

EnviroWater

Envirowater Greywater Treatment and Recycling Systems for Multi-dwelling and Commercial Applications

*A Technical Overview for Architects, Hydraulic Consultants & Engineers,
Developers and Hydraulic*

What is grey water ?

Grey water gets its name from its cloudy appearance and from its status as being between fresh, potable water (known as "white water") and sewage water ("black water")

Grey water is made up of the following:

- Basins
- Laundry
- Bath
- Shower

The grey water system can be installed beside your house and very easy to install.

- No unpleasant odours, Low maintenance, Low power consumption
- No harmful chemicals, No pump outs, No excavation, Automatic, continuous process

Black water and kitchen sink water cannot be routed to a grey water system. Black water is too high in biological media and Kitchen discharge needs to be fed through a fat trap to remove all the oils and fats.

Reduce fresh water use

When the weather is warm, about half of the water consumed by the average household is for outdoor use. Capturing the indoor grey water for use outdoors can cut water usage in half.

Reduce strain on septic system or treatment plant

Grey water makes up the majority of the household wastewater stream, so diverting it from the septic system extends the life and capacity of the system. For municipal systems, decreased input means more effective treatment coupled with cost savings.

Develop otherwise unsuitable real estate

A grey water recycling system, along with the use of biological black water system, can enable the development of property that is unsuitable for a septic system.

Groundwater Recharge

Grey water recycling for irrigation replenishes groundwater, helping the natural hydrologic cycle to keep functioning.

Plant growth

Grey water can support plant growth in areas that might otherwise not have enough water.

Enhance water quality

The quality of groundwater and surface waters are much better preserved by the natural purification processes the grey water undergoes in the biological treatment plant

Satisfaction

The grey water user gets the satisfaction of direct participation in the responsible management of global nutrient and water cycles

Uses of recycled grey water

- Garden Irrigation
- Toilet flushing
- Car wash
- General non-potable use

Introduction

Envirowater provides sustainable water solutions for the urban environment. We have the a range of systems designed to allow people to use our planet's most precious resource sustainably. Our vision is to help to make homes and offices become water self-sufficient.

Envirowater was formed to research, develop and bring to the market products that address one of the most significant global challenges in the 21st Century - the maintenance of adequate supplies of clean drinking water.

Envirowater's grey water treatment and recycling technology has been developed for use in residential and office applications and has been proven to be effective in houses, apartments, prisons and 'sustainable' office developments.

Developed in Australia, where grey water recycling is well established under a structured state regulatory system, Envirowater's systems have been accredited for 'single-dwelling' use in all mainland states for the highest level of re-use options including above-ground irrigation and internal re-use for toilet flushing and clothes washing.

Not surprisingly, projects designed for commercial and multi-dwelling projects generally require a higher level of recycled water quality than single dwellings.

Envirowater is proud that in validation tests conforming to the Australian Guidelines for Water Recycling, its technology was able to deliver treated and recycled water to the standards required by:

- Australian State of New South Wales Water and Energy :
"Guidelines for Management of Private Recycled Water Schemes"
- State of Queensland:
"Queensland Plumbing and Waste water Code"
- EPA Victoria Guidelines for Environmental Management:
"Dual pipe water recycling schemes - Health and Environmental Risk Management" (Publication 1015)



Liberty Greywater Skid Ridge side Durban

This document focuses on Envirowater's solutions for these more demanding, commercial and multi-dwelling environments. It is designed for architects, hydraulic consultants & engineers, developers and hydraulic contractors & plumbers and is aimed at helping them understand how Envirowater has tackled the special requirements these environments present.

Envirowater Commercial Grey water Treatment Systems

The Envirowater CGT Series of products are designed as a packaged plantable to be tailored to the specific application required by the end-customer.



The CGT Series has been developed from the highly successful and well proven Envirowater single-dwelling system. It uses the same core technology but in addition can be equipped with enhanced disinfection capability, control systems and remote management systems.

