

## **APPENDIX I - COMMONLY USED TERMS**

### **Attenuation**

Reduction of peak flow and increased duration of a flow event.

### **Balancing pond**

A pond designed to attenuate flows by storing runoff during the peak flow and releasing it at a controlled rate during and after the peak flow has passed. The pond always contains water. Also known as wet detention pond.

### **Basin**

Flow control or water treatment structure that is normally dry.

### **Bio retention area**

A depressed landscaping area that is allowed to collect runoff so it percolates through the soil below the area into an under drain, thereby promoting pollutant removal.

### **BRE Environmental Assessment Method (BREEAM)**

The most widely used environmental assessment method for buildings. It sets the standard for best practice in sustainable development and demonstrates a level of achievement.

### **Catchment**

The area contributing surface water flow to a point on a drainage or river system. It can be divided into sub-catchments.

### **Construction Industry Research and Information Association (CIRIA)**

CIRIA is a member-based research and information organisation dedicated to improvement in the construction industry.

### **Climate Change**

Any long-term significant change in the average weather that a given region experiences. Average weather may include average temperature, precipitation and wind patterns.

### **Code for Sustainable Homes**

The Code measures the sustainability of a new home against categories of sustainable design, rating the whole home as a complete package.

### **Combined sewer**

A sewer designed to carry foul sewage and surface runoff in the same pipe.

### **Detention basin**

A vegetated depression, normally dry except after storm events constructed to store water temporarily to attenuate flows. May allow infiltration of water to the ground.

**Department for Environment, Food and Rural Affairs (DEFRA)**

UK Government Department that champions Sustainable Development, helping Government as a whole to deliver economic, social and environmental sustainability.

**Development Plan Document (DPD)**

The new system of local planning brought in under the Planning and Compulsory Purchase Act 2004, the term 'development plan document' covers any Local Development Document that is part of the development plan. A development plan document has to be independently tested by a Government inspector and carries full weight in relation to planning applications, which distinguishes it from a supplementary planning document.

**Eco-homes**

Eco-homes is a version of BREEAM for homes. It provides an authoritative rating for new, converted or renovated homes, and covers houses, flats and apartments.

**Environment Agency**

Are a UK non-departmental public body of DEFRA with the principle aim of protecting and enhancing the environment to make a contribution towards the objective of achieving sustainable development. The Agency has principle responsibility for river flooding.

**Evapotranspiration**

The process by which the Earth's surface or soil loses moisture by evaporation of water and by uptake and then transpiration from plants.

**Exception Test**

If, following application of the Sequential Test (see below), it is not possible for proposed development to be located in zones of lower probability of flooding, the Exception Test should be applied. For the Exception Test to be passed:

- it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and
- a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

**Filter drain**

A linear drain consisting of a trench filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water, but may also be designed to permit infiltration.

**Filter strip**

A vegetated area of gently sloping ground designed to drain water evenly off impermeable areas and filter out silt and other particulates.

**Flood frequency**

The probability of a flow rate being equalled or exceeded in any year.

**Floodplain**

Land adjacent to a watercourse that is subject to repeated flooding under natural conditions.

**Flood Mitigation**

Methods of reducing the effects of floods. These methods may be structural solutions (e.g. reservoirs) or non-structural (e.g. land- use planning, early warning systems).

**Flood Risk Assessment (FRA)**

An assessment of the risk of flooding, particularly in relation to residential, commercial and industrial land use. FRAs are required to be completed according to the NPPF alongside planning applications in areas that are known to be at risk of flooding.

**Flood routing**

Design and consideration of above-ground areas that act as pathways permitting water to run safely over land to minimise the adverse effect of flooding. This is required when the design capacity of the drainage system has been exceeded.

**Flow control device**

A device used to manage the movement of surface water into and out of an attenuation facility, e.g. a weir.

**Fluvial flooding**

Flooding from a main watercourse (brooks, streams, rivers and lakes etc) that occurs when the water features cannot cope with the amount of water draining into them, from the land. When rainfall is heavy and / or prolonged, a large amount of run-off reaches the rivers and eventually causes them to overtop their banks.

**Grampian Condition**

A "Grampian condition" is a planning condition attached to a planning permission that prevents the start of a development until off-site works have been completed on land not controlled by the applicant. E.g. off-site drainage works to a watercourse.

**Greenfield runoff**

This is the surface water runoff regime from a site before development, or the existing site conditions for brownfield redevelopment sites.

**Green roof**

A roof with plants growing on its surface, which contributes to local biodiversity. The vegetated surface provides a degree of retention, attenuation and treatment of rainwater, and promotes Evapotranspiration.

**Greywater**

Wastewater from sinks, baths, showers and domestic appliances. A Greywater system captures this water before it reaches the sewer (or septic tank system).

**Groundwater**

Water that is below the surface of ground in the saturation zone.

**Highways Agency**

The government agency responsible for strategic highways, i.e. motorways/trunk roads.

**Hydrological**

The occurrence, circulation, distribution, and properties of the waters of the earth and its atmosphere.

**Impermeable surface**

An artificial non-porous surface that generates a surface water runoff after rainfall.

**Infiltration (to the ground)**

The passage of surface water through the surface of the ground.

**Infiltration (to a sewer)**

The entry of groundwater to a sewer.

**Infiltration device**

A device specifically designed to aid infiltration of surface water into the ground.

**Infiltration trench**

A trench, usually filled with stone, designed to promote infiltration of surface water to the ground.

**Lead Local Flood Authority (LLFA)**

Established through the Flood and Water Management Act as the body responsible for managing local flood risk from surface runoff, ordinary watercourses and groundwater.

**Local Highway Authority**

A local authority (Gloucestershire County Council) with responsibility for the maintenance and drainage of highways maintainable at public expense.

**Material Consideration**

A legal term describing a matter or subject which is relevant (material) for a local authority to consider when using its powers under planning law in dealing with a planning application.

**Microbial decomposition**

The breaking down of complex molecules into constituent parts or elements by microorganisms.

**Natural Environment and Rural Communities Act (NERC)**

Designed to help achieve a rich and diverse natural environment and thriving rural communities through modernised arrangements for delivering Government policy.

**Operating Authorities**

Any body, including the Environment Agency, Internal Drainage Board, County Council and Local Authority, who have powers to make or maintain works for the drainage of land.

**Ordinary Watercourses**

Any watercourse that does not form part of a main river.

**Permeability**

A measure of the ease with which a fluid can flow through a porous medium. It depends on the physical properties of the medium, for example grain size, porosity and pore shape.

**Permeable pavement**

A paved surface that allows the passage of water through voids between the paving blocks/slabs.

**Permeable surface**

A surface formed of material that is itself impervious to water but, by virtue of voids formed through the surface, allows infiltration of water to the sub-base through the pattern of voids, e.g. concrete block permeable paving.

**Pervious surface**

A surface that allows inflow of rainwater into the underlying construction or soil.

**Piped system**

Conduits generally located below ground to conduct water to a suitable location for treatment and/or disposal.

**Pluvial Flooding**

Flooding that results from rainfall generated overland flow before the runoff enters any watercourse or sewer. It is usually associated with high intensity rainfall events. Also referred to as surface water flooding.

**Pollution**

A change in the physical, chemical, radiological or biological quality of a resource (air, water or land) caused by man or man's activities that is injurious to existing, intended or potential uses of the resource.

**Pond**

Permanently wet basin designed to retain storm water and permit settlement of suspended solids and biological removal of pollutants.

**Porous paving**

A permeable surface allowing the passage of water through voids within, rather than between, the paving blocks / slabs.

**Porous surface**

A surface that infiltrates water to the sub-base across the entire surface of the material forming the surface. E.g. grass and gravel surfaces, porous concrete and porous asphalt.

**Prevention**

Site design and management to stop or reduce the occurrence of pollution and to reduce the volume of runoff by reducing impermeable areas.

**Probability Event**

The statistical probability of a flooding episode (event) occurring.

**Public sewer**

A sewer that is vested in and maintained by a sewerage undertaker.

**Rainwater harvesting or rainwater use system**

A system that collects rainwater from where it falls rather than allowing it to drain away. It includes water that is collected within the boundaries of a property, from roofs and surrounding surfaces.

**Residual Risk**

The Risk that remains after risk management and mitigation measures have been implemented.

**Retention pond**

A pond where runoff is detained (e.g. for several days) to allow settlement and biological treatment of some pollutants.

**Riparian Ownership**

Riparian ownership or riparian rights relates to a legal principle where all landowners whose property adjoins a body of water, have a duty and a right to maintain and make reasonable use of it as it flows through or over their property. These rights cannot be sold or transferred other than with the adjoining land and only in reasonable quantities. Riparian rights/ownership usually relates to land up to the centre of the watercourse where it is located along a land boundary.

**Riparian Duties**

Duties arising from riparian ownership include the duty to pass on the flow of water without obstruction, pollution or diversion affecting the rights of others. To maintain the bed and banks of the watercourse and to clear any debris, whether natural or man-made, to keep any culverts, rubbish screens, weirs and mill gates clear of debris. To be responsible for protection of your land from flooding, and to not cause any obstructions.

**Run-off**

Water flow over the ground surface to the drainage system. This occurs if the ground is impermeable, is saturated or if rainfall is particularly intense.

### **Section 38 Agreement**

An agreement entered into pursuant to Section 38 Highways Act 1980 whereby a way that has been constructed or that is to be constructed becomes a highway maintainable at the public expense. A publicly maintainable highway may include provision for drainage of the highway. (Drainage of highways is defined in Section 100 (9) of the Highways Act 1980).

### **Section 106 (Town and Country Planning Act 1990)**

A section within the Town and Country Planning Act 1990 that allows a planning obligation to a local planning authority to be legally binding.

### **Section 106 (Water Industry Act 1991)**

A key section of the Water Industry Act 1991, relating to the right of connection to a public sewer.

### **Separate Sewer**

A sewer for surface water or foul sewage, but not a combination of both.

### **Sewer**

A pipe or channel taking domestic foul and/or surface water from buildings and associated paths and hard standings from two or more curtilages and having a proper outfall.

### **Sewerage undertaker**

This is a collective term relating to the statutory undertaking of water companies that are responsible for sewerage and sewage disposal including surface water from roofs and yards of premises.

### **Sewers for Adoption**

A guide agreed between sewerage undertakers and developers (through the House Builders Federation) specifying the standards to which private sewers need to be constructed to facilitate adoption.

### **Sequential Test**

The NPPF advocates that planners use a sequential test when considering land allocations for development to avoid flood risk where possible. The Sequential Test aims to steer development to Flood Zone 1, which is an area at low risk of flooding. Where it is not possible to locate development in such locations sites in Flood Zone 2 will be considered. Only where it is not possible to locate development within Flood Zones 1 and 2 will development in Flood Zone 3 be considered.

### **Site and regional controls**

Manage runoff drained from several sub-catchments. The controls deal with runoff on a catchment scale rather than at source.

### **Soakaway**

A subsurface structure into which surface water is allowed to infiltrate into the ground.

**Stormwater**

Rainwater that runs off impervious surfaces and into storm drains rather than being absorbed into the soil.

**Sub-catchment**

A division of a catchment, allowing runoff management as near to the source possible.

