Supporting guidance for Rural Sustainable Drainage Systems – Retention Pond

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Retention ponds are permanent water features designed to hold run-off long enough for self-purification processes to clean up low levels of pollution.

Table of Contents

Benefits

Ponds can reduce pollution risk by slowing down run-off, allowing pollutants to filter or settle out and be taken up by plants and / or broken down in the soil.

In relation to steadings, ponds are useful for accepting and treating run-off from clean yard areas. This should preferably as part of a treatment train approach, where the pond accepts run-off from another feature such as a sediment trap and / or swale. They are not appropriate for accepting more polluted types of run-off such as slurry.

Ponds can also be used in-field to help manage soil erosion risks.

> ***Using a combination of rural sustainable drainage systems will be more effective than individual measures – the treatment train approach.***

What needs to be done?

Note: Where an assessment has been carried out as part of the diffuse pollution audit there is no need to carry out the assessments noted below.

Drainage from a steading

Where it is proposed that the pond will take drainage from a steading the first step should be to carry out a drainage assessment. The aim of this is to illustrate which parts of the yard areas will be suitable to be discharged to the pond. See attached annex for information on identifying different drainage types.

It is important to note that steading areas which produce slurry or that are contaminated with slurry must not be conveyed to a pond.

Field run-off

For arable situations, the principle aim of the pond will be to collect overland run-off to allow sediment to drop out. In grassland situations the purpose may be to capture run-off from a track or road used by livestock or machinery and to discharge it to grassland away from watercourses.

For in-field ponds it will be necessary to carry out a simple risk assessment to identify which fields are at risk of erosion and where the pond should be created.

Using a map, such as a copy of the IACS map, identify all watercourses on the farm or area of land in question.

The next step is to consider where the potential for soil erosion is greatest and where this can pose a risk to the water environment.

This assessment should consider the following:

- proximity to nearby watercourses – the closer the area is to a watercourse, the greater will be the risk.
- slope of the land will be one of the most significant factors– the steeper the downward slope towards the watercourse the greater will be the risk. Slopes of over three degrees (1 in 14) should be considered moderate risk and those above eight degrees (1 in 7) considered high risk. Fields with slopes which tend to converge or fall to a specific low point or corner of the field near to a watercourse will have a particular high risk of causing pollution. Long, uninterrupted slopes are also of greater risk of erosion
- past experience – consider where it has previously been noted that surface run-off has entered a watercourse or where soil erosion has occurred
- soil texture – light soils with a high sand content are at greater risk of erosion

Once the assessment has been completed, identify on the map those areas which are at risk of soil erosion and which may potentially pollute a watercourse. Mark on the map where the pond would be best located to intercept the run-off and where it should discharge to.

Design guidelines

Key design guidelines [1]:

- for steadings, the surface area should be 3–7 per cent [1, 2, 3] of the catchment area and for ponds taking surface run-off from fields the surface area should be 1–2 per cent of the drainage catchment
- the pond should have a two-stage design, with a sediment trap or sediment forebay, followed by a second larger body of water
- a sediment forebay will improve the ability of the pond to treat the run-off and allow accumulated sediment to be easily removed
- a permanent pool volume should be provided for water quality treatment with a provision for temporary / additional storage capacity for times of high rainfall
- the length:width ratio should be between 3:1 and 5:1
- the open water area should have a minimum depth of 1.2 metres with a maximum permanent depth of two metres. Note however it can be beneficial to provide additional temporary storage for times of high rainfall
- the sides of the pond should have slopes of 3:1 or gentler for safety and have a shallow bench to encircle deeper water, with emergent vegetation such as reeds (*Phragmites*)
- for safety, designs should provide for an aquatic and dry grass safety bench on the periphery
- where there is more than one inlet, they should be sensibly located at the start of the feature to minimise the risk of short-circuiting or erosion
- adequate access to the sediment forebay in particular should be provided for ease of maintenance. An attractive and effective design is to use a shallow berm to divide the sediment forebay in a retention pond from the main body of water; reeds (*Phragmites)* can spread across the berm forming a living filter between the two parts of the pond