Common across all Envirowater's systems is the ability to treat and recycle grey water to a high level of quality. Grey water can originate from showers, baths, basins and laundries but excludes waste water from kitchens, dishwashers, toilets and urinals. Envirowater's patented technology enables the safe re-use of the recycled water for a range of residential and commercial applications including:

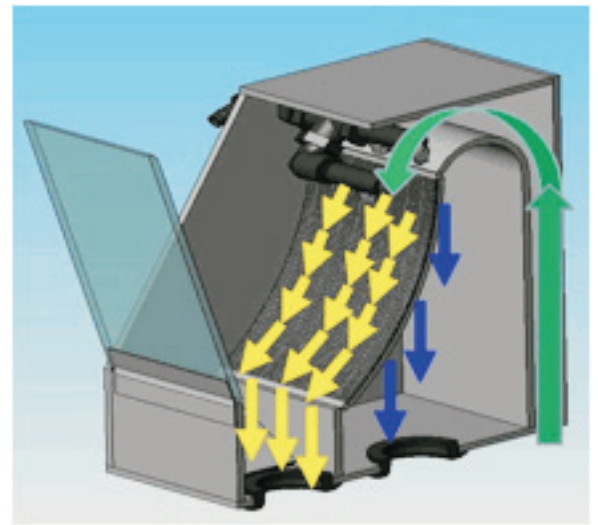
- Carwashing
- Clothes washing - cold water input to a machine
- Cooling tower make-up
- Surface landscape irrigation
- Toilet flushing
- Water features

DWAF regulates which of these applications are allowable and ensures demand an effective and reliable treatment process. Envirowater's treatment and recycling process is able to meet the toughest regulations due to its ability to consistently deliver a high quality of treated water. There are 4 key steps to the process.

1. Pre-screening

The pre-screening system uses an automatic self-cleaning mechanical screen to remove hair, lint and other coarse materials to prevent blockages and fouling of the system. Due to its unique design the pre-screen requires limited maintenance interventions and is able to operate effectively at high processing volumes

Self-cleaning pre-screen separates incoming grey water from solids

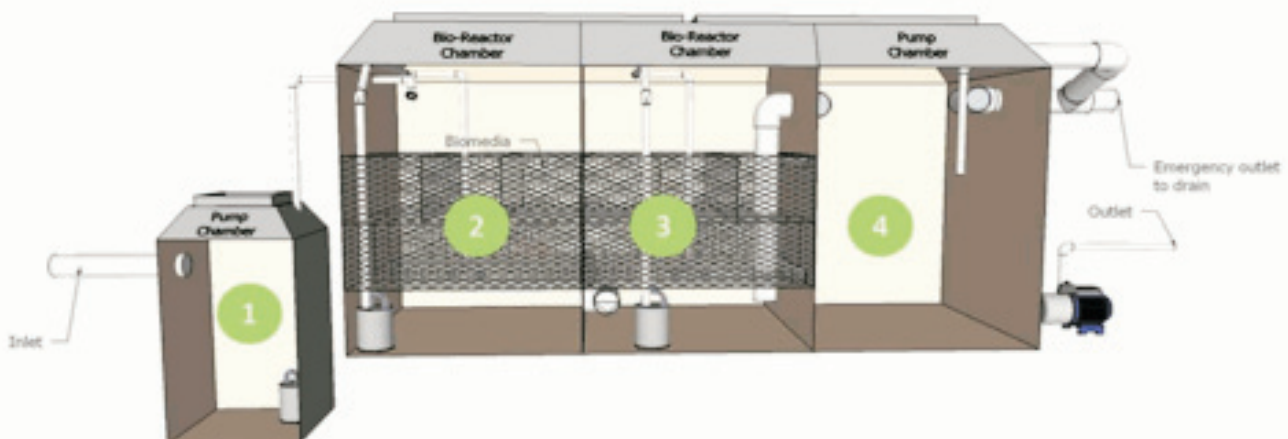


2. Bio-Filtration

The second and principal stage of treatment in the Envirowater system occurs in the patented submerged, aerated biofilter. Grey water flows through the bio filter under gravity and contaminant removal is achieved through a combination of physical removal, adsorption and microbial induced aerobic degradation.