**Subsidiarity**

The principle that an issue should be managed as close as is reasonable to its source.

**SUDS (Sustainable Drainage Systems)**

A sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques. Surface water management - The management of runoff in stages as it drains from a site.

**Swale**

A shallow vegetated channel designed to conduct and retain water, but may also permit infiltration; the vegetation filters particulate matter.

**Treatment**

Improving the quality of water by physical, chemical and/or biological means.

**Water Act 2003**

Introduced some changes to the regulation of the water industry in England and Wales under the Water Industry Act 1991, by transferring responsibility for economic regulation from an individual Director General to an Authority (Ofwat).

**Water Authority**

Public, private or combined entity responsible for the provision of drinking water and sewerage service.

**Water Butt**

A container designed to capture rainwater for its reuse.

**Watercourse**

A term including all rivers, streams ditches drains cuts culverts dykes sluices and passages through which water flows.

**Water Management Statement**

A report outlining the water cycle issues relevant to a development proposal and the suitable means of providing for drainage in the long term.

**Wetland**

An area that has a high proportion of emergent vegetation in relation to open water.



## **APPENDIX II - PRINCIPALS OF THE SURFACE WATER MANAGEMENT TRAIN**

The surface water management train (sometimes called the treatment train) is fundamental to designing a successful SUDs scheme and provides a hierarchy of drainage techniques for improving quality and quantity. If water cannot be dealt with at one level in the management train, it should be taken; preferably using SUDs techniques, down the hierarchy and techniques closer to source are preferable to those lower down the hierarchy. Therefore prevention and source control should always be considered before site or regional control and discharging runoff to surface water sewers should only be a last resort, when no other option is available.

### **Prevention**

Prevention seeks to prevent or minimise runoff and pollution; effectively to stop water entering the drainage system. It is applied on individual sites and involves good design. Prevention also involves good site housekeeping measures that will prevent pollutants entering the drainage system:

1. Keeping impervious areas to a minimum would maximise the amount of water that soaks into the ground.
2. Collecting rainwater for re-use.
3. A tidy yard with bunds around chemical storage areas will reduce spillage and leakage into the drainage system.
4. Minimising use of fertilisers, herbicides and fungicides on landscaped areas will reduce runoff of chemicals

Any excess surface runoff that can't be prevented from entering the drainage system is dealt with by the next level down so is subject to source control.

### **Source Control (control of runoff at or near its source)**

Source control forms the start of the surface water management train and should be considered at the outset of development proposals. Source control (best management practice) is the preferred choice in any surface water drainage scheme. Controlling water at or near its source will usually be achieved by relatively small-scale techniques with each technique serving a small catchment area. Source control techniques can include the following:

1. Minimising paved areas - allowing surface water run off to drain naturally, through areas such as gardens, and public open space.
2. Use of porous surfaces where possible.
3. Rainwater recycling/harvesting - capturing rainwater from the roofs of buildings. The capture of rainwater can be used for indoor needs such as flushing toilets, filtered and purified for use within the main water system, stored via water butts for use as grey water for activities such as car washing and general irrigation of gardens.

Good housekeeping and education is essential to minimising pollution associated with surface water run off. Simple measures include, keeping paved areas clean and free of litter and waste, and informing and educating occupants about how the site is drained.

Any water not controlled at source should be subject to the next level down, i.e. site control.

#### **Site Control (the management of water from several sources)**

Site controls are used where adequate control of quantity or quality cannot be achieved with source controls alone after exhausting potential to manage surface water run off through preventative measures. This next level of the management train should be designed with the objective of minimising the quantity of water discharged directly to a river and can include the following:

1. Rainwater recycling.
2. Permeable surfaces and filter drains - permeable surfaces offer alternatives to conventional hard surfaces. Use of materials such as porous paving, gravel, and grass allows water to permeate through the surface, rather than draining off it.
3. Infiltration devices - work by enhancing the natural capacity of the ground to store and drain water. Devices may be in the form of surface features such as swales and filter strips. Generally these are small-scale systems, which are designed to fit into landscaped areas, consisting of vegetated sections of land and grassed depressions, which mimic natural drainage patterns, controlling discharge to a pond or wetland, or other discharge system. These systems assist in removing excess solids and pollutants before final discharge.
4. Devices may also be in the form of below ground features, such as soakaways and trenches. These features create underground reservoirs, which allow surface water to infiltrate gradually into the subsoil, or discharge to another structure at a controlled rate.
5. Grass swales - grassed areas adjacent to roads and pavements with a very shallow depression, allowing water to infiltrate.

Where adequate control of quantity or quality cannot be achieved at site level, flows should be conveyed to regional controls.

#### **Regional Control (the management of runoff from several sites)**

Where surface water cannot be accommodated on site, techniques should be considered which drain water away to a point where it can be returned to the natural water cycle. Regional control of surface water runoff from a site lies at the bottom of the surface water management train and is similar to site control, except the overall catchment area will be greater. It deals with water from several sites and involves the same control techniques although they should not be used on their own without source control provided at the level of individual developments. These systems can contribute to the flow and quality of run off and should be considered as water amenity features that provide habitat and encourage biodiversity. Regional control systems can include:

1. filter drains
2. swales, and
3. infiltration devices

## **APPENDIX III - CASE STUDIES FROM OTHER AREAS**

The following two examples are of development ideas that integrate flood risk management into the development master plan. These measures may not be appropriate in all locations. Further details of each development, including costing can be found in the Life Project - Long-term Initiatives for Flood-risk Environments publication EP98.

## Site 1 > The River Wandle at Hackbridge

Hackbridge is located in the London Borough of Sutton on the upper catchment of the River Wandle. Flood risk is predominantly from the river, which is flashy and responsive to intense rainfall. Climate change could result in longer or more intense rainstorms increasing flash floods from overland run off, sewers and the river. Flood Zone 3 is expected to extend from the river's edge further into the site. A central amenity space, termed the village blue/green, could bring multiple benefits to this suburb, such as space for recreation, flood storage and a focal point to the local area. Higher density development is located in Flood Zone 1. Mixed residential blocks would look onto communal 'rain gardens' as part of a sustainable drainage system (SuDS). Each garden would provide multiple uses, high quality planting treating surface run off and providing a buffer to a toddlers' play area at the centre, this would be raised above a communal rain-water harvesting system. A planted gulley would carry water from the river into the 'village blue' at times of flood. This landscaped hollow is designed to regularly accommodate floodwater, which would slow the flow downstream, and replenish a mix of dry and wetland habitats, providing both high amenity and biodiversity value. 'Space for Water' would be provided through regrading of the riverbank, creating a low-lying flood shelf with soft banks for a range of habitats; the 'village green' would provide a flexible informal recreation area with vegetated banks and areas of hard landscaping. The green would also provide future flood storage potential.



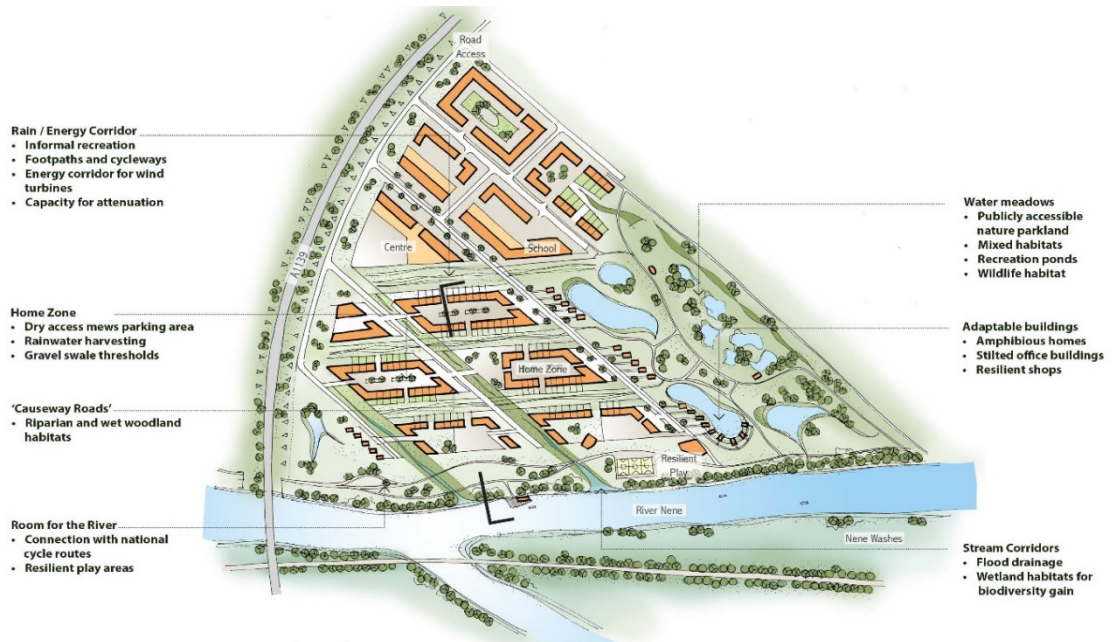
Courtyard rain gardens would slow the passage of rain overland, storing it until the storm has passed





## Site 2 > The River Nene at Peterborough

Peterborough is located on the middle catchment of the River Nene. Flood risk is predominantly from the river. Floodwater volumes are large and floodwater could remain on site for several days. Climate change could result in the flood levels and duration of flooding increasing. Development ideas aim to reunite the city with the river. A mixture of brownfield sites and a landfill site were considered for redevelopment as part of a holistic vision. Higher density development was located close to the city centre and within Flood Zone 1 (low risk). Potential development was organised around a combination of views of Peterborough Cathedral, connections to 'Central Park', and 'stream corridor' drainage paths in times of flood. An adaptable development plan was formed for the Fengate site. The majority of the site was found to be above the 1 in 100 year flood level, having been elevated by the landfill. Climate change could result in this changing and the area becoming at risk from more frequent events. Level variations on site would allow drainage and flood paths to be created away from homes. These were envisaged as high quality, wide and attractive green corridors for public gardens and play areas. Deeper excavations could provide permanent water bodies creating various wildlife habitats and recreation opportunities. Car parking was located on higher levels of the site. A SUDS system, above the flood level, would include green roofs, permeable parking spaces and gravel swales to slow rainwater run-off.



## APPENDIX IV - EXAMPLES OF WATER CONSERVATION METHODS

### Water saving tap devices

**Tap Aerators** with integrated flow regulators reduce the flow rate by 50 % and more.

**Tap Restrictor Valves** reduce flow rates and pressure.

### Water saving shower devices

**Shower timer devices** - restrict the amount of time the shower is left running.

**Low flow showers** - low flow shower-heads help reduce water waste by restricting the flow of water leaving your shower head.

**Shower Start converter** - connects to existing showerheads and automatically pauses a running shower once it gets warm.

**Aerating Showers** - to reduce flow rates.

### Water saving WC's and Urinals

**Urinal Controls** - minimise water consumption within the washroom, whilst maintaining desirable levels of hygiene required for everyday public use.

**Waterless Toilets** - waterless composting toilets treat the waste without needing water and are ideal where water supply is limited or where waste-water disposal is difficult.

