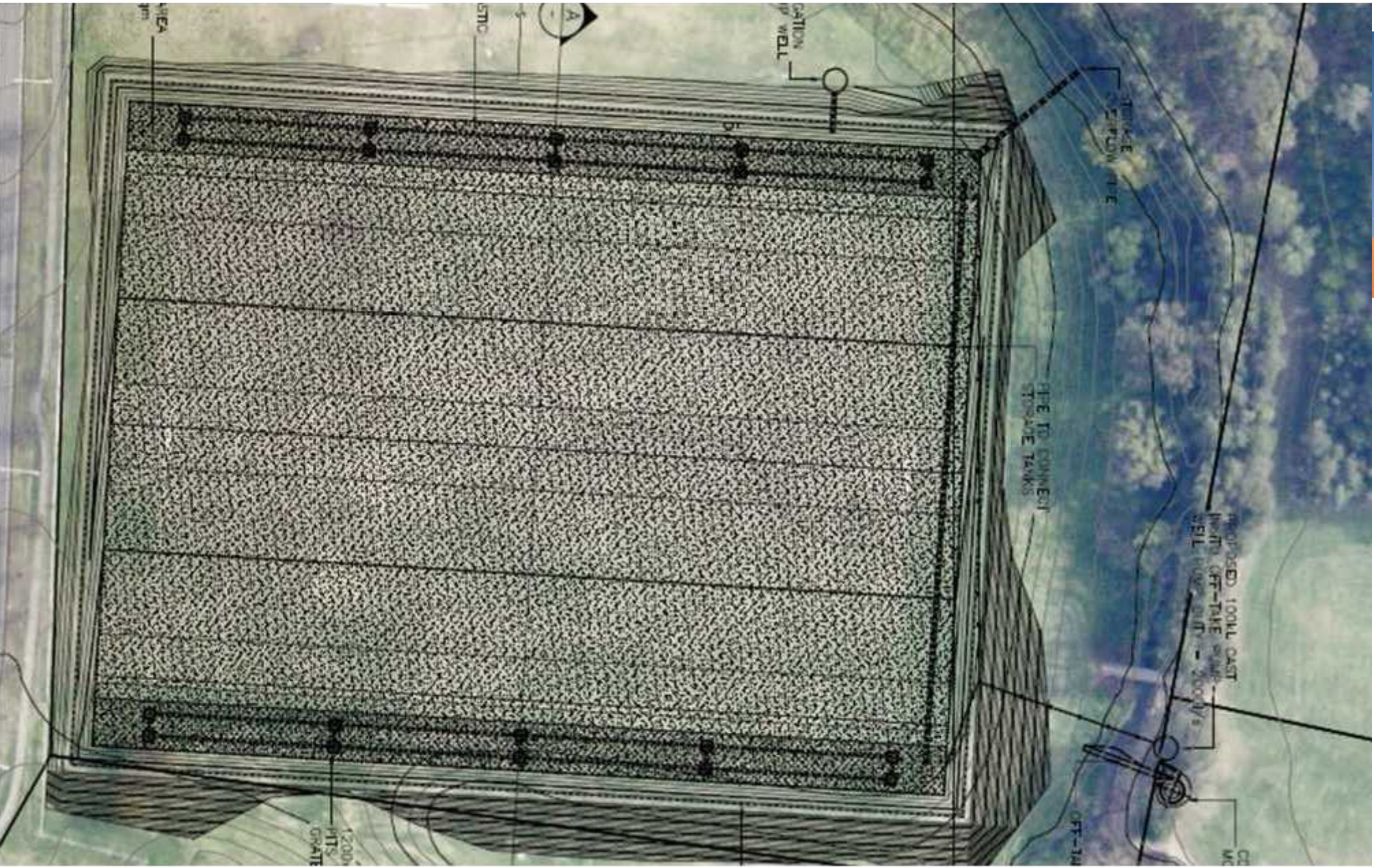
Pollutant	Capital cost	LCC (\$2015)
TSS (kg)	\$37	\$62
TP (kg)	\$23,500	\$40,000
TN (kg)	\$3,300	\$5,500

Peter Van Hasselt Reserve – Savings from stormwater harvesting.