The physical removal mechanisms are those typical of granular medium filters; straining, sedimentation, impaction, interception and adhesion. However, Envirowater's patented system is superior to conventional granular medium filters as it provides additional treatment through the proprietary media.

The properties of the media allow a significant degree of adsorption to occur which complements the physical removal mechanisms. The combined capacities for physical removal, adsorption and bacterial degradation create an extremely robust treatment system.



3. Disinfection

To meet the regulatory standards required in commercial and multi-dwelling applications Envirowater offers a powerful, “triple-barrier” approach to disinfection consisting of.....

1. Ultrafiltration

- A 0.02 micron, automatic backwashing, ultra filtration membrane system's used to provide a barrier to bacteria, viruses and parasites such as Cryptosporidium and Giardia, and to improve turbidity
- The system incorporates on-line membrane integrity testing and automatic “clean-in-place” technology

2. Ozonation

- Is the most powerful water sanitiser available for domestic and commercial use.
- Is up to 3000 times faster acting than chlorine, yet leaves no chemical residues in the water.
- The only by-product from the sterilising process is Oxygen.
- Rapidly kills bacteria, coliforms, viruses. If correctly applied, Ozone is also effective against Giardia and Cryptosporidium cysts.
- Is effective for the removal process of iron, manganese, organically-bound heavy metals, cyanides,(some), phenols and some other organics
- Does not require the water to be clear to be totally effective.
- Can eliminate the use of sanitising chemicals in your water supplies
- Is a completely natural products that is produced on-site from electricity and air
- Running costs are very low (about the cost of a 100 watt light for the ozone generator)
- It is tasteless, odourless and pH neutral.

As a final step the recycled water is **chlorinated** to ensure a level of residual disinfection in the recycled water distribution system



Typical Filtration and Ozonation



4. Real-time Water Quality Analysis

Critical to ensuring that the recycling system is operating to the required standard is the ability to constantly monitor the quality of the treated water. Envirowater's CGT Series incorporates real-time water quality assurance using a multi-parameter on-line analyser. The water quality analyser is configured to measure turbidity, pH and free chlorine. It directly controls chlorine dosing using proportional control.

System Control Option

The Envirowater CGT Series offers a proprietary control system that integrates, coordinates and optimises a number of subsystems:

- Flow meters
- Pressure sensors
- Level sensors
- Water quality monitors
- Sub-system status alerts
- Manual inputs via touch-screen interface

The controller is a combination of systems which enable it to monitor, process-control, event-log and manage the entire process.

The core of the system is an industrial PLC.

Organics, Nutrients and Pathogen Removal

The treatment process of Envirowater's CGT Series achieves a very high degree of organic, nutrient and pathogen removal. The biofilter is designed to utilise a combination of microbial degradation, straining, impaction and interception to cause the media to retain a significant portion of organic matter and pathogens. Further retention of particulate organics plus dissolved organics and nutrients is achieved by adsorption.

Retained contaminants are discharged to sewer during the automatic backwash cycle.

Supplementing the biofilter, the multiple disinfection stages achieve a very high kill rate of pathogenic organisms.

If the treated water is to be used for irrigation then an important element of grey water recycling is the degree of nutrient (Nitrogen and Phosphorus) removal. The Envirowater CGT Series typically removes more than 40% of both Phosphorus and Total Kjeldahl Nitrogen.

Pathogen Control

For anyone wanting to implement a safe grey water recycling system the critical reference point is *The Australian Guidelines for Water Recycling*. This is a detailed analysis of the risks, to both human health and the environment, which arise from water recycling. The document sets out guidelines for managing these risks to levels which are considered acceptable.