**Dual Flush Toilets and Water Saving Siphons** - the water saving dual flush valve can replace an old fashioned siphon. Water saving siphon are also effective in reducing water wastage.

**Reduced Flush tools** - displacement devices, e.g. save-a-flush bags, toilet float booster, toilet tank-bank and water \_hippo'

**Low flush Toilets** - use at least 20 per cent less water than a standard WC.

### Rain Catchment

**Rain Catchment Systems** - collects rainwater from a roof, paved area or runoff. The water is then filtered and stored in an above or below ground tank and can be used for either residential, commercial or landscape use.

### Greywater Recycling Systems

**Greywater recycling** - the first step in installing a grey water recycling system is to separate the grey water (shower/bath/basin and laundry) from black water (toilet and kitchen). Various types are available including:

The **standard system** allows Greywater dispersal and reuse from the complete household. This system uses trench systems and subsurface irrigation. A typical trench for this system is about 400 mm deep and 300 mm wide filled with stone and capped with a layer of sand. The Greywater is initially passed into a settling (sedimentation) tank. This enables larger particles to settle at the bottom of the tank, thus preventing blockages.

The **Water save Trench System** is used for partial Greywater reuse situations and permits wastewater from limited sources, such as from the washing machine and / or bathroom to

be re-diverted into a settling tank (or through a filter) and then into a subsurface drain system, to be re-directed onto garden areas. This system also uses trench systems and subsurface irrigation.

The **Water save Dripper system** comprises four parts. Initially, Greywater is diverted from the normal waste stream, then it passes through either a sedimentation tank or filter, into a pump chamber, and finally the wastewater is dispersed throughout an interconnecting subsurface dripper system.

**Shropshire, Herefordshire, Worcestershire & Gloucestershire Area – ‘Planning – FRA Guidance note 2’** - For Minor Development (See Sub-section 17 within the Flood Risk and Coastal Change Section of the Government’s National Planning Practice Guidance - NPPG), Domestic & Commercial/Industrial extensions (less than 250m<sup>2</sup> & curtilage development) within Flood Zone 3 & Flood Zone 2 (which includes historic flooding data).

The following is advice for the benefit of landowner/occupier & the Environment:

Note: We do not recommend individual FRA consultants but the following website may help you to source a suitably qualified person <http://www.endsdirectory.com/>

**FRA requirements:** The NPPG contains a useful checklist for FRAs at sub-section 26 of the Flood Risk and Coastal Change Section. It is suggested that applications be accompanied by a simple Flood Risk Assessment (FRA) which confirms in writing that as a minimum:

EITHER

- (1) Floor levels within the proposed development will be set no lower than existing levels AND,
- (2) Flood proofing of the proposed development has been considered by the applicant and incorporated where appropriate to 1% (1 in 100 chance each year) river flood level or 0.5% (1 in 200 chance) tidal and coastal level, including climate change allowance.

OR **preferably** that:

- (3) Floor levels within the extension will be set 600mm above the known or modelled 1% river flood level or 0.5% tidal & coastal flood level (including climate change allowance). This should be demonstrated by a plan to Ordnance Datum/GPS showing finished floor levels relative to the known or modelled flood level.

#### **NOTES:**

\* The NPPG refers to Environment Agency guidance on considering **climate change** in planning decisions which is available online: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances> (new allowances were published on 19 February 2016).

Please refer to our separate ‘Area Climate Change Guidance’ (March 2016) for more information on how to consider and incorporate allowances in development proposals. This advises that an allowance should be added to ‘peak river flows’ to account for ‘climate change’ which should be specific to river basin district catchment.

The table below is for ‘**peak river flows**’ within the Severn River Basin district, and specifies the range of allowances to reflect individual development’s lifetime and vulnerability. For example residential would be 100 years (so 2070-2115).



#### FRA Guidance Note

Severn Peak River Flows: Total potential change anticipated	2015-39	2040-2069	2070-2115
Upper end	25%	40%	70%
Higher central	15%	25%	35%
Central	10%	20%	25%

For non-major development, in the absence of modelled information it may be reasonable to utilise a nominal climate change allowance i.e. an alternative appropriate figure. To assist applicants and LPA's we have provided some 'nominal' climate change allowances within our area climate change guidance. These nominal allowances should be considered as appropriate within any FRA.

- For **'more vulnerable'** development e.g. housing, the FRA should use the 'higher central' climate change allowance (35%), as a minimum, to inform built in resilience; but aim to incorporate managed adaptive approaches/measures for the 'upper end' allowance (70%) where feasible.

– For **'water compatible' or 'less vulnerable'** development e.g. commercial, the FRA should use the 'central' climate change allowance (20%), as a minimum, to inform built in resilience; but aim to incorporate managed adaptive approaches/measures for the 'higher central' allowance (25%) where feasible.

**Background:** For proposed extensions within Flood Zone 3/2, the main aspect of flood risk to consider is that the development itself may be at risk of flooding. The most effective means of addressing this risk is through submission of a simple FRA. This should identify the flood risks and set out the proposed measures to mitigate that risk. For most developments within Flood Zone 3/2, submission of a site plan showing floor levels related to Ordnance Datum/GPS should confirm that the site is above flood level. Where such a plan indicates otherwise or is not provided, mitigation measures would focus on controlling floor levels and incorporating flood proofing into the design of the extension.

**Floor levels:** From a flood risk view point, the ideal mitigation in terms of floor levels is to ensure that these are set to above the known or modelled 1% river flood level or 0.5% tidal and coastal flood level at that location. However, in the case of an extension it will often not be practical to raise floor levels given the potential effects on other issues such as access (including that for disabled users), usability and visual amenity. It is advisable that any proposal to raise floor levels should be discussed and agreed with the Local Planning Authority at the earliest possible stage.

#### FRA Guidance Note

**‘Flood proofing’:** The Environment Agency recommends that in areas at risk of flooding, consideration be given to the incorporation into the design and construction of the development of ‘flood proofing’ measures. These include removable barriers on building apertures such as doors and air bricks and providing electrical services into the building at a high level so that plugs are located above possible flood levels. Such measures could also be considered to protect existing property.

Details of flood resilience and resistance techniques can be found in ‘Improving the Flood Performance of New Buildings - Flood Resilient Construction’ (DCLG 2007).

[http://www.planningportal.gov.uk/uploads/br/flood\\_performance.pdf](http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf)

**Residual risks:** It should be noted that if the existing building is in a 'low spot' the measures adopted above in terms of maintaining floor levels at existing levels and flood proofing will not necessarily eliminate risks during a flood event. Applicants should be asked to check ground levels if in doubt about this. Even where it is possible to ensure floor levels are set above the known or modelled 1% river and 0.5% tidal and coastal flood level, *flood risks will remain for an event that exceeds this magnitude.*

#### FURTHER INFORMATION:

**Flood level data** to assist the FRA and Flood Management Plan (where available) may be obtained from our Area Customers & Engagement team on telephone 03708 506506; [shwgenquiries@environment-agency.gov.uk](mailto:shwgenquiries@environment-agency.gov.uk)

**Flood Risk Permit** (Flood Defence Consents until 6 April 2016)

Works (including temporary) in, on or adjacent to a Main River/ Flood structure or Main river Floodplain may need a permit. See <https://www.gov.uk/guidance/flood-risk-activities-environmental-permits> For advice please phone 03708 506506 and ask for the Partnerships and Strategic Overview Team that covers your area.

**Note:** Development which involves a culvert or an obstruction to flow on an Ordinary Watercourse will require consent under the Land Drainage Act 1991 and the Flood and Water Management Act 2010. In the case of an Ordinary Watercourse the responsibility for Consenting lies with the Lead Local Flood Authority (LLFA). In an internal drainage district, the consent of the Internal Drainage Board, instead of the LLFA, is required for the above works under Section 23 of the Land Drainage Act 1991. An Ordinary Watercourse is defined as any watercourse not identified as a Main River on maps held by the Environment Agency and DEFRA. For further information on Ordinary Watercourses contact the LLFA.

As of November 2012 (Flood Map update) in Shropshire, Herefordshire, Worcestershire & Gloucestershire Area, the Flood Zone 2 outline includes historical flooding data.

Last updated: **May 2016**

Contact: Environment Agency, Sustainable Places Team, Shropshire Herefordshire Worcestershire & Gloucestershire Area.  
[shwgplanning@environment-agency.gov.uk](mailto:shwgplanning@environment-agency.gov.uk)



**Shropshire, Herefordshire, Worcestershire & Gloucestershire Area – ‘Planning – FRA Guidance note 3’ - For all development within Flood Zone 2 and 3 (excluding minor development – see definition of minor development at Sub-section 17 within the Flood Risk and Coastal Change Section of the Government’s National Planning Practice Guidance - NPPG)**

The following is advice to assist in the production of a Flood Risk Assessment (FRA).

Note: We do not recommend individual FRA consultants but the following website may help you to source a suitably qualified person <http://www.endsdirectory.com/>

**FRA requirements:** Planning applications must be accompanied by a FRA that is submitted to the Local Planning Authority (LPA). The NPPG contains a useful checklist for FRAs at sub-section 26 of the Flood Risk and Coastal Change Section. To be acceptable as a FRA the applicant should confirm as a minimum:

1. A level survey to Ordnance Datum/GPS showing the known or modelled 1% (1 in 100 chance each year) river flood level, including **climate change\***, or where relevant 0.5% (1 in 200 chance each year) tidal & coastal flood level relative to proposed site levels. For sites in Flood Zone 3, this should include the 5% (1 in 20 year) flood event, or equivalent.
2. An assessment of the risks posed to the site including that based on 1% modelled flooding (including climate change\*), any documented historic flooding and risks associated with surface water runoff from the site (including climate change).
3. Flood Risk to the development and users - Proposed mitigation measures to control those risks for the lifetime of the development, based on a 1% event, including climate change, e.g. setting appropriate floor levels\*\*, providing ‘flood proofing’; safe access & egress\*\*\* for occupiers (especially important where ‘more vulnerable’<sup>1</sup> users or overnight accommodation);
4. Impact on flood risk elsewhere – The NPPG indicates that developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area (flood risk betterment). Issues to consider include providing ‘level for level, volume for volume’ flood storage compensation, reducing impact on storage and flow routes through the layout, form and design of the building/structure; providing surface water disposal\*\*\*\*.
5. Residual risks after mitigation, including risk during an extreme 0.1% (1 in 1000 year) event.

## FRA Guidance Note

### NOTES:

\* The NPPG refers to Environment Agency guidance on considering **climate change** in planning decisions which is available online: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances> (new allowances were published on 19 February 2016).

Please refer to our separate 'Area Climate Change Guidance' (March 2016) for more information on how to consider and incorporate allowances in development proposals. This advises that an allowance should be added to 'peak river flows' to account for 'climate change' which should be specific to river basin district catchment.

The table below is for '**peak river flows**' within the Severn River Basin district, and specifies the range of allowances to reflect individual development's lifetime and vulnerability. For example residential would be 100 years (so 2070-2115).

Severn Peak River Flows: Total potential change anticipated	2015-39	2040-2069	2070-2115
Upper end	25%	40%	70%
Higher central	15%	25%	35%
Central	10%	20%	25%

For 'major development' (as defined within The Town and Country Planning Development Management Procedure (England) Order 2015), we would expect a detailed FRA to provide an appropriate assessment (hydraulic model) of the relevant climate change ranges.

