Supporting guidance for Managing Steading Drainage and Rural Sustainable Drainage Systems

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This capital item provides a contribution towards the costs of measures designed to keep clean and dirty water separate and allows for the treatment of lightly contaminated run-off from yards and other areas.

In particular this will:

- keep roof and polluted yard water run–off separate minimising the quantity of dirty water
- prevent run-off originating from clean / lightly contaminated yard areas mixing with run-off from dirty yard areas
- allow run-off from clean / lightly contaminated yard areas, which currently discharges directly to a watercourse or clean water drain to be diverted to a rural sustainable drainage system for treatment

Rural sustainable drainage systems, such as swales, ponds and wetlands, can be applied for through separate capital items. They are a sequence of water management practices and facilities designed to drain surface water run-off. They do this in a manner that provides a more sustainable approach than the historic conventional practices of routing run-off through a pipe to a watercourse.

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Benefits

Putting in place measures to help minimise the volumes of dirty water produced on the farm will help prevent sediment, nutrients and bacteria washing to ditches or burns etc. via farm drains. The measures may also reduce the volume of stored effluents that have to be subsequently spread to land.

What needs to be done?

The main purpose of this option is to implement measures to help minimise the production of dirty water and to keep clean and dirty water separate. However, it is also useful to consider, at the planning stage, how different types of run-off will be collected or discharged.

As described below, some types of run-off will require to be collected and stored in a slurry storage facility, some will be suitable for direct discharge to a watercourse and others will be suitable for directing to a rural sustainable drainage system for treatment prior to final discharge.

Drainage assessment

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.

The first step is to carry out an assessment of the steading, focusing on the management of surface water run-off, with a view to identifying the potential sources and pathways of pollutants. This should then be used to identify improvements which can be made to reduce pollution risk.

1. Using a map of the steading (or several maps) highlight:

- areas which produce clean and dirty water (roofs, areas accessed by livestock, pesticide handling areas, areas only accessed by machinery etc). See the 'Identify drainage types' section below
- aim to differentiate between areas which must drain to a slurry store, areas which can drain direct to a watercourse and areas where the drainage would be suitable for diverting to a rural sustainable drainage system
- current drainage and where it discharges (slurry store, direct to watercourse, grassed areas)
- highlight areas that must drain to a slurry store, areas that go direct to watercourses (e.g. roofs of cattle courts, general purpose buildings), areas that already safely drain to grassed areas, and areas that could drain to a rural sustainable drainage system. Assess the volumes of water these areas produce
- what improvements could be made to minimise the production of contaminated drainage at source. Such as concreting existing uncovered courts or yards, changing slopes of yards, installing ramps, sleeping policemen or channels location of any proposed works that are part of the application including any rural sustainable drainage system feature

2. List of potential risks identified from the steading map you have produce.

3. Action plan including timescales as to how these risks will be dealt with.

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, as described below:

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:

1. 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

2. 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.

3. 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.

4. 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.

Once the various run-off types produced on the farm are understood, it will be possible to determine which areas of the steading need to drain to a slurry store and those areas where other management options may exist. This will allow you to select the rural sustainable drainage measures that are most suitable to be installed within the steading to manage run-off and minimise the risk of pollution.

A simple hierarchy of preferred management techniques should guide pollution prevention work on farms steadings:

1. Containment as the priority action for slurry, midden drainage, wash waters, oil tanks and agrochemical stores, in accordance with codes of practice and regulations. Minimise the production of dirty water, and take appropriate steps to keep clean water clean.

2. Do not create potential pathways for pollution unnecessarily. If periodic seepage from an access track or lightly contaminated yard area simply seeps into a field edge or across a grass strip to disperse in a field away from drains or watercourses leave it that way. The focus should be on areas which currently discharge direct to a watercourse.

3. Once the run-off types have been identified and appropriate steps have been implemented to collect and store slurry and minimise the production of dirty water. The final step is to decide how rural sustainable drainage systems can be used in the treatment train of measures to treat the run-off which currently discharges direct to watercourse.

