



**Project:** Phosphate Reduction Calculation and Proposal

**Client:** Philip Cooper

**Site:** Glamping Site at Whitewell, Whitchurch

**Viltra Ref:** J16289

## Introduction

Viltra, as trusted designers and manufacturers of wastewater treatment systems through the UK and Europe, have been requested to provide dosing calculation / mitigation of phosphate (Total -P) to comply with National Resources Wales guidance on phosphates from sewage treatment.

The site currently comprises of an existing 4 bedroom farmhouse serviced by an existing septic tank. This equates to a population equivalent of 6 (6 PE)

It is proposed to add 6 No. glamping pods serviced by a sewage treatment plant to the site. This would equate to a PE of 24. The sewage treatment plant proposed is a Bespoke 30 PE with chemical dosing by Viltra.

The septic tank to the farmhouse will be abandoned and discharge will be taken to the new treatment plant. This would take the population up to an equivalent of 30.

There is a restriction of 2m<sup>3</sup> per day from any new development in this area, in order to protect the water environment from phosphates. In order to increase this discharge rate, measures must be taken to reduce Total – P within the discharge as described below.

## Bespoke Oxcrete for Total P removal

For this site Viltra is proposing a Submersed Aerated Filter (SAF) treatment unit, with a precipitation stage incorporated.

Normal levels of Total P discharged from a package plant can vary between 5 and 12 mg/l. Higher levels of P can be recorded if the levels of phosphorus in the influent are over the standard limits.

Currently for this site there is a flow cap at 2m<sup>3</sup>/day, for a typical package plant. In the future it is expected that the flow will reach a maximum of 4.5 m<sup>3</sup>/day after being fully developed. To be able to discharge a flow of 4.5 m<sup>3</sup>/day we are proposing to reduce the phosphorus levels down to 2mg/l.

Assuming a normal discharge level of 10 mg/l (a worst-case scenario) we have calculated that a typical (2m<sup>3</sup>/day flow) package plant is discharging 20 g/day and that the future system will have to discharge same amount of P or less but adjusted to the higher input in flow and P load.

|                          |                   |        |
|--------------------------|-------------------|--------|
| Total P outlet of unit   | 10.00             | mg/l   |
| Permitted Discharge flow | 2,000.00          | litres |
| Total P discharged/day   | 20,000.00         | mg/day |
|                          | 20.00             | g/day  |
| Future discharge flow    | 4,500.00          | litres |
| Total P discharge        | 20,000.00         | mg/day |
| Total P limit            | 4.44 (20000/4500) | mg/l   |

If it is permitted to discharge 10 mg/l at this time in the future the limit will be maximum 4.44 mg/l.

To achieve this, we are proposing to dose a coagulant at the inlet of our Oxcrete unit. The coagulant will react with the contaminants in the water and will precipitate the Phosphorus, for which has an affinity. The Phosphorus thus will be trapped in the inorganic flocs formed and settled in the Primary Sedimentation tank and removed before it gets to the biological section of the plant.

The coagulant dosing is realized with a dedicated pump, the pump flow rate can be controlled, thus we can increase the Coagulant dose, precipitate more phosphorus and achieve lower Phosphorus discharges.

In theory discharges as low as 0.1 mg/l are achievable but typically concentrations varying between 2 and 0.5 mg/l are more realistic.

Example of calculation for P removal to achieve 2mg/l in discharge

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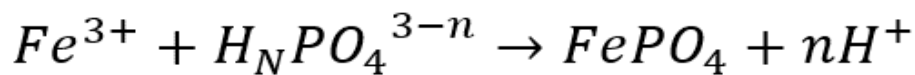
|                                            |          |        |
|--------------------------------------------|----------|--------|
| Number of People                           | 30       | PE     |
| Average amount of water per person per day | 150.00   | l/PE   |
| Daily inflow                               | 4,500.00 | litres |
| Total-P after Secondary treatment effluent | 10.00    | mg/l   |

|                                    |           |      |
|------------------------------------|-----------|------|
| Total-P after biological treatment | 45,000.00 | mg/l |
|------------------------------------|-----------|------|

To achieve a 2mg/L discharge, which is a level lower than NRW guidelines, the amount of phosphorous discharged to the soakaway per day will be:

|                                    |            |      |
|------------------------------------|------------|------|
| Total-P after Dosing               | 2.000      | mg/l |
| Total-P after biological treatment | 9,000.000  | mg/l |
| Total-P to be removed              | 36,000.000 | mg/l |

Knowing the amount of Phosphorus required to be removed we can calculate the necessary of Coagulant based on below Formula



The coagulant used is typically a Metal salt i.e., Ferric Chloride, Ferric sulphate, Poly-aluminium Chloride, etc.

Please note that the calculation has not considered, as far as mitigation is concerned, the existing septic tank on site that will become obsolete, due to the flow from the associated dwelling being diverted to the proposed treatment plant. It is thought that such a system would produce approximately twice the Total P as an equivalent sewage treatment plant. However, the exact flows are not known to the septic tank, therefore, not considering the effect of removing the tank will give a more robust assessment.

## Indicative Treatment Layout