- Saving on mains supply by harvesting (excluded from cost estimates) is:
113ML @ \$2.23/kL = \$250K/annum
- Savings = Operating Cost = \$250k/annum
- Other sites – save between 30-60% of annual maintenance cost
- At PVH – offset energy consumption with PV panels on roof of aquatic centres – add \$120k or 1.5% capex → ↓
\$18k op cost



■ Mitigar Reserve



Waterway Stability

- Addressed through on site detention policy
- Adopt latest version of UPRCT OSD Handbook
- Requires 455m³ detention per hectare
- 300m³ used for detaining everyday flows up to 1.5 year ARI flow – 40l/s/ha discharge
- Rest (155 m³) for matching 100 year ARI peaks
- OSD considered easiest way to implement stability targets
- Modelling indicates SEI of 1.5 – almost achieving the stretch target

Beneficial Effect on Water Quality

Pollutant	Treatment Target for new development (% reduction on annual average load)	Overall reduction in pollution compared to the current (2015) levels of development (% reduction in average annual load)
TSS	85	47
TP	65	42
TN	45	39

Costs & Benefits

- **Contributions = \$82k/ha and \$63k/ha**
- Rate Payers need to pay for maintenance from an increased rates base from the population increase
- Maintenance & operation costs - \$600k/yr by 2030
- Biggest winners – mums and dads and business owners who through avoided maintenance - saving nearly \$3.8 million per annum
- Significant savings to developers – on average, off-site approach will save 40% compared to on-site

Cost and Benefits

- More certainty & quicker approvals for developers
- Each regional project will harvest stormwater to irrigate local playing fields – saving 300 million litres of water per year & further improving quality
- Lead to better quality playing fields & better water quality outcomes because Council will maintain them

Costs & Benefits

Pollutant	Capital cost to remove (\$/kg)	Discounted Maintenance Cost (\$/kg)	50 year whole of life cycle cost to remove (\$/kg)
TSS	62	20	82
TP	41,400	15,000	56,400
TN	5,900	2,400	8,300
Melbourne Water developer off-set cost for TN removal	6,645	N/A	N/A

