

Biologic Design

Wetland Ecosystem Treatment

Whole Site Water Reticulation and Integrated Wastewater Purification, Resource Production & Habitat Creation

Earthworm Housing Co-Op WET System

- Overview -

WET System at The Earthworm Housing Co-Op

The WET System at The Earthworm Housing Co-Op will serve a maximum of 20 people living full-time at the Co-Op, as well as the occasional increased loading due to up to 25 visitors attending weekend workshops.

Existing Sewage Treatment at The Earthworm Housing Co-Op

The sewage is currently disposed of using a soakaway in the garden via an existing Septic Tank adjacent to the buildings.

The current arrangement is carrying out Primary Treatment only (i.e. settlement) with the settled sewage then being released through the soakaway field. The WET System will provide not only Primary Treatment (Settlement), but also Secondary Treatment (Nutrient removal) and Tertiary Treatment (Polishing) too.

The Biologic Design WET System proposed for The Earthworm Housing Co-Op is not a simple Horizontal or Vertical Reedbed Treatment System. It is a Horizontal Plug-flow, Soil Mycorrhizal, Multi-Species Constructed Wetland Purification System.

WET System - Location

The WET System will comprise a new septic settlement tank to be installed adjacent to the outside of the kitchen wall. A new pipe run will then take the settled sewage to the WET System, which will be located in the garden of Wheatstone House.



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The location chosen is currently a large comfrey bed which is cut each year to make compost, this location is advantageous in that it follows the slope of the land and so allows for a gravity fed WET System.

WET System - function

The Swale banks and ponds which make up the WET System are designed to direct the wastewater flow along and through specially constructed banks of topsoil. These soil banks will be densely planted with a variety of native wetland and marginal species, as well as wildflowers and 1,200 osier type willow trees - which will be managed as short rotation coppice.

As the wastewater passes through these soil banks, drawn by capillary action and evapotranspiration by the trees and the 1,000 other planted marginal and wetland plants, it will be purified by the plethora of micro-organisms (fungi and bacteria) which inhabit the soil in the root zone of this densely planted, soil-based, multi-species constructed wetland.

This is in distinct contrast to conventional Reedbed Treatment Systems which, for purification, rely on a gravel matrix, usually planted with a single species of reed - *Phragmites communis*.

Settlement of solids

The WET System The Earthworm Housing Co-Op will be preceded by the new underground septic Settlement Tank. This Settlement Tank will require, as is the case at present, the settled solids to be pumped out approximately every year or two, depending on the total suspended solids load.

Compacted clay and GCL lined swales

The liquid supernatant from the Settlement Tank will pass into the WET System, which comprises a series of densely planted purification Swales.

The basic structure of these swales will be formed using the clay subsoil, and the swales will then be lined with a Geosynthetic Clay Liner. This is a Bentonite Clay liner which is self-sealing if accidentally punctured.

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Purification media - topsoil

The whole of the surface of the WET System - both the swale banks and the swale pools - will be covered with the topsoil from the site; this topsoil acts as both the purification medium and planting substrate for the wetland and marginal species we use.

Polishing Ponds

The last two swales will be constructed with large swale pools and so act as polishing ponds for the system.

Retention Time

Compared with the short retention times of both conventional waste treatment equipment and gravel based Reedbed Treatment Systems, the WET System at The Earthworm Housing Co-Op will have the very long hydraulic retention time of around six months.

The retention time is based upon the total volumetric capacity of the WET System and does not take into account the evapotranspiration potential of the 1,200 willow trees and 1,000 marginals that we shall be planting on the Swale banks and pond edges or evaporation over the surface area of the ponds.

Due to this long retention time, as well as the large number of trees we shall plant within and around the WET System, the sewage input will not only be purified as it passes through the soil swale banks and evaporate from the pools - it will also be evapotranspired, as pure water vapour, to the atmosphere by these trees.

The evapotranspiration of the water within the WET System has the positive effect of lowering the actual annual hydraulic load through the system. When this is factored into the overall hydraulic balance the WET System will be a total absorption system with no outfall.

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Robust purification process - due to Plug Flow Kinetic

The robust Plug Flow kinetic regime, upon which the WET System design is based, enables the system to cope with a wide variation in both the hydraulic and organic loading rates, as well as any 'shock-loadings', due to the occasional courses run at Wheatstone House.

Woodchip mulch

The swales of the WET System will be mulched with a 10 centimetre deep layer of woodchip prior to planting.

This woodchip will give not only weed suppression, after the initial completion of the earthworks stage, but also gives the WET System an immediate ability to accept wastewater; the woodchip will act as a particulate organic carbon source - helping to absorb and mineralise the nitrogen within the wastewater.

Over the first two years operation of the WET System the woodchip, whilst acting as a high surface area substrate for colonisation of the soil mycorrhizae microbes, will also break down and add organic matter to the deep topsoil layer - adding to the long term efficacy of this soil-based constructed wetland.

Maintenance of the WET System

Biologic Design will maintain the WET System for the first year of its operation and will offer and undertake an ongoing annual maintenance agreement if required by Earthworm Housing Co-Op.

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