



# West Wales ECO Centre

## The ECO Centre's Rain Water Toilet Flush



### **Background**

Over 1/3 of all potable water supplied to domestic premises is flushed straight down the toilet. A great deal of effort is expended to ensure that the water supplied to our houses is fit to drink. We do not need to use such high quality water simply as a transport medium for our waste material. This extravagance results from the continued use of a waste disposal system inherited from the Victorians. It may be argued that dry toilets would now be a more appropriate method of waste management.

As most of us still enjoy the convenience of a water closet, the West Wales ECO Centre set out to devise a system that would reduce its impact on our water resources. It is hard to believe, living in West Wales, that water is a finite resource. Water utilities are facing an increasing demand for water and so the environmental impact of water abstraction becomes more acute. These include loss of wetland habitats and critically low flow levels in rivers that threaten marine and aquatic species. By using rain water to flush our toilets, we reduce the pressure on our river catchments and save the energy and resources that would have gone into the purification and distribution network. Furthermore, with the spreading use of water meters it not only makes environmental sense to use rainwater, but also makes good financial sense.

**The main components of the ECO Centre's Rain Water Flush are as follows.**



**1. The Rain Water Butt** - This collects rainwater from the roof via a *downpipe diverter* which fits onto our drain pipe. The butt houses a *submersible pump* on an extended leg attached to the lid. When the pump shuts off, all the water in the pipe back flushes cleaning the filter and ensuring that there is no water left in the supply pipe that could freeze. The butt also contains the *low level cut-off float switch* which activates to prevent the pump running dry.



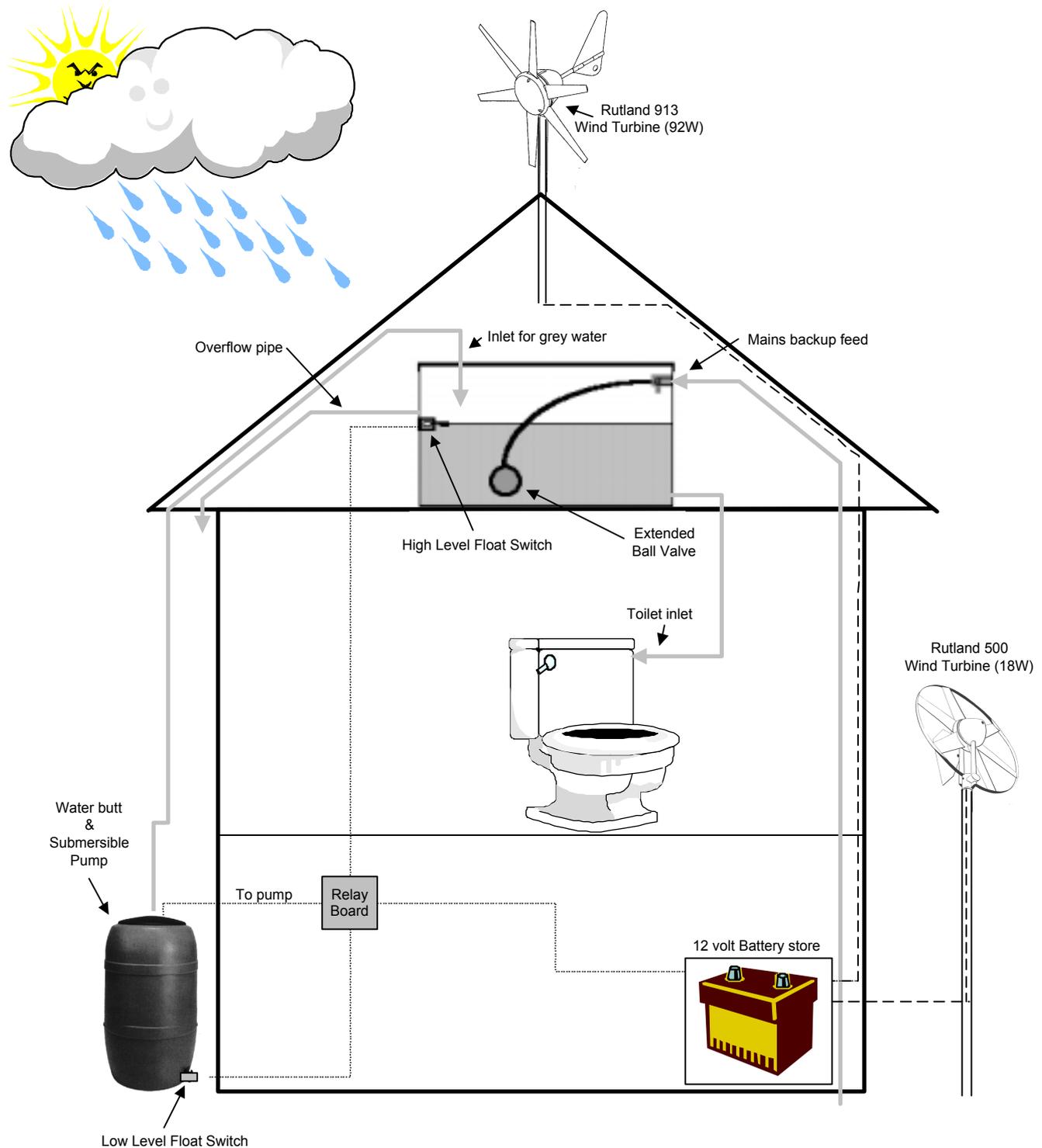
**2. The header tank** - This is where the integration with the mains water backup occurs. The tank is filled to a certain level from the mains via our own, patented, *extended arm ball valve*. Further filling occurs via the pump in the rain water butt. The pump is shut off when filling is complete by a *float switch* situated in the header tank. An *over-flow situated 15cm below the mains water inlet* ensures that no biological contamination of the mains water can occur (this is required by law). When enough rain water is available, the pump is triggered as demand from the toilet drops the level below the float switch. The capacities are arranged such that during times of adequate rainfall the extended arm ball valve ensures that the mains supply is turned off. When rain water is not available the level drops until the extended arm ball valve is activated. Thus an uninterrupted supply to the toilet is achieved (*see diagram overleaf*).

**3. System Power** - The whole system is renewably powered. A *12 volt battery store* in the ECO House is charged by two small Rutland wind turbines. The batteries are then used to power the 12 volt submersible pump in the water butt. A charge controller is used to regulate the charge and also gives us the option to connect a solar photovoltaic panel to power the system in the summer months. Unfortunately the ECO Centre is not well placed for utilising wind and our two turbines are primarily for demonstration. In normal circumstances a single small machine or a solar panel should be sufficient to power the system. Alternatively, a mains adapter or pump could be used. However, 12 volts d.c is always a far safer bet when using submersible pumps.



**4. The Relay Board** - Because the current demanded by the pump is too high for the float switches to handle, they operate via two relays. The high level cut off relay is a straight forward 10A car relay. To prevent cyclical activation of the pump caused by the back flush feature and also relay bounce as the butt slowly fills with rain water, the low level relay incorporates a delay device. This is set to 6 hours. This means that once the low level condition occurs, the system will not be reactivated until 6 hours have elapsed. This is enough time to allow for significant refilling of the barrel via the down pipe. If refilling has not occurred, once again the low level float switch and delay will shut the system down for a further 6 hours.

There are two LED's on the delay relay. A green light indicates that the system has power from the battery store and a red light indicates that there is water available in the rain water butt.



For more information on rain water systems contact:

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