

FACT
SHEET

SAVE

WATER

INTEGRATED WATER SYSTEM

WE ALL HAVE A RESPONSIBILITY TO USE WATER RESPONSIBLY. WITH 72% OF PERTH'S DRINKING WATER BEING USED IN OUR HOMES AND MORE THAN 40% OF THIS BEING USED TO WATER OUR GARDENS, HOW WE DESIGN AND MANAGE OUR HOUSEHOLD AND LANDSCAPE WATER USE CAN MAKE A BIG IMPACT ON WATER SAVINGS.

At Josh's House, a number of things have been done to reduce demand on precious drinking water, through efficient use as well as making the most of alternative sources such as rainwater and greywater. All in all the homes will use less than a third of the typical Perth household mains water consumption, while maintaining a beautiful, productive and shady garden. Here's how it's been done.



RAINWATER HARVESTING

Each of the homes has been fitted with a separate rainwater tank to collect the rainwater from the entire roof area, which is roughly 200m² per home. The front house is fitted with a 12,000L water tank and the rear house has a larger 20,000L water tank, due to more space being available. These tanks will meet the demand for internal purposes for about eight months of the year, based on Perth's rainfall. During dry summer months the tanks will likely be empty and the water supply will automatically switch to mains water through the use of a mains water backup valve. This is explained in greater detail in the notes below and the Water System Design plans available for download on the Josh's House website.

Collecting Rainwater

The rainfall on each roof surface is collected in gutters that fall into down pipes fitted with insect and leaf excluding rain heads. A 'wet feed' or 'charged' rainwater collection system which means that all the stormwater pipes between the gutters and tank inlet are permanently full of water. To eliminate the potential of the



rainwater becoming stagnant during dry weather periods, a diversion valve has been fitted below ground to discharge this unwanted water into soakwells below the driveway. This valve can also be opened to divert the first rains of the season, as this will contain dust and other contaminants from the roof that have built up over the summer. Importantly, all pipes and openings are fitted with insect proof screens.

When the rainwater tank is full, the excess water will discharge into the soakwells and infiltrate into the ground. To prevent the unlikely event of the soakwells becoming full and backing up into the rainwater tank, an air gap backflow prevention device has been installed.

Using Rainwater

Rainwater is supplied to the house via a domestic pressure pump and a Watermark approved mains water backup valve to switch between rainwater and mains water. These are neatly located in a cabinet along with the necessary isolation valves, back flow prevention devices, cartridge filter and water meters for tracking both rainwater and mains water usage. The water used for drinking and cooking passes through an additional 0.2 micron cartridge and carbon filter to remove any odours and impurities.

It's important to note that when using rainwater in the home, all piping, water outlets and taps should be clearly labelled as 'RAINWATER' to comply with AS/NZS 3500:1 Plumbing and Drainage Standards.

GREYWATER REUSE

Greywater is household water that hasn't come into contact with toilet wastewater. Typically kitchen water is excluded from collection because it contains fats, greases and detergents which can be problematic with system maintenance and soil health. When carried out sensibly in accordance with the relevant local guidelines, greywater is a valuable alternate water supply for irrigation and other fit-for-purpose uses. In addition to saving water, greywater reuse ensures a regular supply of irrigation water that is not limited by water restrictions.

Greywater Diversion Device

The greywater diversion device selected for the project is the 'Grey Flow' by Advanced Wastewater Systems, which is approved for use nationally. It's a pumped system that incorporates an automatic filter back flush device, which is a self-cleaning mechanism to reduce maintenance. It also has a very practical two-stage installation process which begins with the installation of a sump and dual interceptor unit (referred to as the 'Builder's Kit') during the initial drainage plumbing works (as shown in Episode 2 of Josh's House on-line video series). On completion of the house build, the second stage of the installation process involves the fitting of the pump, self-cleaning mechanism and irrigation pipework to get the greywater out to the garden.



Installing rainheads to downpipes



20,000L rainwater tank with overflow to soakwells



Grey Flow greywater diversion system

The dual interceptor unit is connected to a wall mounted automatic filter back flush device. This will flush the filter pads with air at timed intervals, practically eliminating the need for manual cleaning. A submersible pump is housed inside the underground sump which in turn is connected to the greywater irrigation system.

