

Flood Attenuation and SUDS

Use of a rainwater harvesting tank as a means of attenuating flood water flow

A white Paper from RainWaterHarvesting.co.uk

There is more and more support from government and councils for rainwater harvesting tanks as a means of attenuating flood water and of reducing the amount of water we put to drain. At the same time, some councils are interpreting this by obliging home builders to submit with their planning applications a plan for flood attenuation, as part of or separate from their rainwater harvesting proposal. This paper is therefore intended to advise clients how to respond to such demands for flood attenuation plans and to appraise them of options available.

It would seem that there are four arguments to focus on, three of which (1 to 3 below) come from the government's own briefing materials. The fourth (4 below) is the base principles of water retention, as part of a rainwater harvesting system or in addition, which can form part of a home builder's plan.

Much of flood attenuation has to do with rainwater coming of hardstandings and gardens, not just off the roof. We should stress that we do **not** recommend that home owners collect any rainwater other than off the roof: hardstanding water might be polluted by animal droppings, oil spills etc., and is not suitable for water destined for washing clothes etc.

Overall, the official stance clearly is to encourage rainwater harvesting in the context of flood attenuation. See below for the 2 recent revisions to planning regs which clearly advocate rainwater harvesting.

1) Planning Permission

UK Government's support in Planning Permission guidelines for Rainwater Harvesting as a means of attenuating flood

<http://www.communities.gov.uk/documents/planningandbuilding/pdf/ppscclimatechange.pdf>

QUOTE

UK Government: Planning Permission will favour applications with rainwater harvesting

Planning Policy Statement: Planning and Climate Change, Supplement to Planning Policy Statement 1

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Site	Planning, building and the environment
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As of December 2007 councils give expeditious and sympathetic handling of planning permission to applications which include rainwater harvesting, as follows:

40. An applicant for planning permission to develop a proposal that will contribute to the delivery of the key Planning Objectives set out in this PPS should expect expeditious and sympathetic handling of the planning application.

42. In their (i.e. planners') consideration of the environmental performance of the proposed development.

- give priority to sustainable drainage systems, **paying attention to the potential contribution to be gained from water harvesting from impermeable surfaces** and encourage layouts to accommodate grey water recycling.

END OF QUOTE

2) Hardstandings

UK Government's recommendations in "hardstandings" guidelines for RainWater Harvesting as a means of attenuating flood

<http://www.communities.gov.uk/documents/planningandbuilding/doc/969973.doc>

QUOTE

Flood Attenuation

Flooding during the summers of 2007 and 2008 drew attention to any measures that could reduce flooding. For example, in Sept. planning regulations were changed on hardstandings:

"From 1 October 2008 the permitted development rights (see Glossary) that allow householders to pave their front garden for hardstanding without planning permission have changed. Planning permission is now required to lay traditional impermeable driveways that allow uncontrolled runoff of rainwater from front gardens onto roads, because this can contribute to flooding and pollution of watercourses.

If a new driveway or parking area is constructed using permeable surfaces such as permeable concrete block paving, porous asphalt or gravel, or if the water is otherwise able to soak into the ground you will not require planning permission. The new rules will also apply where existing hardstandings are being replaced. The new rules apply to hard surfaces exceeding 5 square metres in area."

"What are the options? (see section 2 page 9)

Water from a paved surface can be dealt with using three main approaches:

- Soaking into ground (soakaway)
- Rainwater harvesting (see Glossary) or storage for later use
- Flowing to the drains, but this should be the last option considered and might not be permitted development

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From "Guidance on the permeable surfacing of front gardens" Communities and Local Government publication"

<http://www.communities.gov.uk/documents/planningandbuilding/doc/969973.doc>

END OF QUOTE

We should stress that we do **not** recommend that home owners collect any rainwater other than off the roof: hardstanding water might be polluted by animal droppings, oil spills etc., and is not suitable for water destined for washing clothes etc.

3) SUDS - Sustainable Drainage Systems

The Environment Agency is the ministry which establishes government policy in the areas of flood attenuation and SUDS (Sustainable Drainage Systems).

General information about floods and how to reduce them is at <http://www.environment-agency.gov.uk/homeandleisure/floods/31736.aspx>

The best page to start for information on SUDS is at <http://www.environment-agency.gov.uk/business/sectors/36998.aspx>

The Code of Practice for SUDS is at http://www.environment-agency.gov.uk/static/documents/Business/icop_final_0704_872183.pdf

Nothing in the official documentation seems to link flood attenuation or SUDS with rainwater harvesting, but if any reader does find such a link in any official documentation we would be grateful to know about it. Note also that SUDS applies to urban water management and is often incorrectly applied to country sites by councils.

The relevant parts of the Environment Agency statements are, in our understanding, as follows. But we would advise you to read the documentation yourself to ensure you have access to everything that might be relevant.

“Traditional drainage is designed to move rainwater as rapidly as possible from the point at which it has fallen to a discharge point, either a watercourse or soakaway.

“This approach has a number of harmful effects:

- Run-off from hard paving and roofing can increase the risk of flooding downstream, as well as causing sudden rises in water levels and flow rates in watercourses.
- Surface water run-off can contain contaminants such as oil, organic matter and toxic metals. Although often at low levels, cumulatively they can result in poor water quality in rivers and groundwater, affecting biodiversity, amenity value and potential water abstraction. After heavy rain, the first flush is often highly polluting.
- By diverting rainfall to piped systems, water is stopped from soaking into the ground, depleting ground water and reducing flows in watercourses in dry weather.

“As a result, many urban watercourses are lifeless and unattractive, and are often hidden in culverts under the ground.

“The SUDS approach to drainage incorporates a wide variety of techniques.

