Low Energy Tertiary Treatment with Vertical Flow Wetlands: A Case Study

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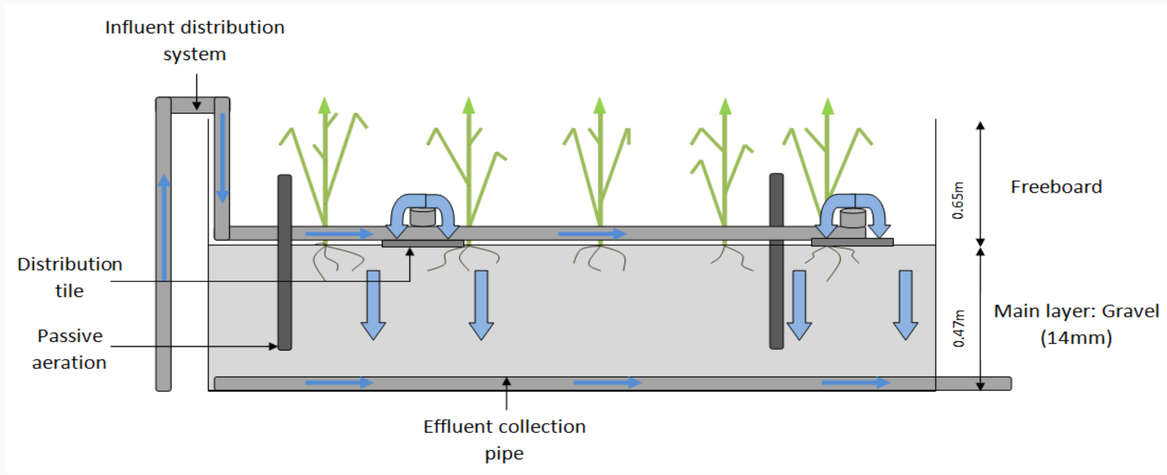
stream

The Industrial Doctorate Centre for the Water Sector

Background

- Technology has been used worldwide for primary and secondary treatment.
- Limited to no experiences with tertiary treatment.
- Potential to compete with other tertiary treatment processes
- Low carbon, low energy and low cost treatment process

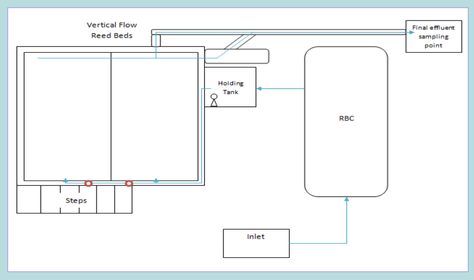
Vertical Flow Wetland



An assessment of the performance and efficiency of gravel based vertical flow constructed wetlands for tertiary wastewater treatment

Site Information

- Small works
- Wetlands built in 1992
- Reeds harvested in 2011
- 2 wetlands operating in parallel
- Each wetland has an area of 9.5m^2
- Wetland media primarily gravel

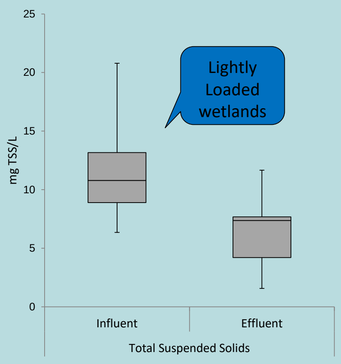


Methodology

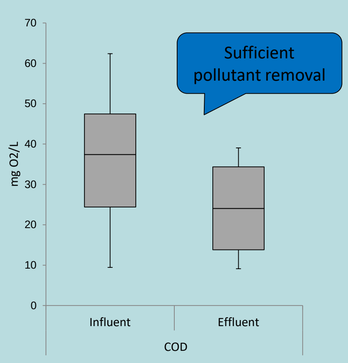
Parameters measured
- TSS/ VSS
- COD
- BOD_5
- Ammonia
- Nitrate
- Nitrite
- Phosphorus
- Metals

Results

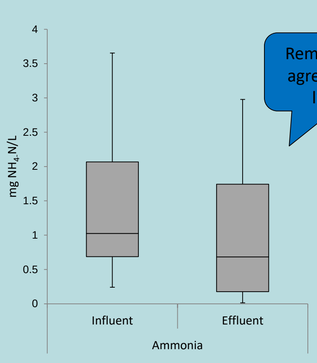
Sanitary Pollutant Analysis



Solids removal efficiency 1.07g/m^2/d

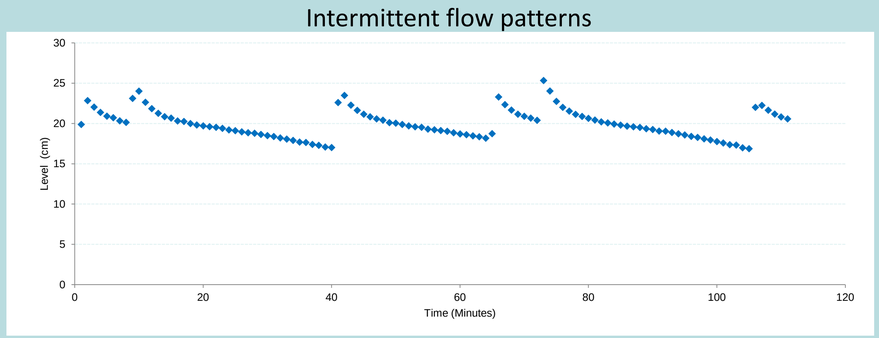


COD removal efficiency 2.08g/m^2/d



NH_4-N removal efficiency 0.15g/m^2/d

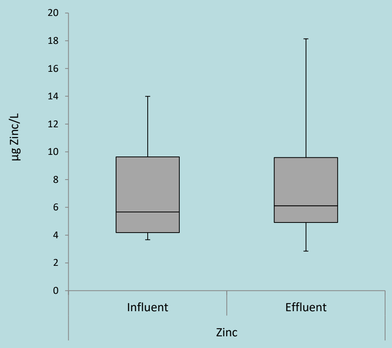
Intermittent flow patterns



Nitrification Rates

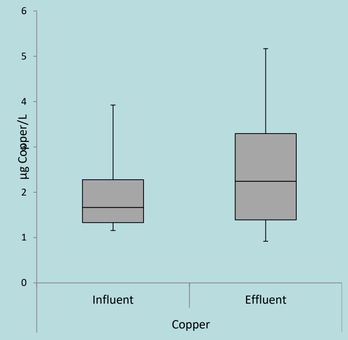
Type	Treatment	Media	Nitrification rate (g/m2/d)	Reference
VF	Tertiary	Gravel	0.15	This study
VF	Tertiary	Gravel	0.16	Copper et al. 1997. The design and performance of a nitrifying vertical-flow reed bed treatment system
AHF	Teriary	Gravel	0.20	Butterworth et al. 2013. Effect of artificial aeration on tertiary nitrification in a full scale subsurface horizontal flow constructed wetland
TF	Tertiary	plastic	0.3-1.4	Metcalf & Eddy. 2004. Wastewater engineering treatment and reuse

Metal Analysis



Ni, Cd & Pb below levels of detection

No metal removal being performed by the wetlands



Conclusion

RBC effluent

Lightly loaded mature wetlands successfully utilised to polish secondary effluent

- Low Energy
- Low Carbon

Achieves average effluent NH_4-N 1.15mg/L (95th percentile)

Vertical flow wetlands can potentially be used to further drive the 'Green Agenda'

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