For non-major development, in the absence of modelled information it may be reasonable to utilise a nominal climate change allowance i.e. an alternative appropriate figure. To assist applicants and LPA's we have provided some 'nominal' climate change allowances within our area climate change guidance. These nominal allowances should be considered as appropriate within any FRA.

The design flood (1% with climate change) should be used to inform the sequential test including appropriate location of built development and ensure 'safe' development.

- For '**more vulnerable**' development e.g. housing, the FRA should use the 'higher central' climate change allowance (35%), as a minimum, to inform built in resilience; but aim to incorporate managed adaptive approaches/measures for the 'upper end' allowance (70%) where feasible.
- Development classed as '**Essential Infrastructure**' (as defined within Table 2 - Flood Risk Vulnerability Classification, Paragraph: 066 Reference ID: 7-066-20140306 of the NPPG) should be designed to the 'upper end' climate change allowance (70%).

\*\* It is advised that **Finished Floor Levels** should be set no lower than 600mm above the 1% river flood level plus climate change with flood proofing techniques considered (where

#### FRA Guidance Note

appropriate). For more information on resistance and resilience techniques see:  
[http://www.planningportal.gov.uk/uploads/br/flood\\_performance.pdf](http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf)

– For **‘water compatible’** or **‘less vulnerable’** development e.g. commercial, the FRA should use the ‘central’ climate change allowance (20%), as a minimum, to inform built in resilience; but aim to incorporate managed adaptive approaches/measures for the ‘higher central’ allowance (25%) where feasible.

Some ‘water compatible’ and ‘less vulnerable’ development such as agricultural developments/structures, or stables etc, by their nature may be floodable and therefore the raising of floor levels may not be feasible/practicable. In these cases, we would suggest that any storage in these buildings, including any flood susceptible electrics, or items that may be damaged should be sited above possible flood levels, in order to prevent flood risk and associated pollution.

\*\*\* For **‘more vulnerable’** and **‘highly vulnerable’** development, where overnight accommodation is proposed, the FRA should demonstrate that the development has **safe, pedestrian access** above the 1% river flood level plus climate change\*. Pedestrian access should preferably remain flood free in a 1% river flood event plus climate change. However, in cases where this may not be achievable, the FRA may demonstrate that pedestrian access is acceptable based on an appropriate assessment of ‘hazard risk’ including water depth, velocity and distance to higher ground (above the 1% river flood level plus climate change). Reference should be made to DEFRA Hazard risk (FD2320) – ‘Danger to People for Combinations of Depth & Velocity’ (see Table 13.1 – DEFRA/EA Flood Risk Assessment Guidance for New Development FD2320 at:  
[http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM\\_Project\\_Documents/FD2320\\_3364\\_TRP\\_pdf.sflb.ashx](http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/FD2320_3364_TRP_pdf.sflb.ashx)

Given our role and responsibilities we would not make comment on the safety of the access or object on this basis. This does not mean we consider that the access is safe or the proposals acceptable in this regard. We recommend you consult with your Emergency Planners and the Emergency Services to determine whether they consider this to be safe in accordance with the guiding principles of the NPPG.

Furthermore access and egress by vehicular means is also a matter for your Emergency Planners and the Emergency Services.

A Flood Evacuation Management Plan may also be appropriate, see note below.

- Applications involving intensification of use, for example conversion of buildings to provide additional residential units, should consider safe access as a risk. It may be possible to reduce the risk of flooding to an existing access through minor modifications to ground levels or alternative provision.

- For **‘less vulnerable’** development (especially those uses where there are people occupying the building and/or vehicles are present, e.g. office, retail) the FRA should consider **safe access** above the 1% river flood level plus climate change. However, given the nature of this type of proposal we would advise that this is considered as a less critical risk i.e. future occupants may not be able to access the proposed development (building and/or any car park) in design flood events. On this basis, this risk could be managed by

#### FRA Guidance Note

implementation of a flood evacuation plan (see below) in consultation with your Emergency Planners.

**Flood Evacuation Management Plan:** The NPPG (paragraph 056) states that one of the considerations for safe occupation is whether adequate 'flood warning' would be available to people using the development.

**Flood Warning:** For your consideration, where no Flood Warning service is in place we would be unable to offer any notification of potential danger from rising levels.

Where the Flood Warning service consists of a Flood Alert, whilst this gives a level of flood awareness, it will not provide a detailed local warning to comprehensively inform evacuation.

Where a comprehensive Flood Warning service operates, a trigger level may be sought to assist in evacuation.

For information on developing a Flood Evacuation Management Plan see sub-section 22 of the Flood Risk and Coastal Change Section of the NPPG and our guidance online at: <https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

We recommend you consult with your Emergency Planners and the Emergency Services to determine whether they consider the FEMP secures safe and sustainable development.

\*\*\*\* For surface water management advice, please contact your Lead Local Flood Authority (LLFA).

**Background:** Need for a FRA

There are three main flood risk considerations –

- The flood risk to the site, and any occupiers, resulting from a 1% event and an extreme flood event (i.e. a flood with between a 0.1% and 1% chance each year from rivers or between 0.1% and 0.5% chance each year from the sea) – **including climate change**.
- The flood risk resulting from the change of use of greenfield land to developed land which will reduce the natural drainage permeability of that land leading to increased flood risk elsewhere.
- The risk to occupiers and /or others of surface water flooding due to increased run-off. Even at outline stage the applicant needs to be able to demonstrate that surface water balancing can be achieved to a 1% (plus climate change) standard. All sites should aim to provide flood risk reduction/betterment.

The FRA should use available historic information, surveys and local knowledge to establish what the impact of flooding would have been based on previous events. This can then be used to establish any mitigation measures necessary to protect the development from future events.

It is possible that flooding may occur from a source other than that identified by the Agency's 'indicative' Flood Zones, which may occur due to local sewer or other drainage constraints, groundwater and surface water run off problems in the area. These may be

#### **FRA Guidance Note**

identified within Strategic Flood Risk Assessment for the relevant local authority. The FRA will need to investigate the cause and effect of such local flooding as well as identifying appropriate mitigation/flood risk reduction.

#### **INFORMATION:**

##### **Other flood risk issues to consider for development in Flood Zones 1 or 2 - Dry Islands**

There are some areas within Flood Zones 1 or 2 that are surrounded by areas at a higher risk of flooding i.e. areas falling within Flood Zones 3. In certain cases development upon such 'dry islands' can present particular hazards to public safety and risks such as those associated with maintaining safe access and exit for occupants during flood events. The distribution of dry islands and risks posed by them in terms of access/exit vary considerably across the country. (If there is a concern on this issue, contact the local Environment Agency Sustainable Places Team).

#### **FURTHER INFORMATION:**

**Flood level data** to assist the FRA and Flood Management Plan (where available) may be obtained from our Area Customers & Engagement team on telephone 03708 506506; [shwgenquiries@environment-agency.gov.uk](mailto:shwgenquiries@environment-agency.gov.uk)

##### **Flood Risk Permit** (Flood Defence Consents until 6 April 2016)

Works (including temporary) in, on or adjacent to a Main River/ Flood structure or Main river Floodplain may need a permit. See <https://www.gov.uk/guidance/flood-risk-activities-environmental-permits> For advice please phone 03708 506506 and ask for the Partnerships and Strategic Overview Team that covers your area.

(Note: Flood Defence Consents still apply to Ordinary watercourses – Contact your LLFA).

As of November 2012 (Flood Map update) in Shropshire, Herefordshire, Worcestershire & Gloucestershire Area, the Flood Zone 2 outline includes historical flooding data.

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<sup>1</sup> Flood risk 'Vulnerability' classification of development - see Table 2 at sub-section 25 of the Flood Risk and Coastal Change section of the NPPG.





**Environment Agency Standing Advice to Local Planning Authorities on Development and Flood Risk**

**Minor Development (Sub-section 17 within the Flood Risk and Coastal Change Section of the NPPG), Domestic & Commercial/Industrial extensions (less than 250m<sup>2</sup> & curtilage development) within Flood Zone 3 & Flood Zone 2 (and historic)**

**Process: Formal EA response is 'NO COMMENT'**

The following is advice for the benefit of landowner/occupier and the environment:

**FRA requirements:** The NPPG contains a useful checklist for FRAs at sub-section 26 of the Flood Risk and Coastal Change Section. It is suggested that applications be accompanied by a simple Flood Risk Assessment (FRA) which confirms in writing that as a minimum:

EITHER

- (1) Floor levels within the proposed development will be set no lower than existing levels AND,
- (2) Flood proofing of the proposed development has been considered by the applicant and incorporated where appropriate to 1% (1 in 100 chance each year) river flood level or 0.5% (1 in 200 chance) tidal and coastal level, including climate change allowance.

OR **preferably** that:

- (3) Floor levels within the extension will be set 600mm above the known or modelled 1% (1 in 100 chance each year) river flood level or 0.5% (1 in 200 chance each year) tidal & coastal flood level (including climate change allowance). This should be demonstrated by a plan to Ordnance Datum/GPS showing finished floor levels relative to the known or modelled flood level.

**Background:** For proposed extensions within Flood Zone 3/2, the main aspect of flood risk to consider is that the development itself may be at risk of flooding. The most effective means of addressing this risk is through submission of a simple FRA. This should identify the flood risks and set out the proposed measures to mitigate that risk. For most developments within Flood Zone 3/2, submission of a site plan showing floor levels related to Ordnance Datum/GPS should confirm that the site is above flood level. Where such a plan indicates otherwise or is not provided, mitigation measures would focus on controlling floor levels and incorporating flood proofing into the design of the extension.

**Floor levels:** From a flood risk view point, the ideal mitigation in terms of floor levels is to ensure that these are set to above the known or modelled 1%(1 in 100 chance each year) river flood level or 0.5% (1 in 200 chance each year) tidal and coastal flood level at that location. However, in the case of an extension it will often not be practical to raise floor



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levels given the potential effects on other issues such as access (including that for disabled users), usability and visual amenity.

**‘Flood proofing’:** The Environment Agency recommends that in areas at risk of flooding, consideration be given to the incorporation into the design and construction of the development of ‘flood proofing’ measures. These include removable barriers on building apertures such as doors and air bricks and providing electrical services into the building at a high level so that plugs are located above possible flood levels. Such measures could also be considered to protect existing property.

Additional guidance, including information on kite marked flood protection products, can be found on the Environment Agency web site at <https://www.gov.uk/prepare-for-a-flood>.

Details of flood resilience and resistance techniques can be found in ‘Improving the Flood Performance of New Buildings - Flood Resilient Construction’ (DCLG 2007).  
[http://www.planningportal.gov.uk/uploads/br/flood\\_performance.pdf](http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf)

**Residual risks:** It should be noted that if the existing building is in a 'low spot' the measures adopted above in terms of maintaining floor levels at existing levels and flood proofing will not necessarily eliminate risks during a flood event. Applicants should be asked to check ground levels if in doubt about this. Even where it is possible to ensure floor levels are set above the known or modelled 1% river and 0.5% tidal and coastal flood level, *flood risks will remain for an event that exceeds this magnitude*.

