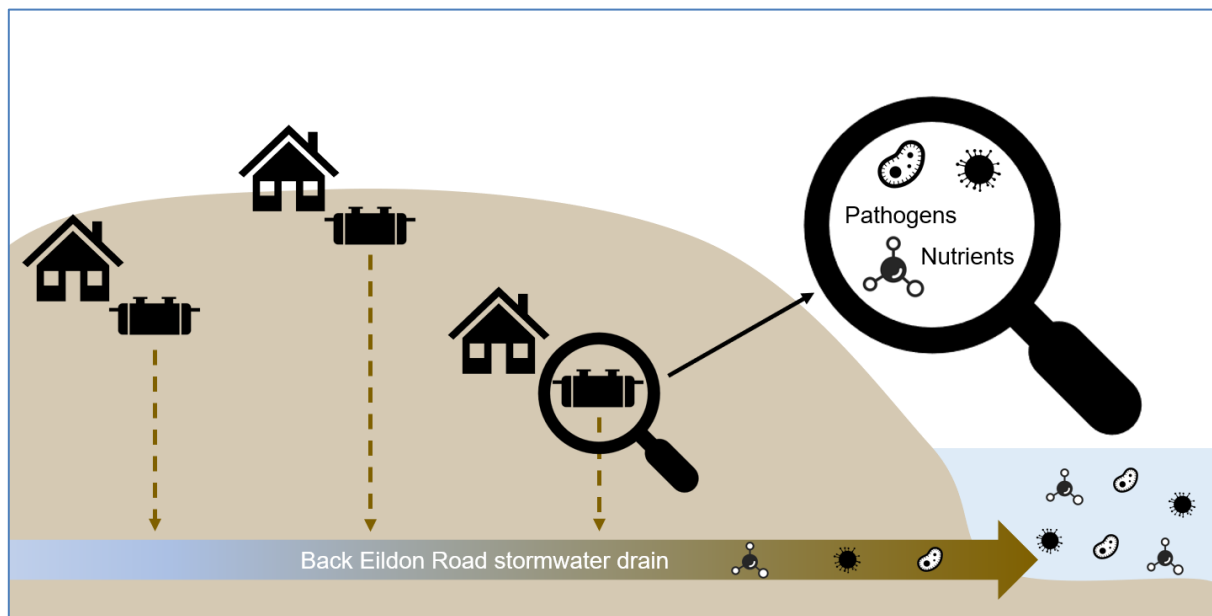


Thornton treatment wetland & wicking bed system

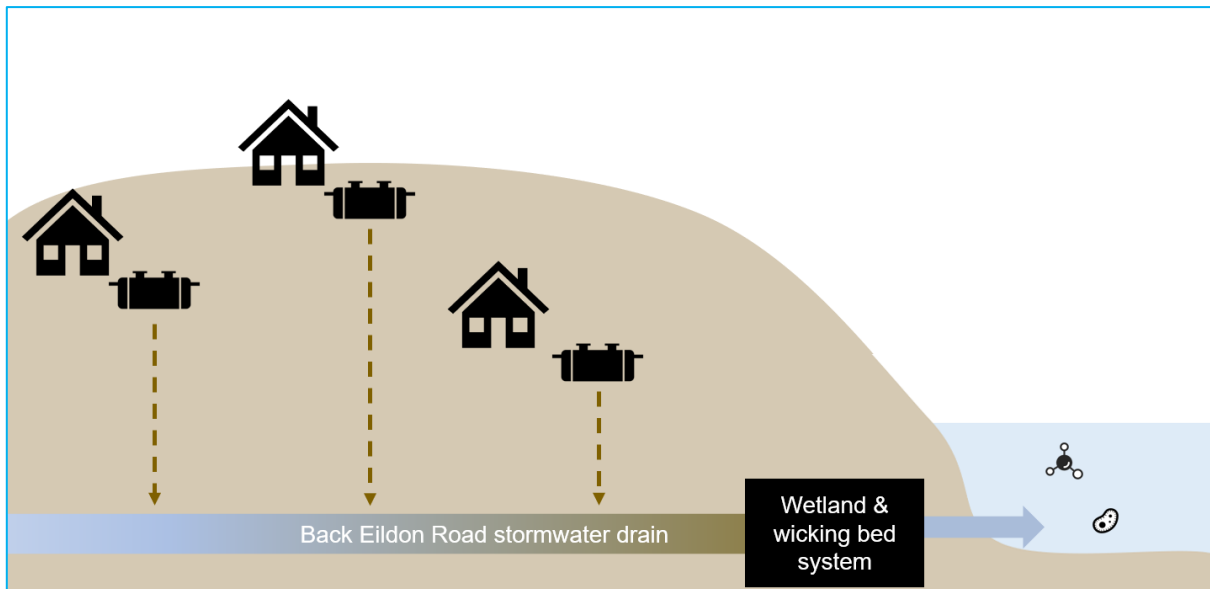
Current situation

- ◆ Township of Thornton is currently unsewered; individual households employ own septic systems
- ◆ Many septic systems are bypassed by greywater or are poorly maintained and leaking grey and blackwater into stormwater system, which discharges untreated directly into Goulburn River
 - High nutrient levels in effluent pose ecological risks to waterway health
 - Faecal pathogens represent disease risk to downstream recreational users of river
- ◆ Treating grey and blackwater discharge a key priority to mitigate these effects