Incorporation of rural sustainable drainage systems into the steading drainage system

For all steading types grass filter strips (grass margins or swales) and / or engineered features, such as swales, retention ponds and wetlands, can be used to treat lightly contaminated run-off.

The main purpose of the rural sustainable drainage system is to:

- discharge run-off to the burn or river which does not pose a pollution risk
- slow and store run-off to help reduce flood risks
- increase biodiversity

Rural sustainable drainage system measures suitable for steadings

Table 1 below summarises the basic rural sustainable drainage system characteristics, their pollutant removal processes and their potential on farm application.

SUDS feature	Pollutant removal process	Factors promoting pollutant removal	Farm applications
Grass margins, to filter pollutants from run-off	Filtration Absorb soluble pollutants Break down in aerobic soils	Evenly distributed flow across surface. Cut turf best for filtration, not so critical for absorbing soluble pollutants, but level turf helps even distribution for degradation; tussock growth leads to concentrated seepages	Below pollution sources, wherever space and practicality allows; at steading and infield. **Priority source control option**

Grass swales	Filtration and absorption of soluble pollutants if not overloaded	Shallow sloping filter strip sides, broad even base and trapezoidal cross-section. Open to UV light and aerobic conditions for degradation. NB/ a ditch is not a swale	May also be useful as part of infield soil erosion control strategy on arable farms
Sediment traps and bunds	Sedimentation Blocking a rill discharge infield	Regular removal of trapped material from the sediment trap Limit loading at source Provision as part of a treatment train	Infield features can be very effective as part of soil erosion strategy For steading silt traps give limited benefit; out-of-sight, low capacity and irrelevant for soluble pollutants
Constructed wetlands	Sedimentation Aerobic degradation	Sedimentation enhanced by presence of emergent vegetation and degradation by microbial attachment to stems, plus aerobic conditions if lightly contaminated	For steading drainage requires some source control measures, and a two-stage design facilitates maintenance
Retention pond	Sedimentation, and nutrient uptake (if low level contamination and at least four weeks residence time	Very slow flow, long residence time, low level contamination Sedimentation in a forebay pond, dispersed, even flow to second stage of pond	Final stage treatment feature for low level contamination. Habitat enhancement feature. Contingency measure for dealing with major accident involving release of pollutants Two-stage basins desirable (management of accidents, removal of sediment)

Table 1 - pollutant capture characteristics of some SUDS features in relation to applications on farms (modified from Campbell *et al* 2004)

Run-off to local grassland / grass margins

Grassed areas are suitable for accepting run-off from small areas that are not polluted with slurry. It is, generally, not advisable to collect flows and pollutants which are currently safely managed to then try and provide treatment. However, seepages of pollutants onto filter strips close to watercourses or drains, or onto sloping land above watercourses must be avoided.

Swales

Swales are useful for slowing down the rate of run-off and allowing filtration. They are most appropriate as a pre-treatment option, used to collect run-off and convey it to a wetland or pond. Where the drainage volumes are small relative to the size of the swale it may be sufficient on its own. Provided it does not become inundated at times of high rainfall.

