

Introduction

Background

- A small scale sustainable housing development comprising 15 earth sheltered eco-homes, situated to the north of Bedford.
- 53 P.E. and 'off grid' with regards to water supply and wastewater services.
- Residents will live in an eco-friendly and sustainable manner to minimise water consumption.

Objectives

- Design of water and wastewater treatment processes that would enable 100% greywater reuse and achieve > 60% water self-sufficiency
- Literature review, feasibility study and estimation of CAPEX and OPEX.
- To outline a low water usage strategy for residents.

Potable Water Treatment

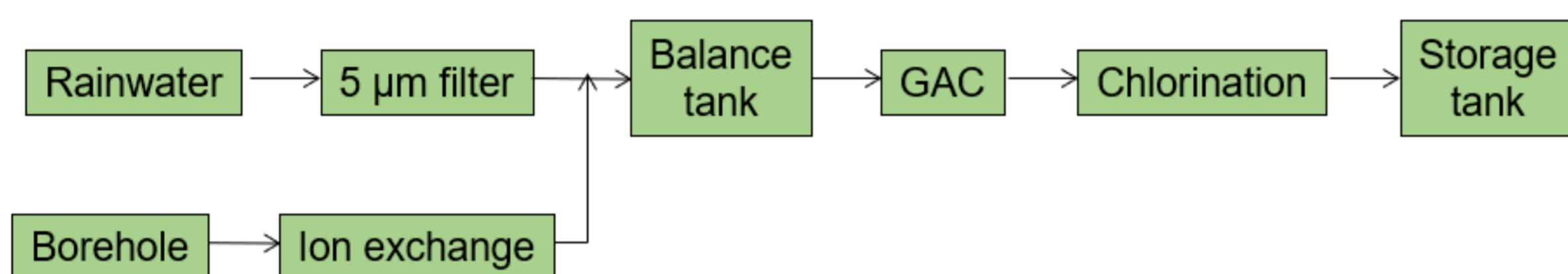


Figure 1. Potable water flowsheet: blending of water from good quality groundwater source and rooftop rainwater harvesting.



Benefits of proposed process designs:

- Uses passive treatments such as constructed wetlands and trickling filters.
- Low chemical consumption.
- Low energy consumption.
- Aesthetically pleasing.
- 100% self-sufficiency in terms of water supply.

Greywater Treatment

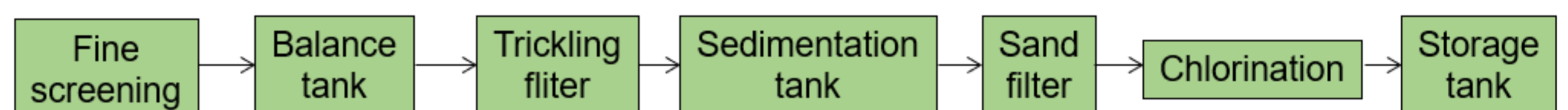


Figure 2. Greywater flowsheet: passive biological treatment followed by filtration, treated greywater used for toilet flushing and garden irrigation.

Blackwater Treatment

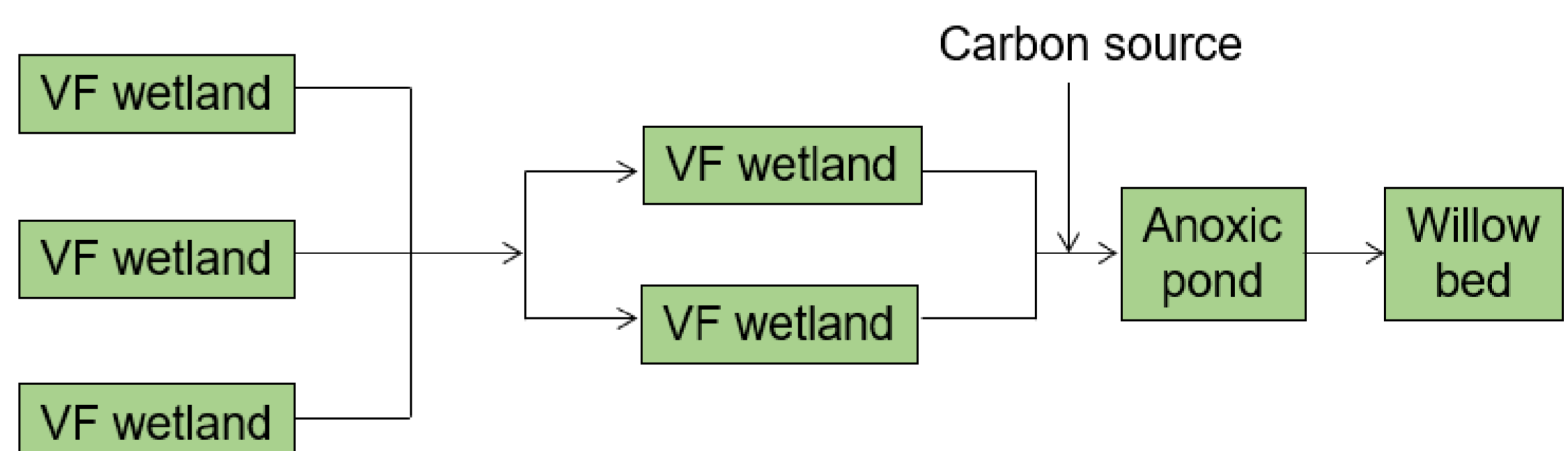


Figure 3. Blackwater flowsheet: blackwater from toilets treated using the above treatment methods, minimal effluent discharge is achieved by utilising a willow bed.

Findings

- Passive biological processes like wetlands have the potential to meet the project wastewater requirements.
- Denitrification in VF wetlands could achieve up to 85% nitrate conversion.
- Greywater and blackwater separation can offer greater flexibility regarding water reuse applications.
- Utilisation of greywater reuse provides sustainable alternatives to conventional water supply sources.

“We do not inherit the Earth from our ancestors; we borrow it from our children.”

– Native American Proverb

Sludge Management

Humus from TF (kg/year)	120
SS in raw water (kg/year)	117
Total SS (kg/year)	237
Removed SS (kg/year)	178

Designed system

Number of beds	6
Total surface area (m ²)	6
Surface area (m ² /bed)	1
Initial depth (m)	1.7
Initial volume (m ³ /bed)	1.7

Figure 4. Sludge production and summary of design calculations for dewatering reed beds.

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