Greywater diversion devices like this one do not store greywater and the pump will start the irrigation process as soon as it is generated in the homes. This means plants only get water when greywater is generated. To ensure plants have sufficient water during periods when the homes are vacant, the addition of greywater top up water is required. To achieve this, bore water controlled via the irrigation controller and metered solenoid valve will discharge water directly above an overflow relief gully on the greywater draining line that was installed as part of the greywater ready plumbing, ensuring no cross flow contamination via an air gap. This top up water flows to the greywater diversion device, triggering the pump to irrigate.

Greywater Irrigation

The greywater system irrigation fields for each house are based on an occupancy rate of four people, generating up to 100 litres per day in the bathroom and laundry, that's 400 litres in total per day. Like most of Perth, Josh's House is located on sandy soils typical of the Swan Coastal Plain. Greywater is applied at a maximum rate of 10mm of water per day over an area of 40m² of garden incorporating fruit trees, shrubs and other ornamental plantings around both houses.

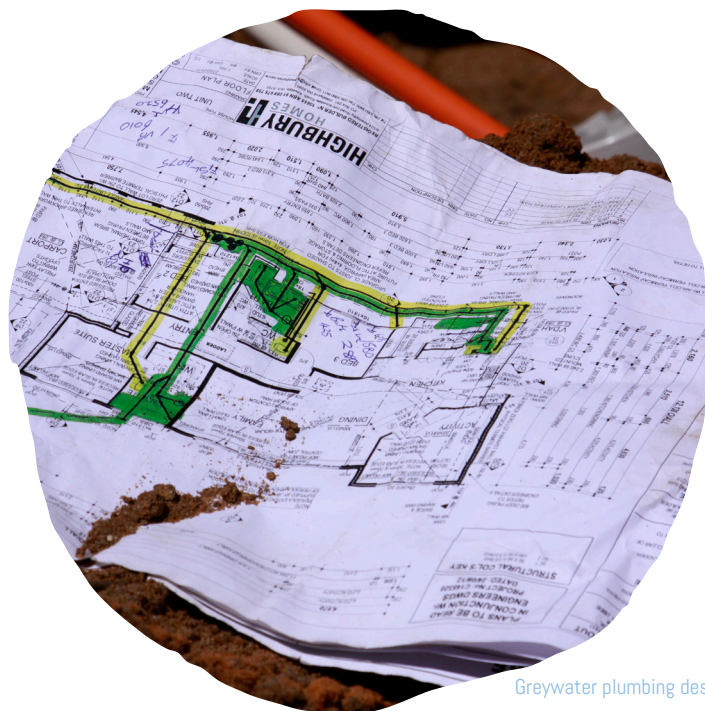


Purple substrata drip irrigation

The greywater is disbursed via purple coloured substrata dripline irrigation, which is installed on the surface of the soil and covered with a 100mm layer of mulch to prevent human contact. The purple colour coding of the drip line helps to reduce the likelihood of cross-connection with other water pipework. Likewise people can instantly identify the pipe as carrying wastewater and know that they should wash their hands after coming into contact with it.

The dripline has drippers spaced at 300mm intervals along the length and the driplines spaced at 300mm apart. The drippers are a high-flow, clog resistant drippers that are designed to be self-flushing. The dripline is installed between a supply pipe and a collector pipe. A manual flush valve has been fitted to the collector pipes on each bed to allow for the occasional flushing of the irrigation lines to clear out any muck that may accumulate. A vacuum breaker valve has also been included at the highest point of the irrigation line. This allows air to enter through the one-way valve as the water drains out of the line avoiding the potential for dirty water being sucked back through the drippers that can lead to them becoming blocked with grit.

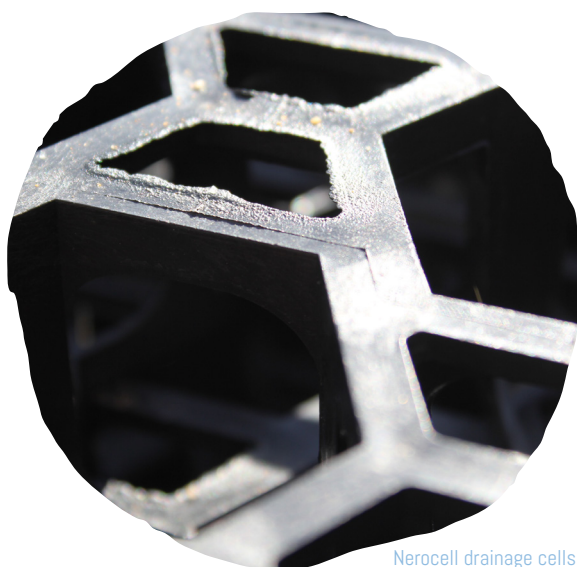
Greywater irrigation drip lines are setback from paving, retaining walls, neighbouring properties and buildings to comply with the WA Health Department Code of Practice for the Reuse of Greywater in Western Australia (2010). These guidelines provide information on the required approvals, limitations, setbacks, design and sizing of a greywater reuse system and its use in the garden.