**Note:** Development which involves a culvert or an obstruction to flow on an Ordinary Watercourse will require consent under the Land Drainage Act 1991 and the Flood and Water Management Act 2010. In the case of an Ordinary Watercourse the responsibility for Consenting lies with the Lead Local Flood Authority (LLFA). In an internal drainage district, the consent of the Internal Drainage Board, instead of the LLFA, is required for the above works under Section 23 of the Land Drainage Act 1991. An Ordinary Watercourse is defined as any watercourse not identified as a Main River on maps held by the Environment Agency and DEFRA. For further information on Ordinary Watercourses contact the LLFA.

**Flood level data** to assist the FRA and Flood Management Plan (where available) may be obtained from our Area Customers & Engagement team on telephone 03708 506506; [shwgenquiries@environment-agency.gov.uk](mailto:shwgenquiries@environment-agency.gov.uk)

As of November 2012 (Flood Map update) in Shropshire, Herefordshire, Worcestershire & Gloucestershire Area, the Flood Zone 2 outline includes historical flooding data.

Last updated: **May 2016**

Contact: Environment Agency, Sustainable Places Team, Shropshire Herefordshire Worcestershire & Gloucestershire Area.  
[shwgplanning@environment-agency.gov.uk](mailto:shwgplanning@environment-agency.gov.uk)

Environment Agency Standing Advice to Local Planning  
Authorities on Development and Flood Risk**Development in Flood Zone 2 where the flood zone is generated by an  
'ordinary watercourse'<sup>1</sup>****Process**

**Formal EA response for Green Box on the local matrix = 'LPA to use the advice below'.**

This advice applies to applications, in Flood Zone 2, where the proposed development footprint (including change of use) is **less than 1ha**. However, it excludes 'essential' and 'highly vulnerable'<sup>2</sup> developments. **These and larger scale applications would still be subject to 'Red Box' consultation.**

This advice also applies to larger scale applications (greater than 1ha) excluding 'Essential Infrastructure' and/or 'Highly Vulnerable' development; or landfill, hazardous waste sites and caravans/camping sites. **These applications would still be subject to 'Red Box' consultation.**

**ADVICE NOTE:** We recommend consultation with your Lead Local Flood Authority (LLFA) or Internal drainage Board (IDB) and/or Local Land Drainage section, to provide information to support the production of and review of the Flood Risk Assessment (FRA).

Fluvial risk - There may be information within your Preliminary FRA, Strategic FRA, including data on ordinary watercourses/historical flooding.

Other sources of flooding including surface water may also be relevant.

Works affecting an Ordinary Watercourse may require consent from the LLFA or your local IDB. This consenting role ceased to be a responsibility of the Environment Agency in April 2012.

**Requirement for a Sequential Test:** Prior to investing resources in completing a detailed FRA, it is recommended that applicants contact the Local Planning Authority (LPA) and discuss how the flood risk Sequential Test as set out in the National Planning Policy Framework (NPPF) and its accompanying National Planning Practice Guidance (NPPG) will affect the proposed development. It is possible that the development will be inappropriate and be refused planning permission irrespective of any detailed FRA.

The NPPF details the requirement for a risk-based Sequential Test (ST) in determining planning applications. See paragraphs 100–104 of the NPPF and sub-sections 4, 5 and 11 within the Flood Risk and Coastal Change Section of the NPPG.

Paragraph 101 of the NPPF requires decision-makers to steer new development to areas at the lowest probability of flooding by applying a ST. It states that 'Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding'.

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Further detail is provided in the NPPG. This states that “Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of river or sea flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test [ET] if required”. (Paragraph: 019 Reference ID: 7-019-20140306). See also paragraph 102 of the NPPF and Table 3 in sub-section 25 within the Flood Risk and Coastal Change Section of the NPPG e.g. ET is required for ‘more vulnerable’ development in Flood Zone 3.

Based on the scale and nature of the proposal, which is considered non-major development in accordance with the Development Management Procedure Order (2010), we would not make any bespoke comments on the ST, in this instance. The fact that we are not providing comments does not mean that there are no ST issues, but we leave this for your Council to consider.

You should seek evidence that the ST has been properly applied (see notes in EA ST process guide in our National Flood Risk Standing Advice (available online at: <https://www.gov.uk/government/publications/flood-risk-standing-advice-for-local-planning-authorities-frsa>) and paragraph 104 and footnote 22 of the NPPF on change of use developments).

**Requirement for a FRA:** The NPPF (paragraph 103) requires that a planning application should be accompanied by a FRA. Where a FRA is not submitted with the application or the FRA is not accepted by the LPA the Environment Agency would recommend that the LPA either defers the application or refuses planning permission. We would support your decision at any subsequent appeal.

For ‘less vulnerable’ or ‘more vulnerable’ development, if the FRA confirms that the development is within **Flood Zone 3b** (functional floodplain, as defined in Table 1 in sub-section 25 within the Flood Risk and Coastal Change Section of the PPG) depending on the site specifics, for example the potential impact upon flows, the proposal may be inappropriate. This is in accordance with Table 3 in sub-section 25 within the Flood Risk and Coastal Change Section of the NPPG which states that such development “should not be permitted” in Zone 3b functional floodplain.

We would expect sites in Zone 3b to assess the impact on the 5% (1 in 20 year) event.

### FRA Guidance

- Refer to FRA Guidance note 3.

**FRA requirements:** Planning applications must be accompanied by a FRA that is submitted to the Local Planning Authority (LPA). The NPPG contains a useful checklist for FRAs at sub-section 26 of the Flood Risk and Coastal Change Section. To be acceptable as a FRA the applicant should confirm as a minimum:

1. A level survey to Ordnance Datum/GPS showing the known or modelled 1% (1 in 100 chance each year) river flood level, including **climate change\***, or where relevant 0.5% (1 in 200 year) tidal & coastal flood level relative to proposed site levels. For sites in Flood Zone 3, this should include the 5% (1 in 20 year) flood event, or equivalent.

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2. An assessment of the risks posed to the site including that based on 1% modelled flooding (including climate change\*), any documented historic flooding and risks associated with surface water runoff from the site (including climate change).
3. Flood Risk to the development and users - Proposed mitigation measures to control those risks for the lifetime of the development, based on a 1% event, including climate change, e.g. setting appropriate floor levels\*\*, providing 'flood proofing'; safe access & egress\*\*\* for occupiers (**essential where 'more vulnerable'<sup>2</sup> uses include overnight accommodation and a less critical risk for other 'more vulnerable', 'water compatible' and 'less vulnerable' uses**).
4. Impact on flood risk elsewhere – The NPPG indicates that developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area (flood risk betterment). Issues to consider include providing 'level for level, volume for volume' flood storage compensation, reducing impact on storage and flow routes through the layout, form and design of the building/structure; providing surface water disposal\*\*\*\*.
5. Residual risks after mitigation, including risk during an extreme 0.1 % (1 in 1000 year) event.

### NOTES:

\* The NPPG refers to Environment Agency guidance on considering **climate change** in planning decisions which is available online: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances> (new allowances were published on 19 February 2016).

Please refer to our separate 'Area Climate Change Guidance' (March 2016) for more information on how to consider and incorporate allowances in development proposals. This advises that an allowance should be added to 'peak river flows' to account for 'climate change' which should be specific to river basin district catchment.

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Severn Peak River Flows: Total potential change anticipated	2015-39	2040-2069	2070-2115
Upper end	25%	40%	70%
Higher central	15%	25%	35%
Central	10%	20%	25%

For 'major development' (as defined within The Town and Country Planning Development Management Procedure (England) Order 2015), we would expect a detailed FRA to provide an appropriate assessment (hydraulic model) of the relevant climate change ranges.

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For non-major development, in the absence of modelled information it may be reasonable to utilise a nominal climate change allowance i.e. an alternative appropriate figure. To assist applicants and LPA's we have provided some 'nominal' climate change allowances within our area climate change guidance. These nominal allowances should be considered as appropriate within any FRA.

The design flood (1% with climate change) should be used to inform the sequential test including appropriate location of built development and ensure 'safe' development.

- For '**more vulnerable**' development e.g. housing, the FRA should use the 'higher central' climate change allowance (35%), as a minimum, to inform built in resilience; but aim to incorporate managed adaptive approaches/measures for the 'upper end' allowance (70%) where feasible.

\*\* It is advised that **Finished Floor Levels** should be set no lower than 600mm above the 1% river flood level plus climate change with flood proofing techniques considered (where appropriate). For more information on resistance and resilience techniques see:

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– For '**water compatible**' or '**less vulnerable**' development e.g. commercial, the FRA should use the 'central' climate change allowance (20%), as a minimum, to inform built in resilience; but aim to incorporate managed adaptive approaches/measures for the 'higher central' allowance (25%) where feasible.

Some 'water compatible' and 'less vulnerable' development such as agricultural developments/structures, or stables etc, by their nature may be floodable and therefore the raising of floor levels may not be feasible/practicable. In these cases, we would suggest that any storage in these buildings, including any flood susceptible electrics, or items that may be damaged should be sited above possible flood levels, in order to prevent flood risk and associated pollution.

\*\*\* For '**more vulnerable**' development, where overnight accommodation is proposed, the FRA should demonstrate that the development has **safe, pedestrian access** above the 1% river flood level plus climate change\*. Pedestrian access should preferably remain flood free in a 1% river flood event plus climate change. However, in cases where this may not be achievable, the FRA may demonstrate that pedestrian access is acceptable based on an appropriate assessment of 'hazard risk' including water depth, velocity and distance to higher ground (above the 1% river flood level plus climate change). Reference should be made to DEFRA Hazard risk (FD2320) – 'Danger to People for Combinations of Depth & Velocity' (see Table 13.1 – DEFRA/EA Flood Risk Assessment Guidance for New Development FD2320 at:

[http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM\\_Project\\_Documents/FD2320\\_3364\\_TRP\\_pdf.sflb.ashx](http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/FD2320_3364_TRP_pdf.sflb.ashx)

Given our role and responsibilities we would not make comment on the safety of the access or object on this basis. This does not mean we consider that the access is safe or the proposals acceptable in this regard. We recommend you consult with your Emergency Planners and the Emergency Services to determine whether they consider this to be safe in accordance with the guiding principles of the NPPG.

Furthermore access and egress by vehicular means is also a matter for your Emergency Planners and the Emergency Services.

## LPA Process Note

A Flood Evacuation Management Plan may also be appropriate, see note below.

- Applications involving intensification of use, for example conversion of buildings to provide additional residential units, should consider safe access as a risk. It may be possible to reduce the risk of flooding to an existing access through minor modifications to ground levels or alternative provision.

- For '**less vulnerable**' development (especially those uses where there are people occupying the building and/or vehicles are present, e.g. office, retail) the FRA should consider **safe access** above the 1% river flood level plus climate change. However, given the nature of this type of proposal we would advise that this is considered as a less critical risk i.e. future occupants may not be able to access the proposed development (building and/or any car park) in design flood events. On this basis, this risk could be managed by implementation of a flood evacuation plan (see below) in consultation with your Emergency Planners.

**Flood Evacuation Management Plan:** The NPPG (paragraph 056) states that one of the considerations for safe occupation is whether adequate 'flood warning' would be available to people using the development.