Ponds

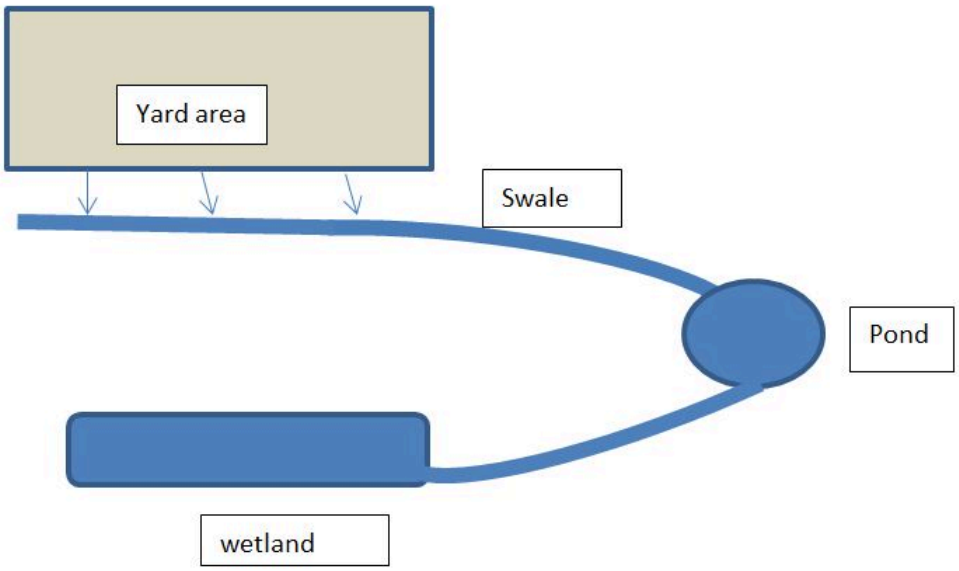
Ponds are particularly good for slowing down run-off through a drainage system and providing storage in situations where the capacity offered by a swale would be insufficient. The deeper water levels provided by ponds offers the opportunity for sediment contained within the run-off to drop out. Hence, ponds are particularly useful where run-off contains higher levels of soil and sediment or where there are higher volumes of clean run-off such as from roofs. They are best located after swales and any sediment traps and before wetlands in the treatment train.

Wetlands

Wetlands tend to be the final step in the treatment train approach. Their shallow vegetated cells offer a greater treatment potential compared to ponds and are particularly useful for helping to remove dissolved nutrients through breakdown in the soil and uptake by the plants.

The items that are most relevant to a given situation will depend on a variety of site specific factors such as available space, drainage volumes and types of run-off. In most cases however the most effective

system will involve the use of a combination of appropriately designed rural sustainable drainage system features, as below.



Clean and dirty water separation

This item specifically funds various types of works aimed at minimising the risk of contamination of run-off that discharges to the water environment:

Underground pipework

Underground pipework can be used to help keep clean and dirty water separate by, for example, collecting clean run-off from a roof, bypassing a dirty yard area and discharging it to a watercourse.

To install underground pipework within an existing concrete yard a drainage trench will require to be cut, excavated and a new pipe together with chambers and connections installed and covered with aggregate and with a concrete finish.

Concreting existing uncovered steading or court surfaces

Upgrading existing uncovered surfaces using concrete can help keep yard areas clean and reduce the volumes of dirty water produced. This work is expected to involve scraping the surface, installing an aggregate base with a steel mesh and concrete finish.

Surface drainage interception

Measures such as re-grading yard areas to create a slope can be useful to direct run-off in a particular direction such as towards a collection point or to divert run-off from a clean yard area away from a contaminated yard area, or vice versa.

The incorporation of kerbs, channels, cross drains and sleeping policemen or ramps can also be used to intercept and control run-off from yard areas or tracks.

Raised kerbs if properly sealed can prevent contaminated run-off entering a clean water (roof) drain.

Maximum protection can be achieved by completely sealing down pipes to the drain and eliminating open surface water grid.

Where clean or lightly contaminated drainage currently discharges safely to local grassed areas away from watercourses or open drains etc. then the best environmental option is usually to allow this to continue. Effort should be focused on the run-off which currently discharges direct to a watercourse and ensuring that all slurries are adequately collected.

Further information

- The SuDS Manual. CIRIA Report C697, CIRIA, 2007, and in book format from www.ciriabooks.com ISBN: 978-0-86017-697-8
- Rural Sustainable Drainage Systems (RSuDS), The Environment Agency, Bristol (pp. 17-18 and 50-51). ISBN: 978-1-84911-277-2
- The Prevention of Environmental Pollution From Agricultural Activity (PEPFAA) Code of Good Practice
- Farm and Water Scotland Know the Rules Guide, Scottish Government, 2013
- The 4 Point Plan, Scottish Government, 2005
- *Diffuse Pollution: An Introduction to the Problems and Solutions*. Campbell N, D'Arcy B, Frost A, Novotny V and Sansom A (2004). IWA Publishing, London. ISBN: 1 900222 53
- Guidance for Treating Lightly Contaminated Surface Run-off from Pig and Poultry Units, Northern Ireland Environment Agency, 2006