Greywater plumbing design



Purple substrate
drip irrigation



Nerocell drainage cells

Greywater Ready Plumbing & Costs

Greywater ready plumbing is pretty straight forward provided it is thought through at the beginning of the build. All up the greywater plumbing at Josh's House cost \$1200 per house with the greywater system itself including pumps, filters and irrigation costing around \$2500 for supply and installation.

NOTE: The Water Corporation in partnership with Josh Byrne & Associates have released the Residential Greywater-Ready Plumbing Guidelines which have been developed to assist homebuyers, builders and plumbers with the design & installation of greywater-ready plumbing for new homes. These guidelines are available to download from the Greywater Industry Group's website: www.gwig.org

BORE WATER

In many parts of the Perth Swan Coastal Plain, groundwater from the superficial (shallow) aquifer is easily accessible and is generally of suitable quality for garden irrigation. This groundwater is recharged by winter rainfall and provided that extraction doesn't exceed infiltration, it can be managed in a sustainable way. Bore water provides an appropriate fit-for-purpose water source for local food production (where greywater may not be appropriate) as opposed to relying on constrained mains water.

The bore has been located in a non-trafficable section of the driveway and goes down 30m into the superficial aquifer. Bore water is used to irrigate the vegetable garden, turf, trees, native plantings and greenhouse hydrozones. Garden taps are also connected to the bore for hand watering and other outdoor water uses. As flagged above, bore water will also be used to automatically top up the greywater system when the houses are unoccupied.

It's important to note that there are groundwater sensitive areas across the Swan Coastal Plain where bores aren't appropriate, or have been historically overused – the WA Department of Water's Ground Water Atlas is a useful resource to assist in determining where bores are likely to be suitable: www.water.wa.gov.au/idelve/gwa/

STORM WATER

Whilst groundwater is being extracted via the bore, it's also being recharged on the property by directing stormwater back into the soil via directing excess rainwater into to soakwells, the use of permeable surfaces and a winter dampland soak feature.

Soakwells

The rainwater overflow from both tanks goes into a large soakwell under the driveway in close proximity to the bore. This soakwell is made from a series of stackable recycled plastic modular tank drainage cells that are lightweight, strong and easy to install and have a high storage volume of around 90%. The modular tank system is wrapped in a permeable geotextile fabric to allow the water to infiltrate into the ground whilst stopping silt and soils from washing into the tank system. Importantly the soakwells have been sized to suit Perth's rainfall, the combined roof catchment area and local government requirements.

Permeable Surfaces

Paved areas have been kept to a minimum and instead, used permeable surfaces like the gravel driveway, which allows rain to quickly penetrate into the sandy soil below.

Under the driveway, a lightweight recycled plastic drainage cell has been installed to make the surface secure and suitable to drive on, whilst minimising vehicle compaction. The cells lock together easily in a grid pattern and were installed over a geotextile fabric liner. The drainage cells were then filled and covered with the coarse gravel.

Dampland Soak

The water from the carport and front veranda downpipes has been directed into a native dampland 'winter wet depression' feature to make the most of the stormwater. The downpipes are connected to a coil of flexible sub soil drain that is wrapped in a geotextile fabric and covered in coarse sand at the bottom of the basin so that water infiltrates the soil and doesn't pond. The areas has been planted with a range of native rushes and sedges that are suited to a winter wet – summer dry regime.

WATER EFFICIENT PLUMBING & APPLIANCES

Water efficiency inside the houses is also a priority. We have selected efficient fixtures and appliances throughout including 3 star* shower heads and 4 star* kitchen and vanity basin tap ware. There is a 5 star* rated toilet in each home which includes an integrated hand basin so when you flush the toilet, you can wash your hands with the clean water as it refills the toilet cistern. Effectively the water is used twice. The dishwashers and washing machines have also been carefully selected to have high water efficiency.

* Water Efficiency Labelling Scheme (WELS).

For information on landscape and irrigation water efficiency measures, download the Irrigation Plans and Landscape FAQ Factsheet from the Josh's House web site.



ProTank modular tank soakwell



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For product or supplier details go to the Josh's House Partnerships Page : www.joshshouse.com.au/partnerships