**Flood Warning:** For your consideration, where no Flood Warning service is in place we would be unable to offer any notification of potential danger from rising levels.

Where the Flood Warning service consists of a Flood Alert, whilst this gives a level of flood awareness, it will not provide a detailed local warning to comprehensively inform evacuation.

Where a comprehensive Flood Warning service operates, a trigger level may be sought to assist in evacuation.

For information on developing a Flood Evacuation Management Plan see sub-section 22 of the Flood Risk and Coastal Change Section of the NPPG and our guidance online at: <https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

We recommend you consult with your Emergency Planners and the Emergency Services to determine whether they consider the FEMP secures safe and sustainable development.

\*\*\*\* For surface water management advice, please contact your Lead Local Flood Authority (LLFA).

### **Background:** Need for a FRA

There are three main flood risk considerations –

- The flood risk to the site, and any occupiers, resulting from a 1% event and an extreme flood event (i.e. a flood with between a 0.1% and 1% chance each year from rivers or between 0.1% and 0.5% chance each year from the sea) – **including climate change**.
- The flood risk resulting from the change of use of greenfield land to developed land which will reduce the natural drainage permeability of that land leading to increased flood risk elsewhere.



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- The risk to occupiers and /or others of surface water flooding due to increased run-off. Even at outline stage the applicant needs to be able to demonstrate that surface water balancing can be achieved to a 1% (plus climate change) standard. All sites should aim to provide flood risk reduction/betterment.

The FRA should use available historic information, surveys and local knowledge to establish what the impact of flooding would have been based on previous events. This can then be used to establish any mitigation measures necessary to protect the development from future events.

It is possible that flooding may occur from a source other than that identified by the Environment Agency's 'indicative' Flood Zones, which may occur due to local sewer or other drainage constraints, groundwater and surface water runoff problems in the area. These may be identified within Strategic Flood Risk Assessment for the relevant local authority. The FRA will need to investigate the cause and effect of such local flooding as well as identifying appropriate mitigation/flood risk reduction.

### FURTHER INFORMATION:

**Flood level data** to assist the FRA and Flood Management Plan (where available) may be obtained from our Area Customers & Engagement team on telephone 03708 506506; [shwgenquiries@environment-agency.gov.uk](mailto:shwgenquiries@environment-agency.gov.uk)

**Flood Risk Permit** (Flood Defence Consents until 6 April 2016)

Works (including temporary) in, on or adjacent to a Main River/ Flood structure or Main river Floodplain may need a permit. See <https://www.gov.uk/guidance/flood-risk-activities-environmental-permits> For advice please phone 03708 506506 and ask for the Partnerships and Strategic Overview Team that covers your area.

(Note: Flood Defence Consents still apply to Ordinary watercourses – Contact your LLFA).

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<sup>1</sup> Main Rivers are indicated on our Flood Zone Maps by red lines. When determining whether to consult the EA, the LPA will need to check the Flood Zone Maps to see whether the site is affected by the floodplain of a main river (including backing up of any adjacent watercourse). You can also check the classification of the watercourse with the LLFA, some of which have produced Drainage and Flooding Interactive Maps.

<sup>2</sup> Flood risk 'Vulnerability' classification of development - see Table 2 at sub-section 25 of the Flood Risk and Coastal Change section of the NPPG.

Environment Agency Standing Advice to Local Planning  
Authorities on Development and Flood Risk**Development in Flood Zone 3 where the flood zone is generated by an  
'ordinary watercourse'<sup>1</sup>****Process**

**Formal EA response for Green Box on the local matrix = 'LPA to use the advice below'.**

This standing advice applies to applications, in Flood Zone 3, where the provision of '**less vulnerable**' and '**water compatible**'<sup>2</sup> building(s) **footprint (or change of use) is less than 1000m<sup>2</sup>** and **proposals for less than 10 dwellings/caravan or camping pitches.**

However, it excludes 'essential' and 'highly vulnerable'<sup>2</sup> developments; and the following 'more vulnerable'<sup>2</sup> development types: Hospitals, Residential Institutions (including student halls of residence) and hazardous waste management sites.

**These and larger scale applications would still be subject to 'Red Box' consultation.**

**ADVICE NOTE:** We recommend consultation with your Lead Local Flood Authority (LLFA) or Internal drainage Board (IDB) and/or Local Land Drainage section, to provide information to support the production of and review of the Flood Risk Assessment (FRA).

Fluvial risk - There may be information within your Preliminary FRA, Strategic FRA, including data on ordinary watercourses/historical flooding.

Other sources of flooding including surface water may also be relevant.

Works affecting an Ordinary Watercourse may require consent from the LLFA or your local IDB. This consenting role ceased to be a responsibility of the Environment Agency in April 2012.

**Requirement for a Sequential Test:** Prior to investing resources in completing a detailed FRA, it is recommended that applicants contact the Local Planning Authority (LPA) and discuss how the flood risk Sequential Test as set out in the National Planning Policy Framework (NPPF) and its accompanying Planning Practice Guidance (NPPG) will affect the proposed development. It is possible that the development will be inappropriate and be refused planning permission irrespective of any detailed FRA.

The NPPF details the requirement for a risk-based Sequential Test (ST) in determining planning applications. See paragraphs 100–104 of the NPPF and sub-sections 4, 5 and 11 within the Flood Risk and Coastal Change Section of the NPPG.

Paragraph 101 of the NPPF requires decision-makers to steer new development to areas at the lowest probability of flooding by applying a ST. It states that "Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding".

Further detail is provided in the NPPG. This states that "Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of river or sea flooding) be considered, taking into



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account the flood risk vulnerability of land uses and applying the Exception Test [ET] if required". (Paragraph: 019 Reference ID: 7-019-20140306). See also paragraph 102 of the NPPF and Table 3 in sub-section 25 within the Flood Risk and Coastal Change Section of the NPPG e.g. ET is required for 'more vulnerable' development in Flood Zone 3.

Based on the scale and nature of the proposal, which is considered non-major development in accordance with the Development Management Procedure Order (2010), we would not make any bespoke comments on the ST, in this instance. The fact that we are not providing comments does not mean that there are no ST issues, but we leave this for your Council to consider.

You should seek evidence that the ST has been properly applied (see notes in EA ST process guide in our National Flood Risk Standing Advice (available online at: <https://www.gov.uk/government/publications/flood-risk-standing-advice-for-local-planning-authorities-frsa>) and paragraph 104 and footnote 22 of the NPPF on change of use developments).

**Requirement for a FRA:** The NPPF (paragraph 103) requires that a planning application should be accompanied by a FRA. Where a FRA is not submitted with the application or the FRA is not accepted by the LPA the Environment Agency would recommend that the LPA either defers the application or refuses planning permission. We would support your decision at any subsequent appeal.

For 'highly vulnerable', 'more vulnerable', or 'less vulnerable' development, if the FRA confirms that the development is within **Flood Zone 3b** (functional floodplain, as defined in Table 1 in sub-section 25 within the Flood Risk and Coastal Change Section of the PPG) depending on the site specifics, for example the potential impact upon flows, the proposal may be inappropriate. This is in accordance with Table 3 in sub-section 25 within the Flood Risk and Coastal Change Section of the NPPG which states that such development "should not be permitted" in Zone 3b functional floodplain.

We would expect sites in Zone 3b to assess the impact on the 5% (1 in 20 year) event.

### FRA Guidance

- Refer to FRA Guidance note 3.

**FRA requirements:** Planning applications must be accompanied by a FRA that is submitted to the Local Planning Authority (LPA). The NPPG contains a useful checklist for FRAs at sub-section 26 of the Flood Risk and Coastal Change Section. To be acceptable as a FRA the applicant should confirm as a minimum:

1. A level survey to Ordnance Datum/GPS showing the known or modelled 1% (1 in 100 chance each year) river flood level, including **climate change\***, or where relevant 0.5% (1 in 200 year) tidal & coastal flood level relative to proposed site levels. For sites in Flood Zone 3, this should include the 5% (1 in 20 year) flood event, or equivalent.
2. An assessment of the risks posed to the site including that based on 1% modelled flooding (including climate change\*), any documented historic flooding and risks associated with surface water runoff from the site (including climate change).

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3. Flood Risk to the development and users - Proposed mitigation measures to control those risks for the lifetime of the development, based on a 1% event, including climate change, e.g. setting appropriate floor levels\*\*, providing 'flood proofing'; safe access & egress\*\*\* for occupiers (**essential where 'more vulnerable'<sup>2</sup> uses include overnight accommodation and a less critical risk for other 'more vulnerable', 'water compatible' and 'less vulnerable' uses**).
4. Impact on flood risk elsewhere – The NPPG indicates that developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area (flood risk betterment). Issues to consider include providing 'level for level, volume for volume' flood storage compensation, reducing impact on storage and flow routes through the layout, form and design of the building/structure; providing surface water disposal\*\*\*\*.
5. Residual risks after mitigation, including risk during an extreme 0.1% (1 in 1000 year) event.

### NOTES:

\* The NPPG refers to Environment Agency guidance on considering **climate change** in planning decisions which is available online: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances> (new allowances were published on 19 February 2016).

Please refer to our separate 'Area Climate Change Guidance' (March 2016) for more information on how to consider and incorporate allowances in development proposals. This advises that an allowance should be added to 'peak river flows' to account for 'climate change' which should be specific to river basin district catchment.

The table below is for '**peak river flows**' within the Severn River Basin district, and specifies the range of allowances to reflect individual development's lifetime and vulnerability. For example residential would be 100 years (so 2070-2115).

Severn Peak River Flows: Total potential change anticipated	2015-39	2040-2069	2070-2115
Upper end	25%	40%	70%
Higher central	15%	25%	35%
Central	10%	20%	25%

For 'major development' (as defined within The Town and Country Planning Development Management Procedure (England) Order 2015), we would expect a detailed FRA to provide an appropriate assessment (hydraulic model) of the relevant climate change ranges.

For non-major development, in the absence of modelled information it may be reasonable to utilise a nominal climate change allowance i.e. an alternative appropriate figure. To assist applicants and LPA's we have provided some 'nominal' climate change allowances within our area climate change guidance. These nominal allowances should be considered as appropriate within any FRA.

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The design flood (1% with climate change) should be used to inform the sequential test including appropriate location of built development and ensure 'safe' development.

- For '**more vulnerable**' development e.g. housing, the FRA should use the 'higher central' climate change allowance (35%), as a minimum, to inform built in resilience; but aim to incorporate managed adaptive approaches/measures for the 'upper end' allowance (70%) where feasible.

\*\* It is advised that **Finished Floor Levels** should be set no lower than 600mm above the 1% river flood level plus climate change with flood proofing techniques considered (where appropriate). For more information on resistance and resilience techniques see:

[http://www.planningportal.gov.uk/uploads/br/flood\\_performance.pdf](http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf)

– For '**water compatible**' or '**less vulnerable**' development e.g. commercial, the FRA should use the 'central' climate change allowance (20%), as a minimum, to inform built in resilience; but aim to incorporate managed adaptive approaches/measures for the 'higher central' allowance (25%) where feasible.