30% of LCA = maintenance for offsite scheme

50% of LCA is maintenance for on-site scheme

On-site costs versus offsite costs

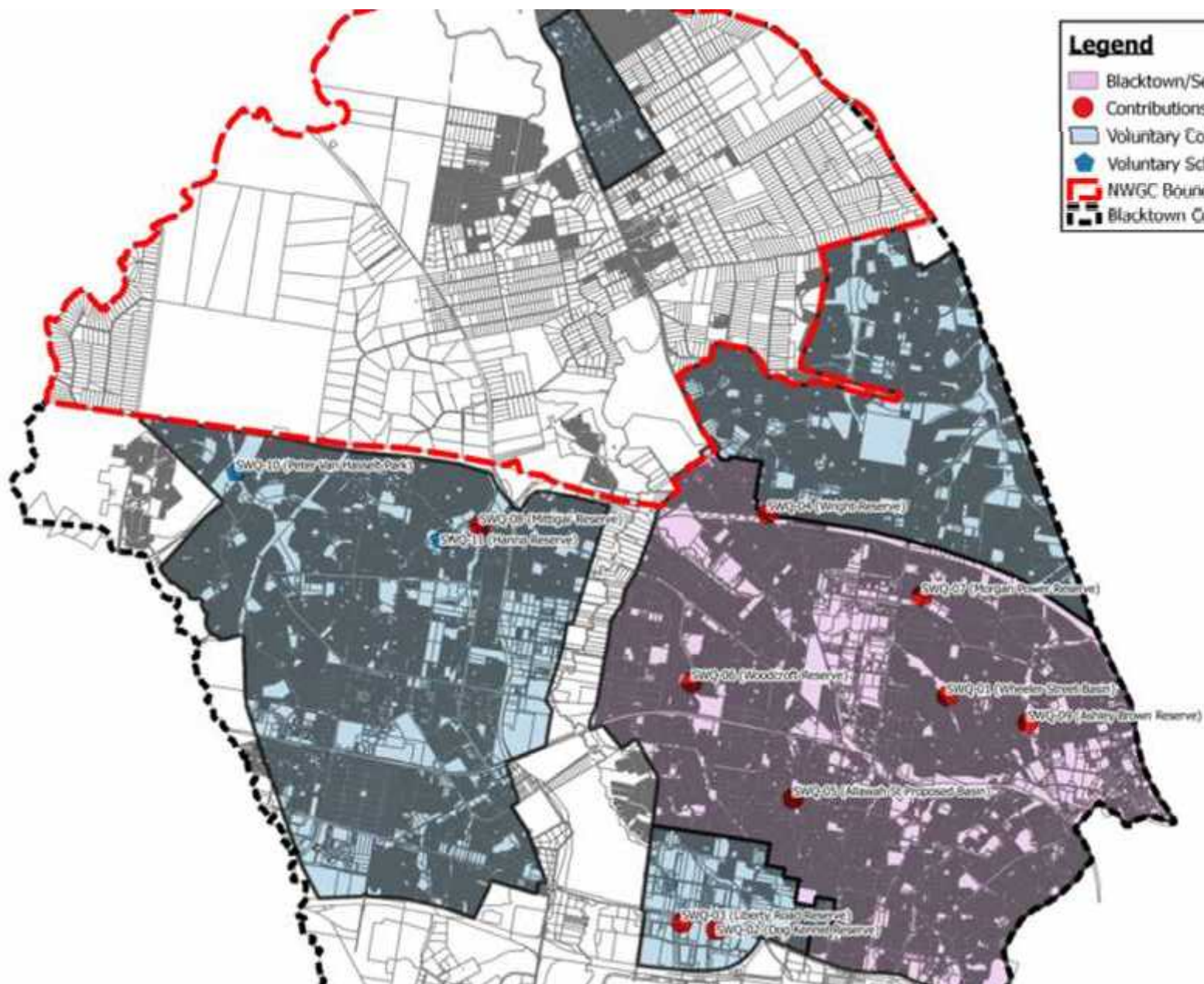
Type of Development investigated	Site Area (ha)	Cost under existing on-site scheme	Estimated Cost Under Proposed S94 Contribution Plan	Cost saving (%)	Estimated Cost Under Proposed Voluntary Scheme	Cost saving (%)
13 Townhouses	0.328	\$29,750	\$27,031	9%	\$17,221	31%
25 Townhouses	0.778	\$104,380	\$64,117	39%	\$40,847	53%
6 Townhouses	0.213	\$45,500	\$17,553	61%	\$11,183	71%
Warehouse	0.093	\$45,270	\$7,664	83%	\$4,883	87%
*Commercial	0.347	\$47,500	\$40,097	16%	\$29,718	30%
*Industrial	1.977	\$275,900	\$177,930	36%	\$118,797	49%
50 Townhouses	1.742	\$286,700	\$143,563	50%	\$91,459	62%
			Average saving	42%		55%

What development will it apply to?

- Will apply to medium and high density residential development including attached housing & subdivisions
- Will apply to business and industrial development greater than 150 m²
- Single Dwellings, Dual Occ's, Group Homes, Boarding Houses and Child Care Centres **exempt**

How will it be implemented?

- In the Mount Druitt / Rooty Hill catchment (blue areas) and other areas where only minor development will occur:
 - Proposing an interim voluntary off-site scheme
 - developers choose to either make a contribution or do work on-site – through a VPA or works on-site
 - a CP for this area will be prepared after new CP19 (will replace voluntary scheme)



Conclusions

- Offset schemes could work well in infill areas
- Offset schemes are likely to be significantly cheaper than on lot, smaller scale, treatment
- \$100 million cheaper life cycle
- Economies of scale & carbon reduction too → avoided transport
- Precinct scale schemes can deliver significant communal benefits – on lot smaller schemes don't
- Can provide an alternative source of water – 300 ML/a for Blacktown
- Reduces maintenance & performance risk