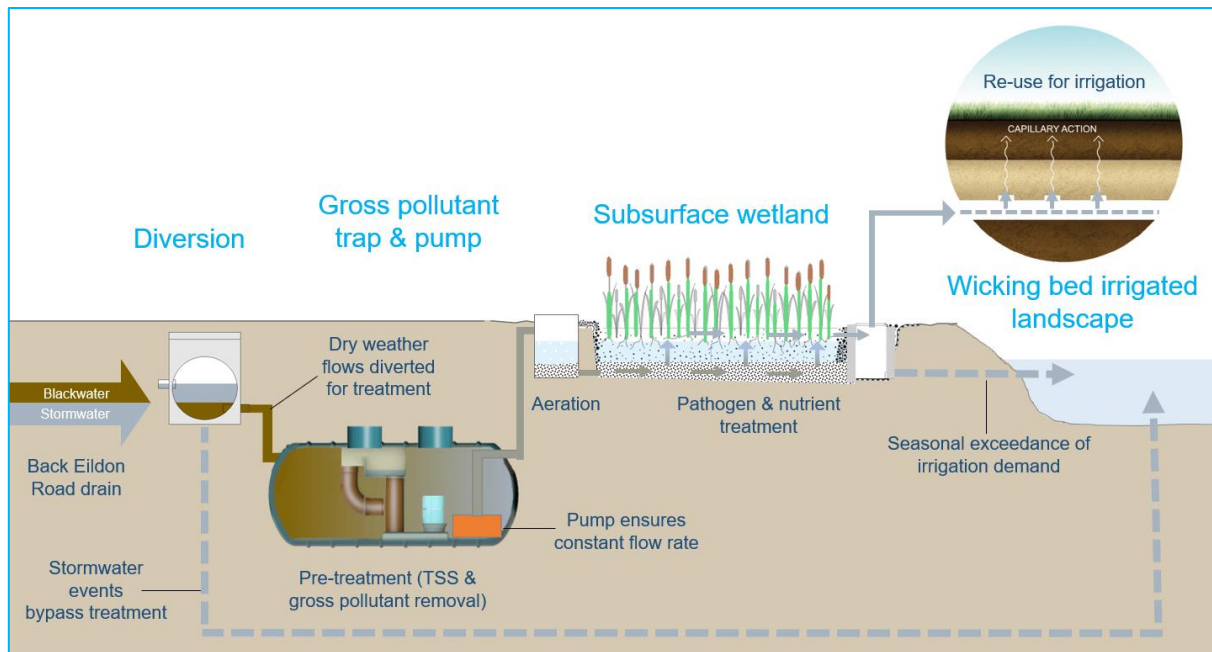


Proposed intervention

- Installation of subsurface flow constructed wetland optionally paired to wicking bed garden/lawn irrigation system
- A constant ~16 KL/day of discharge from Back Eildon Road residential catchment drain diverted into wetland for treatment
- This has been calculated to capture the daily wastewater discharge of up to 75% of properties except for during storm events. This flow rate is more likely in winter.



- Treated flows may optionally be diverted into the base of wicking bed system for passive irrigation of recreational grassed space/ornamental garden beds
 - Pipe will supply underground wicking bed reservoir with treated outflow
 - Approx. 0.7 ha of grass or 0.5 ha of high-quality landscape might be irrigated in summer. This estimate is conservatively factored to recognise that fewer septic systems will be overflowing in summer.
- Stormwater enters drainage system during/following rainfall events. Stormwater has a lower environmental & public health risk. During these events, combined effluent will mostly bypass the proposed treatment system and drain into Goulburn River.



Benefits of intervention

- ◆ Subsurface flow constructed wetlands are a gold standard WSUD system for blackwater treatment
 - High reduction of BOD, suspended solids and pathogens
 - Plant-soil based systems with minimal electrical energy requirements
 - Low operating costs compared to higher energy UV or chemical treatment systems
 - Single isolated system rather than distributed intervention, facilitating ease of maintenance and avoiding management at individual household scale
 - Do not have the mosquito problems of free-water surface constructed wetlands
- ◆ Good interim measure for reducing ecological and public health risks of septic tank discharge into Goulburn River. Avoids the delays and financial expenses of sewerage catchment
- ◆ Employing treated flows for wicking bed system provides additional community benefits:
 - Provides irrigation opportunity without requirement for installing storage tank/reservoir, irrigation pump/reticulation for treated flows
 - Avoids discharge of residual pollutants in treated effluent into Goulburn River
 - Enhances township amenity value by enhancing green space and/or recreational opportunities
 - Novel, innovative pilot intervention providing opportunities for monitoring, further learning and public education.

Key challenges and risks

◆ Public health risk

- Some risk surrounding implementation of treated blackwater passive irrigation scheme for recreational grassed wicking beds
- No current guidelines or precedents for treated blackwater reuse for wicking bed systems. May require pilot study status with monitoring and a commitment to halt the study if necessary.
- However, pathogenic risk predicted to be low due to:
 - Pathogens being unlikely to reach soil surface due to manifold microbial retention and inactivation processes occurring during moisture draw-up through wicking bed soil profile
 - Most pathogens predicted to be retained and undergo die-off (permanent removal) in wicking bed storage reservoir and root zone (zone of plant water uptake via evapotranspiration)
 - Any pathogens which might reach soil surface through capillary rise will likely undergo rapid inactivation due to drying and sunlight (UV-inactivation)
- Residual risk associated with scheme is many magnitudes less than the existing public health risk of blackwater being discharged into Goulburn River (particularly recreational users).

◆ Financial risk

- Cost-benefit of system is limited if:
 - there is a short timeframe until the township is sewered.
 - monitoring of pilot study leads to premature end to the pilot study.
- Note that in these cases, decommissioning does not mean an end to the benefits. Once the township is sewered, the subsurface wetland may be reconfigured as a bioretention bed. The system will then provide similar environmental and community benefits by reducing stormwater pollutants discharged to Goulburn River and providing the wicking bed as an irrigated landscape.