“As a result, there is no one correct drainage solution for a site. In most cases, a combination of techniques, using the Management Train principle, will be required.

“The elements of the Management Train are outlined in the following pages. For more detail, refer to our publication 'Sustainable Drainage Systems – an introduction'.

“Follow the links below to read more about:

- [control of rainwater at source](#)
- [infiltration trenches and filter drains](#)
- [swales and basins](#)
- [ponds and wetlands](#)

“Prevention plays an essential part in the Management Train. This includes both the prevention of run-off and the prevention of pollution.

“The prevention of run-off requires careful consideration of the need to pave a surface – a gravel surface for a car park may be an acceptable alternative – and the disposal of roofwater. For example, it may be possible to discharge roofwater onto a lawn, where it can soak into the ground.

“The prevention of pollution includes a wide range of measures designed to tackle urban diffuse pollution. These include:

- safe oil and chemical storage at industrial sites
- safe disposal of waste oil and chemicals from domestic and industrial premises
- minimal use of herbicides or the use of alternative techniques for weed control in public areas
- proper disposal of wash water from cleaning activities to the foul sewer
- steps to prevent the illegal connection of foul sewage flows to surface water sewers
- a dog litter policy”

end of quote

4) Engineering, water flow principles

Further input from RainWaterHarvesting.co.uk:

4.1) Attenuation and dissipation by any water holding device

Any tank, crate array, land drain, soakaway or storage device will serve to attenuate water flow to the drain when it rains hard. Water flows into an empty or part empty holding area and dissipates more slowly to the drain.

4.2) Rainwater harvesting tanks serve to attenuate flood water

Therefore any rain water system attenuates the flow of water during heavy rain storms because an empty or part empty tank will take up much of the initial flow off the roof.

An attenuation device is available which converts a pre-allocated volume of a rainwater tank into an attenuation device. For example, a tank of 6500 litres, equipped with this device, allows the first, say, 3000 litres to flow to drain through a construction, i.e. at low flow rate. This therefore stops the first 3000 litres of a rain shower from going down the drain and releases it over the next day or so in a controlled fashion. This is what councils and water boards are often seeking. The remaining 3500 litres stays in the tank to supply the house and garden.

Bear in mind that if the tank is largely empty, which is often the case when a heavy shower comes in summer, then all that available capacity serves to attenuate flow.

4.3) Rainwater harvesting tanks serve to reduce total water flow to drain

Any rainwater harvesting system, in addition, reduces the total amount of water going to drain, because water is drawn off for productive uses (flushing toilets, washing clothes and watering the garden in between those rain storms).

The logic of these issues suggests that some individuals in the Environment Agency (references available to others in government) should probably be advocating rainwater harvesting more enthusiastically. Are there flaws in their arguments or have we misunderstood them? Do they represent an official line in which case can they give us web links or references to them?

3.4) Rainwater harvesting tank attenuates run off from hardstandings

These individual sources admit that rainwater harvesting does have the advantage over standard flood attenuation products in that the saved rain can be used productively! Certainly, if the site is prone to flooding, and/or if a large area of hard standing is planned round the houses, extra measures would need to be taken, such as a rainwater harvesting tank.

However, we noted in the intro that we do **not** recommend that home owners collect any rainwater other than off the roof: hardstanding water might be polluted by animal droppings, oil spills etc., and is not suitable for water destined for washing clothes etc. A separate tank would need to be installed for hardstanding water, which could be stored for garden use.

3.5) Rainwater harvesting tanks do not fall into disrepair

Some individual sources in ministries have said, in writing, say that rainwater harvesting systems will fall into disrepair. We would dispute this. The tanks are guaranteed for 15 to 25 years depending on manufacturer and the user will be needing to keep them maintained and cleaned so that their toilets get flushed and their clothes get washed. Rainwater harvesting filters are self-cleaning and the leaves and debris are flushed to drain or soakaway. They DO function as designed. We don't see why they should fall into disrepair any more quickly than flood attenuation products, in fact, they are less likely to do so. Flood attenuation crates are subject to blocking with leaves because there is no natural means of getting rid of the leaves and they can clog against the internal structure.

Both the government and the rainwater harvesting industry agree that rainwater harvesting tanks attenuate and reduce flood water flow and should be encouraged at every level including the planning process.

5) Other water attenuation solutions

When responding to a council, usually as part of the planning permission application process, it will be important to show, by using the arguments above, that a "plan" has been established to help reduce flooding by reducing the amount of rainwater released from the building or property during a shower. In addition to substantiating rainwater harvesting tanks as a positive contribution to flood attenuation, the following solutions could also play a part and could be included in the plan.

5.1) Crates as soakaways

We supply drainage anti-flooding blocks (the Graf Bloc in our case) for rapid drainage of land. Surface water is quickly diverted or soaks down into weight resistant crates, underground, and from there dissipates into the lower ground slowly.

5.2) Culverts as soakaways

On the same principle as 5.1, many larger buildings are equipped with an underground culvert, usually in concrete, with a cross section of about 1 square metres and a length of between 5 and 20 metres. This would have a capacity of between 5,000 and 20,000 litres. Roof and/or ground water flows rapidly into the culvert and is only permitted to flow to drain or soakaway from its lower end through a restriction.

5.3) Ponds and water features

Any low lying area including fish ponds and water features make a positive contribution to flood attenuation. Firstly, they require topping up and will reduce the total amount of water being sent to drain from the property. Secondly, in the event of excess water, they will hold a certain quantity before overflowing.

5.4) Soakaways

Any soakaway contributes to flood attenuation because it will absorb water which would otherwise go to drain during a heavy shower. The soakaway releases water slowly to the ground over time.

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