

Willow System Treatment Options

**Summary overview of
zero discharge willow systems,
willow filters and
willow-planted percolation areas
for effluent treatment**

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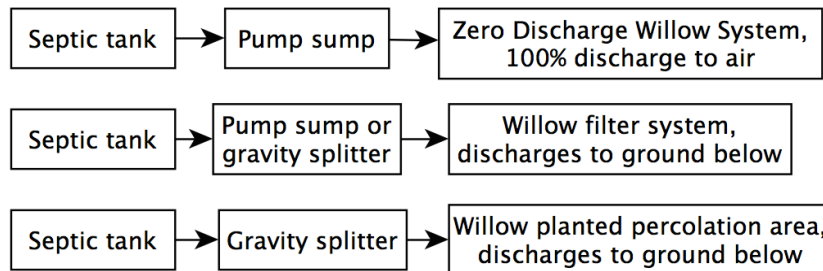
FH Wetland Systems

2024

Willow Treatment Systems

Willow treatment systems are willow planted treatment areas that may be fully contained with a plastic liner (zero discharge systems) or unlined. They can be divided into three main categories, as follows:

- ⤴ Zero discharge willow systems
- ⤴ Willow filters for nutrient removal
- ⤴ Willow planted percolation areas



Pros and Cons compared to other treatment options

Pros

- ⤴ Can have excellent removal of nitrates and phosphates.
- ⤴ Can be designed with gravity splitters as zero energy input systems.
- ⤴ Good for wildlife and can be attractive garden features.
- ⤴ Willow biomass can be used for fuel or chipped for landscaping.
- ⤴ Sequesters atmospheric carbon.
- ⤴ Can be designed to protect watercourses during summer months, or be 100% zero discharge, depending on design.
- ⤴ May be suitable for failed sites with no percolation.
- ⤴ Can be used as effective upgrade system on existing sites.

Cons

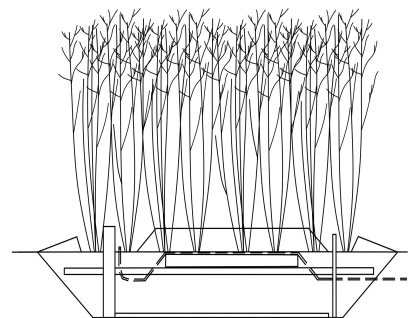
- ⤴ Willows may be too tall for garden (to 6-8m).
- ⤴ Need large space.
- ⤴ Require maintenance to cut willows on 3-yr rotation.
- ⤴ Zero discharge option is expensive to install.



Willow system photographed in June; showing three tall rows at the rear, due for coppicing the following February, and three front rows with fresh growth.

Zero discharge willow facilities

Zero discharge willow facilities are plastic lined, soil filled basins that rely upon the willows for 100% evapotranspiration of septic tank effluent. Typically 6m wide and vary in length from 35-75m depending on the location in Ireland (rainfall and evapotranspiration rates dictate size, as well as water use of home owners).



Pros and Cons compared to other willow treatment options

Pros

- ⤴ Can be fully zero discharge if designed following new FHWS/TCD design protocol.
- ⤴ Zero pollution to surrounding environment.

Cons

- ⤴ Costly to install (€20-50,000 for a single dwelling system depending on location).
- ⤴ Larger than some other willow options.
- ⤴ Typically requires electricity for pumped inlet, although this may be avoided where suitable gradient exists.

Newly planted zero discharge willow system in Denmark, showing three rows of cuttings on either side of the central covered spreading pipe. Outer bund work due for completion the following February.



Note that the new EPA Code (2021) requires a willow system size of 187.5m²/pe, x 1.8m depth. While this sizing is not feasible it is recommended to use the new FHWS/TCD design protocol for new planning applications in the Irish context, despite being outside of Code guidelines.

Willow filter systems

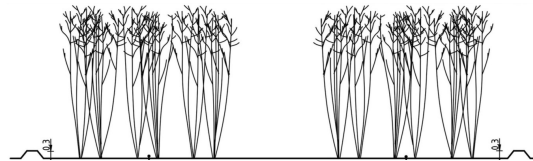
Unlined willow systems are typically sized to achieve high nutrient uptake. They have full summer uptake of liquid and usually allow some infiltration to ground during winter months. Size may be smaller or larger than the zero discharge system depending on the degree of nutrient uptake required.

*Pros and Cons compared to other willow treatment options***Pros**

- ⤴ Much more cost effective to construct.
- ⤴ Still have excellent environmental protection.
- ⤴ May qualify as zero discharge option for planning in certain circumstances.

Cons

- ⤴ Some seasonal infiltration to ground unless specifically excluded in designs.

**Willow planted percolation areas**

These are essentially EPA Code compliant percolation areas except that the piping layout has been updated to allow for planting with willows in such a way as to avoid clogging with willow roots. Size systems as per EPA Code of Practice for infiltration areas, but double the system length, while halving the width, to maximise the evapotranspiration potential.

*Pros and Cons compared to other willow treatment options***Pros**

- ⤴ Low cost option for additional N and P uptake from infiltration area.
- ⤴ Smaller than other willow options.
- ⤴ Coppicing regime more flexible, and can allow for 5yr rotation rather than the standard 3yr cycle; and thus can be used as a firewood crop.

Cons

- ⤴ Lower nutrient removal.

Layout essentially as per standard percolation area with willow planted over it.



After three years of growth many of the willow stems will be large enough for chipping for fuel or landscaping. Leave for longer if you want firewood (design permitting).

Willow system comparison summary

Willow Systems Compared (also showing treatment wetland for comparison)

	ZDWF	WiFi	WPPerc	CW/RBTS
Treatment effectiveness	High	High	Medium	Medium
Ecological footprint	Low	Low	Low	Med
Wildlife value	High	High	High	Medium
Capital cost	€€€	€€	€	€€
Running costs	€€	€€	€€	€
Odour potential	Low	Low	Low	Medium
Safety risk	Low	Low	Low	Medium
Size	Large	Large	Medium	Small
Fencing	No	No	No	Yes
Electricity needed	Yes	No	No	No
Resilience to sludge overloading	Low	Low	Low	Variable
Can receive stormwater inputs	No	No	No	Sometimes
100% evapotranspiration to air	Yes	Sometimes	No	No

ZDWF – Zero discharge willow facility

WiFi – Willow filter for nutrient uptake

WPPerc – Willow planted percolation area

CW/RBTS – constructed wetland or reed bed

For additional background information on wastewater treatment options and system selection see *Septic Tank Options and Alternatives*, available at <https://www.wetlandsystems.ie/Bookshop.html>