Envirowater has used The Guidelines to develop its water quality targets and risk management protocols and to ensure that risks are managed to acceptable levels on an ongoing basis.

The basis for The Guidelines is the recycling of sewage with the concept of "log reduction values" (LRVs) used to define both the target water quality levels and the actual disinfection system performance. The required reduction in pathogen levels from the "influent water" to the "recycled water" is expressed as an LRV. For example 9C removal is an LRV of 1 while 99% removal is an LRV of 2.

The table below shows the Log removal results achieved in an independently run series of "pathogen challenge tests". These results demonstrate that the Envirowater CGT Series achieves high rates of pathogen removal, significantly exceeding the requirements of The Australian Water Recycling Guidelines.

Parameter	AGWR Guidelines	LRV Achieved
E.Coli	3.0	7-8
Clostridia	3.0	3-5
FRNA (virus)	4.5	6-10

Enviowater's system significantly exceeds "Guidelines" requirements

Installation and Commissioning

Enviowater systems require separate, vented, plumbing waste pipes from tubs, showers, washing machine and hand basins to the untreated grey water tank.

Recycled water supply pipes to toilets, washing machine and irrigation connection points must be connected to the treated grey water system. Where potable water backup is required, additional cross connection and back flow prevention devices must be installed inline with local plumbing codes. Installation and commissioning of the CGT Series can usually be accomplished in 2 to 3 days although connection to plumbing and mechanical systems of the building varies with the complexity of the project. Commissioning of the Enviowater system requires a set of procedures to be followed which include plumbing and system checks, wet testing, loading and washing biological growth and filtration media, followed by individual component commissioning and the initiation of grey water processing.

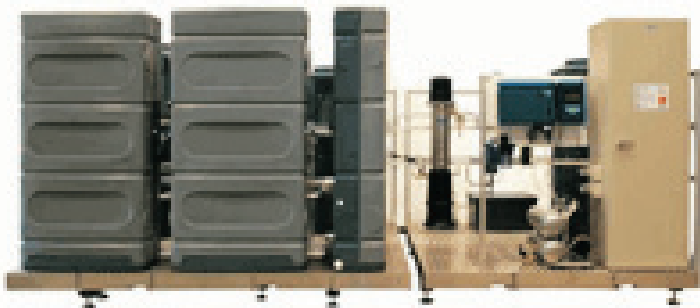
Operation

The CGT Series operates within the conventional system of public water, sewage, distribution and collection. Potable water, sewerage pipes and storm water infrastructure are still utilised - no additional infrastructure is required.

The system is designed so that it can be taken offline for maintenance without requiring alterations or modifications to any building plumbing infrastructure. The system is taken offline by a single valve which routes all grey water directly to sewer. Once offline, the system may be serviced without interference to waste water disposal.

Over flow and drain pipes connect all components of the Enviowater CGTS to sewer. In the event of extreme flows or system malfunction, greywater is automatically or manually diverted to sewer.

The Enviowater CGT Series is appropriate for multi-dwelling, commercial and industrial applications. The modular and scalable nature of the system allows for water flows from 500 to 100,000 litres per day to be managed.



Enviowater CGT2 Commercial Grey water Treatment & Recycling System

Operating costs for the Enviowater CGT Series vary with the system capacity and application but are very low compared to alternative technology.

Enviowater's low operating costs are achieved in 3 ways:

1. The system has very low power consumption
2. There are very few consumable items and the system uses no expensive chemicals
3. Water loss through backwashing is typically around 3%

Enviowater recognises the critical nature of grey water treatment and recycling. Having robust, reliable and effective technology is vital to support the growing community demand for sustainable water use.

Using the CGT Series architects, hydraulic consultants & engineers, developers and hydraulic contractors & plumbers are able to safely respond to their clients' needs, regulators requirements and the communities concerned.

REFERENCES

West Street Alexander Forbes | Woolworths Midrand | Shoprite Midrand
Shared Services Cape | BP foreshore | Liberty Durban | Ridgeside Durban