Some 'water compatible' and 'less vulnerable' development such as agricultural developments/structures, or stables etc, by their nature may be floodable and therefore the raising of floor levels may not be feasible/practicable. In these cases, we would suggest that any storage in these buildings, including any flood susceptible electrics, or items that may be damaged should be sited above possible flood levels, in order to prevent flood risk and associated pollution.

\*\*\* For '**more vulnerable**' development, where overnight accommodation is proposed, the FRA should demonstrate that the development has **safe, pedestrian access** above the 1% river flood level plus climate change\*. Pedestrian access should preferably remain flood free in a 1% river flood event plus climate change. However, in cases where this may not be achievable, the FRA may demonstrate that pedestrian access is acceptable based on an appropriate assessment of 'hazard risk' including water depth, velocity and distance to higher ground (above the 1% river flood level plus climate change). Reference should be made to DEFRA Hazard risk (FD2320) – 'Danger to People for Combinations of Depth & Velocity' (see Table 13.1 – DEFRA/EA Flood Risk Assessment Guidance for New Development FD2320 at:

[http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM\\_Project\\_Documents/FD2320\\_3364\\_TRP\\_pdf.sflb.ashx](http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/FD2320_3364_TRP_pdf.sflb.ashx)

Given our role and responsibilities we would not make comment on the safety of the access or object on this basis. This does not mean we consider that the access is safe or the proposals acceptable in this regard. We recommend you consult with your Emergency Planners and the Emergency Services to determine whether they consider this to be safe in accordance with the guiding principles of the NPPG.

Furthermore access and egress by vehicular means is also a matter for your Emergency Planners and the Emergency Services.

A Flood Evacuation Management Plan may also be appropriate, see note below.

- Applications involving intensification of use, for example conversion of buildings to provide additional residential units, should consider safe access as a risk. It may be

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possible to reduce the risk of flooding to an existing access through minor modifications to ground levels or alternative provision.

- For **'less vulnerable'** development (especially those uses where there are people occupying the building and/or vehicles are present, e.g. office, retail) the FRA should consider **safe access** above the 1% river flood level plus climate change. However, given the nature of this type of proposal we would advise that this is considered as a less critical risk i.e. future occupants may not be able to access the proposed development (building and/or any car park) in design flood events. On this basis, this risk could be managed by implementation of a flood evacuation plan (see below) in consultation with your Emergency Planners.

**Flood Evacuation Management Plan:** The NPPG (paragraph 056) states that one of the considerations for safe occupation is whether adequate 'flood warning' would be available to people using the development.

**Flood Warning:** For your consideration, where no Flood Warning service is in place we would be unable to offer any notification of potential danger from rising levels.

Where the Flood Warning service consists of a Flood Alert, whilst this gives a level of flood awareness, it will not provide a detailed local warning to comprehensively inform evacuation.

Where a comprehensive Flood Warning service operates, a trigger level may be sought to assist in evacuation.

For information on developing a Flood Evacuation Management Plan see sub-section 22 of the Flood Risk and Coastal Change Section of the NPPG and our guidance online at: <https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

We recommend you consult with your Emergency Planners and the Emergency Services to determine whether they consider the FEMP secures safe and sustainable development.

\*\*\*\* For surface water management advice, please contact your Lead Local Flood Authority (LLFA).

## **Background:** Need for a FRA

There are three main flood risk considerations –

- The flood risk to the site, and any occupiers, resulting from a 1% event and an extreme flood event (i.e. a flood with between a 0.1% and 1% chance each year from rivers or between 0.1% and 0.5% chance each year from the sea) – **including climate change**.
- The flood risk resulting from the change of use of greenfield land to developed land which will reduce the natural drainage permeability of that land leading to increased flood risk elsewhere.
- The risk to occupiers and /or others of surface water flooding due to increased run-off. Even at outline stage the applicant needs to be able to demonstrate that surface water balancing can be achieved to a 1% (plus climate change) standard. All sites should aim to provide flood risk reduction/betterment.

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The FRA should use available historic information, surveys and local knowledge to establish what the impact of flooding would have been based on previous events. This can then be used to establish any mitigation measures necessary to protect the development from future events.

It is possible that flooding may occur from a source other than that identified by the Environment Agency's 'indicative' Flood Zones, which may occur due to local sewer or other drainage constraints, groundwater and surface water run off problems in the area. These may be identified within Strategic Flood Risk Assessment for the relevant local authority. The FRA will need to investigate the cause and effect of such local flooding as well as identifying appropriate mitigation/flood risk reduction.

### FURTHER INFORMATION:

**Flood level data** to assist the FRA and Flood Management Plan (where available) may be obtained from our Area Customers & Engagement team on telephone 03708 506506; [shwgenquiries@environment-agency.gov.uk](mailto:shwgenquiries@environment-agency.gov.uk)

**Flood Risk Permit** (Flood Defence Consents until 6 April 2016)

Works (including temporary) in, on or adjacent to a Main River/ Flood structure or Main river Floodplain may need a permit. See <https://www.gov.uk/guidance/flood-risk-activities-environmental-permits> For advice please phone 03708 506506 and ask for the Partnerships and Strategic Overview Team that covers your area.

(Note: Flood Defence Consents still apply to Ordinary watercourses – Contact your LLFA).

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<sup>1</sup> Main Rivers are indicated on our Flood Zone Maps by red lines. When determining whether to consult the EA, the LPA will need to check the Flood Zone Maps to see whether the site is affected by the floodplain of a main river (including backing up of any adjacent watercourse). You can also check the classification of the watercourse with the LLFA, some of which have produced Drainage and Flooding Interactive Maps.

<sup>2</sup> Flood risk 'Vulnerability' classification of development - see Table 2 at sub-section 25 of the Flood Risk and Coastal Change section of the NPPG.

# SHROPSHIRE, HEREFORDSHIRE, WORCESTERSHIRE GLOUCESTERSHIRE AREA LOCAL FLOOD RISK 'MATRIX'

A1 Development Category	B1 Development (including boundary walls etc.) within 8 METRES of the top of a bank of a Main River, or includes culverting or control of flow	C1 Development (including boundary walls etc.) within byelaw of the top of a bank of an Ordinary Watercourse, or includes culverting or control of flow	D1 ORDINARY WATERCOURSE Within Flood Zone 3	E1 ORDINARY WATERCOURSE Within Flood Zone 2	F1 MAIN RIVER Within Flood Zone 3	G1 MAIN RIVER Within Flood Zone 2	H1 Within Flood Zone 1
A2 Householder development and alterations + Non residential extensions with a footprint of less than 250m2	B2 Consult EA on Flood Risk Permit (formerly Flood Defence Consent)	C2 No EA consultation required (Contact LLFA)	D2 STANDING ADVICE - see 'minor development process note'.	E2 STANDING ADVICE - see 'minor development process note'.	F2 STANDING ADVICE - see 'minor development process note'.	G2 STANDING ADVICE - see 'minor development process note'.	H2 No EA consultation required
A3 Change of use resulting in 'Water Compatible' or 'Less Vulnerable' Development*	B3 No EA consultation required	C3 No EA consultation required (Contact LLFA)	D3 STANDING ADVICE - see 'development in Flood Zone 3 process note' for ordinary watercourses; <b>unless RED BOX</b>	E3 No EA consultation required	F3 STANDING ADVICE - see 'development in Flood Zone 3 process note' for Main Rivers; <b>unless RED BOX</b>	G3 No EA consultation required	H3 No EA consultation required
A4 Change of use resulting in 'Essential Infrastructure', 'Highly Vulnerable' or Ltd 'More Vulnerable' Development*	B4 No EA consultation required	C4 No EA consultation required (Contact LLFA)	D4 STANDING ADVICE - see 'development in Flood Zone 3 process note' for ordinary watercourses; <b>unless RED BOX</b>	E4 STANDING ADVICE - see 'development in Flood Zone 2 process note' for ordinary watercourses; <b>unless RED BOX</b>	F4 Consult EA with FRA (see 'development in Flood Zone 3 process note')	G4 STANDING ADVICE - see 'development in Flood Zone 2 process note' for Main Rivers; <b>unless RED BOX</b>	H4 No EA consultation required
A5 Operational Development with a footprint up to 1000m2 (where not included in A2)	B5 Consult EA on Flood Risk Permit (formerly Flood Defence Consent)	C5 No EA consultation required	D5 STANDING ADVICE - see 'development in Flood Zone 3 process note' for ordinary watercourses; <b>unless RED BOX</b>	E5 STANDING ADVICE - see 'development in Flood Zone 2 process note' for ordinary watercourses; <b>unless RED BOX</b>	F5 STANDING ADVICE - see 'development in Flood Zone 3 process note' for Main Rivers; <b>unless RED BOX</b>	G5 STANDING ADVICE - see 'development in Flood Zone 2 process note' for Main Rivers; <b>unless RED BOX</b>	H5 No EA consultation required.
A6 Operational Development with a footprint greater than 1000m2 and up to 1 hectare	B6 Consult EA on Flood Risk Permit (formerly Flood Defence Consent)	C6 No EA consultation required (Contact LLFA)	D6 Consult EA with FRA and Sequential Test evidence (see 'development in Flood Zone 3 process note' for Ordinary Watercourses)	E6 STANDING ADVICE - see 'development in Flood Zone 2 process note' for ordinary watercourses; <b>unless RED BOX</b>	F6 Consult EA with FRA and Sequential Test evidence (see 'development in Flood Zone 3 process note' for Main Rivers)	G6 STANDING ADVICE - see 'development in Flood Zone 2 process note' for Main Rivers; <b>unless RED BOX</b>	H6 No EA consultation required.
A7 Operational Development greater than 1ha	B7 Consult EA on Flood Risk Permit (formerly Flood Defence Consent)	C7 No EA consultation required (Contact LLFA)	D7 Consult EA with FRA and Sequential Test evidence (see 'development in Flood Zone 3 process note' for Ordinary Watercourses)	E7 STANDING ADVICE - see 'development in Flood Zone 2 process note' for ordinary watercourses; <b>unless RED BOX</b>	F7 Consult EA with FRA and Sequential Test evidence (see 'development in Flood Zone 3 process note' for Main Rivers)	G7 STANDING ADVICE - see 'development in Flood Zone 2 process note' for Main Rivers; <b>unless RED BOX</b>	H7 No EA consultation required.

	Consult EA with information as detailed. Note: Highly vulnerable development is NOT appropriate in Flood Zone 3 and only water compatible development is appropriate in functional floodplain (Flood Zone 3b)
	Essential Infrastructure in Flood Zone 3 would need to pass Exception Test (See Table 3 in sub-section 25 within the Flood Risk and Coastal Change Section of the Planning Practice Guidance)
	Do NOT consult the Environment Agency - Substantive response = no comment
	Standing advice / standard comments (some cells may be red box depending on the scale and type of development proposed).
*	EA has no comment to make regarding change of use applications not included within this matrix. The advice in this matrix also applies to Prior Approval enquiries for Permitted Development.