Factors affecting performance

- it’s important to remember that ponds are not intended to treat slurry or effluents but to help to treat run-off which currently discharges directly to a watercourse
- short circuiting and leakage can reduce effectiveness and should be considered at the design stage
- minimise the volume or level of polluted run-off that the pond must deal with. On a steading, several localised grass swales (or grass margins) may be a more practical option than creating one large feature on a steading. Within an arable field, measures such as running tramlines across slopes, relieving compaction, creating within field buffers etc will help to reduce the risk of soil erosion

- ponds are best used as part of a treatment chain whereby combinations of rural sustainable drainage systems are used, such as a sediment trap, swale and then a pond

Maintenance

- ideally exclude livestock where practical
- remove silt as required
- check and clear any inlets or outlets as required

Further information

- [1] The SuDS Manual CIRIA Report C697, CIRIA (2007)
- [2] Guidance for Treating Lightly Contaminated Surface Run-off from Pig and Poultry Units, Northern Ireland Environment Agency (2006)
- [3] Diffuse Pollution, Campbell et al (2004), IWA Publishing, ISBN: 1 900222 53 1
- Sedimentation in Small Constructed Wetlands. Retention of Particles, Phosphorus and Nitrogen in Streams from Arable Watersheds, Braskerud BC (2001), Doctor Scientiarum Theses 2001:10, Agricultural University of Norway, As, Norway, ISSN: 0802-3220
- Best Management Practice (BMPs) Manual
- Ponds, Pools and Lochans, SEPA (2000)

Annex – Identifying run-off types

In general, farm steadings, particularly livestock farms, produce a wide range of run-off ranging from relatively clean roof water to highly contaminated run-off and slurry.

Roof run-off can be considered relatively clean and may already directly discharge to a watercourse. Exceptions may include poultry or pig house roofs with roof vents. Also, any buildings or areas constructed after 1 April, 2007 must be drained by a sustainable drainage system, and roof water can discharge to a closed soakaway or to a watercourse via an infiltration trench or swale.

Yard run-off tends to vary to a greater degree in its polluting load. Therefore, for the purpose of producing the plan for this option, run-off should be classified as:

Slurry

The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003 as amended (SSAFO) defines slurry as excreta produced by livestock while in a yard or building and includes a mixture of run-off containing excreta, bedding etc, from yards and buildings used by livestock and middens, weeping wall structures etc.

Run-off from such areas requires to be collected in a slurry storage system. However there is a provision to allow certain types of slurry to be conveyed to a constructed farm wetland that has been designed in accordance with the Constructed Farm Wetland Design Manual. The types of slurry that can be conveyed to such constructed farm wetlands for treatment includes run-off from:

- areas used by livestock occasionally, but excluding areas where livestock regularly move on and off to be milked, housed, fed or gathered
- silos within the period 1 November to 30 April, unless a crop has been added to the silo within this period. This excludes run-off from silos where livestock have access, such as self-feed silos

Lightly contaminated run-off

This could include drainage from yards and areas where livestock do not frequently have access, which are not contaminated with oils and pesticides. It is accepted that such areas will build up a degree of contamination from passing machinery and other activities carried on nearby. In the majority of cases this run-off would be suitable for treatment via a rural sustainable drainage system or alternatively could discharge to local grassed areas.

Dairy washings

This includes washings from the milking parlour and rinsings from the milk storage tank(s), milking machine and ancillary equipment. These types of effluent can be highly polluting and should be collected in a slurry storage facility or a dedicated storage tank.

Pesticide contaminated run-off

Drainage from pesticide handling and loading areas must not be allowed to discharge into a surface water drainage system or a rural sustainable drainage system. There is a capital item available for upgrading pesticide handling facilities.