## RED BOX INFORMATION (in 'hover' boxes in the electronic version of this matrix):

D3 and F3	Development is <b>RED BOX</b> (consult EA for bespoke response) when: change of use of building(s) with a footprint over 1000m2
D4 and D5	Development is <b>RED BOX</b> (consult EA for bespoke response) when: 'Essential Infrastructure' and/or 'Highly Vulnerable' development; the following type of 'More Vulnerable' development: Hospitals, Residential Institutions (including student halls of residence) and hazardous waste management sites; 10 or more dwellings; 10 or more caravan or camping pitches
E4, 5, 6 and G4, 5, 6	Development is <b>RED BOX</b> (consult EA for bespoke response) when: 'Essential Infrastructure' and/or 'Highly Vulnerable'
E7 and G7	Development is <b>RED BOX</b> (consult EA for bespoke response) when: 'Essential Infrastructure' and/or 'Highly Vulnerable', 'More Vulnerable' where landfill, hazardous waste site or camping/caravan site
F5	Development is <b>RED BOX</b> (consult EA for bespoke response) when: 'Essential Infrastructure', 'Highly Vulnerable' and/or 'More Vulnerable' development

Information on Flood Zones, Flood Risk Vulnerability Classifications, and Flood Risk Vulnerability & Flood Zone 'Compatibility' are all detailed in Tables 1, 2 and 3 respectively in sub-section 25 within the Flood Risk and Coastal Change Section of the PPG available at: <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/flood-zone-and-flood-risk-tables/>

The advice in this matrix applies to Planning Applications, Formal Prior Approval submissions (including for Permitted Development) and other Pre-Application consultations.



# Flood Risk and Coastal Change

## Climate Change allowances for planning (SHWG area)

March 2016  
(updated May 2017)

The National Planning Practice Guidance refers to Environment Agency guidance on considering climate change in planning decisions which is available online: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

This has been updated and replaces the September 2013 guidance.

It should be used to help planners, developers and advisors implement the National Planning Policy Framework (NPPF)'s policies and practice guidance on flood risk. It will help inform Flood Risk Assessments (FRA's) for planning applications, local plans, neighbourhood plans and other projects.

### Fluvial flooding – peak river flows

Table 1 of the guidance advises that an allowance should be added to 'peak river flows' to account for 'climate change' which should be specific to a river basin district catchment.

In Shropshire, Herefordshire, Worcestershire and Gloucestershire area, we would refer you to the relevant extract from Table 1 below. This outlines the '**peak river flows**' within the 'Severn River Basin District', and specifies the range of percentage allowances to reflect individual development's lifetime and vulnerability. For example, residential would be 100 years (so 2070-2115).

Table 1 Extract

Severn Peak River Flows: Total potential change anticipated	2015-39	2040-2069 (less vulnerable)	2070-2115 (more vulnerable)
Upper end	25%	40%	70%
Higher central	15%	25%	35%
Central	10%	20%	25%

### Sea Level rise allowances

Table 3 of the guidance (extract below) indicates that net sea level risk remains unchanged from the 2013 version.

Area of England	1990 - 2025	2026 - 2050	2051 - 2080	2081 - 2115	Cumulative (1990 - 2115)
South West	3.5mm p/a	8mm p/a	11.5mm p/a	14.5mm p/a	1.18m

## Flood Risk Assessment considerations:

The design flood (1% flood level fluvial, or 0.5% tidal, plus climate change allowance) should be used to inform the sequential test, including appropriate location of built development; consideration of flood risk impacts, mitigation/enhancement and ensure 'safe' development.

### Vulnerability classification

- Development classed as 'Essential Infrastructure' (as defined within Table 2 - Flood Risk Vulnerability Classification, Paragraph: 066 Reference ID: 7-066-20140306 of the NPPG) should be designed to the 'upper end' climate change allowance (70%).
- For highly vulnerable or more vulnerable development e.g. housing, the FRA should use the 'higher central' climate change allowance (35%), as a minimum, to inform built in resilience; but aim to incorporate managed adaptive approaches/measures for the 'upper end' allowance (70%) where feasible.
- For water compatible or less vulnerable development e.g. commercial, the FRA should use the 'central' climate change allowance (20%), as a minimum, to inform built in resilience; but aim to incorporate managed adaptive approaches/measures for the 'higher central' allowance (25%) where feasible.

### Modelling approach

- Major Development:

For 'major' development (as defined within The Town and Country Planning Development Management Procedure (England) Order 2015)\*, see definition note below, we would expect a detailed FRA to provide an appropriate assessment (hydraulic model) of the 1% with relevant climate change ranges.

There are two options:

Scenario 1 - Produce a model and incorporate relevant climate change allowances in Table 1.

Scenario 2 - Re-run an existing model and incorporate relevant climate change allowances in Table 1.

- Non Major Development:

For 'non major' development, we would advise that a model is produced or existing model is re-run, similar to the above approach (Scenario 1 and 2). This would give a greater degree of certainty on the design flood extent to inform a safe development.

However, for 'non major' development only, in the absence of modelled climate change information it may be reasonable to utilise an alternative approach. To assist applicants and Local Planning Authorities we have provided some 'nominal' climate change allowances within the 'Table of nominal allowances' below. These should be considered as appropriate within any FRA. There are three additional options:

Scenario 3 - Where previous modelled data (for a variety of return periods) is available, you could interpolate your own climate change figure (see note iv below).

Scenario 4 - Where the 1% level is available from an existing model add on the relevant 'nominal climate change allowance' provided in the 'Table of nominal allowances' below.

Scenario 5 - Establish the 1% level, for example using topographical levels (including LiDAR) and assessment of watercourse flow and nature and then add on the relevant 'nominal climate change allowances' provided in the 'Table of nominal allowances' below.

\*Note: For definitions of 'major' development see 'Interpretation 2.—(1)', on page 5, at [www.legislation.gov.uk/ukxi/2015/595/pdfs/ukxi\\_20150595\\_en.pdf](http://www.legislation.gov.uk/ukxi/2015/595/pdfs/ukxi_20150595_en.pdf)



## Table of Nominal Allowances

Watercourse	20% - 25%	35% - 40%	70%
Upper Severn	600mm	850mm	1500mm
River Wye			
River Teme			
River Avon	400mm	600mm	1000mm
Lower Severn	400mm	600mm	1000mm
Tributaries and 'ordinary watercourses'	200mm	300mm	500mm

Notes to above:-

(i) Watercourse definition:

The "Upper Severn"/"Lower Severn" boundary is taken as Lincomb Weir, Worcestershire (national grid reference SO8196869458).

An 'Ordinary Watercourse' is a watercourse that does not form part of a main river. Main Rivers are indicated on our Flood Map. You can also check the classification of the watercourse with the LLFA, some of which have produced Drainage and Flooding Interactive Maps.

(ii) Where a site is near the confluence of two, or more, watercourses, the FRA should use the larger river climate change allowances.

(iii) We may hold more precise information for some of the "tributaries". We would recommend that you seek this information from us via a 'pre-planning enquiry/data request', to the email address below.

(iv) We would also recommend that you contact us for our modelled '20%' allowances and associated flow data. This is available for some rivers. This data may help inform a more detailed climate change analysis (where necessary), including any interpolation of levels or flow to create a 'stage discharge rating' in order to estimate the required percentage; or be of assistance to inform 'less vulnerable' or 'water compatible' development proposals.

### IMPORTANT NOTE

Please note the nominal climate change allowances are provided as a pragmatic approach, for consideration, in the absence of a modelled flood level and the applicant undertaking a detailed model of the watercourse. Use of nominal climate change allowances are not provided/ recommended as a preference to detailed modelling and historical data.

The Local Planning Authority may hold data within their Strategic Flood Risk Assessment (SFRA), or any future updates, which may help inform the above.

### FREEBOARD NOTE

It is advised that Finished Floor Levels should be set no lower than '600mm' above the 1% river flood level plus climate change. Flood proofing techniques might be considered where floor levels cannot be raised (where appropriate). This 600mm freeboard takes into account any uncertainties in modelling/flood levels and wave action (or storm surge effects).

## Surface Water

Table 2 of the guidance also indicates the relevant increases that surface water FRA should consider for an increase in peak rainfall intensity.

The following table is for ‘**peak rainfall intensity**’ allowance in small and urban catchments. Please note that **surface water (peak rainfall intensity) climate change allowances should be discussed with the Lead Local Flood Authority (LLFA)**.

Peak Rainfall Intensity - Applies across all of England	Total potential change anticipated for 2010-2039	Total potential change anticipated for 2040-2059	Total potential change anticipated for 2060-2115
Upper end	10%	20%	40%
Central	5%	10%	20%

Note to above:-

For river catchments around or over 5 square kilometres, the peak river flow allowances are appropriate.

Produced by: [shwgplanning@environment-agency.gov.uk](mailto:shwgplanning@environment-agency.gov.uk)

West Midlands Area -

Shropshire, Herefordshire, Worcestershire and Gloucestershire Sustainable Places Team.

## B. Detailed maintenance costs for each feature

### Maintenance requirements and costs of ponds and wetlands

Most of the maintenance will be required as part of the overall open space maintenance. The costs are based on the assumption that a specific visit to site is made to carry out the maintenance in the SUDS pond or wetland. If they are incorporated into the general maintenance there will only be some additional costs where extra work relating to the SUDS feature needs to be undertaken above and beyond the cost for the general landscape. Items that are specific to a SUDS pond or wetland that will be carried out in addition to general landscape maintenance are highlighted in blue. The costs assume that access to the site is easy. Minimum costs are based on the cost to visit a site and the rates for larger areas are based on information in the SPON's External Works and Landscape Price Book 2008 and will be updated as necessary. There is no allowance for profit in the costs.

Item	Frequency	Comments	Cost	
			Minimum cost for small areas of POS (based on fixed cost of a site visit)	£/100m <sup>2</sup> per visit for larger POS areas
Litter removal	1 per month	Litter quantity and characteristics will be dependant on the site Litter may collect in ponds and wetland features Litter collection may be part of the general landscape maintenance Litter collection should be undertaken at each site visit and the beginning of any maintenance task, particularly grass cutting All litter must be removed from site	1 site visit with 3 men, 1 light van, mower and ancillary equipment.  Half day visit comprises 3 hours on site and 1 hour travelling.  Half day maximum POS area including SUDS is about 4000 m <sup>2</sup> (including pond or wetland vegetation).  Cost per visit = £249	0.67
Inspect control structures to/from pond or wetland	1 per month	Surface control structures can be slot weirs, V-notch or gabion baskets with control in the stone fill. They can be inspected without removing covers or special keys		£5/ structure
Grass cutting on slopes around pond above temporary water level – amenity grass	1 per month	All grass cuttings managed on site in wildlife or compost piles	Full day visit comprises 7 hours on site and 1 hour travelling.	1.14
Scrub clearance from bankside	1 per year	Overhanging branches and encroaching growth will normally be undertaken as part of landscape maintenance	One day maximum POS area including SUDS is about 10000m <sup>2</sup> (including pond or wetland vegetation)  Cost per visit = £498	5.83
Cut 25% to 30% wetland vegetation and remove to site wildlife piles	1 per year			3.38
Remove planting and silt from 25% to 30% of base and place in site piles	1 per 5 years	Silt accumulation is slow if 'source control' features are located upstream in the 'management train'  Only required once every 5 years	Assume 1 site visit with 3 men, 1 light van, small excavator and ancillary equipment. Total pond area up to 1200m <sup>2</sup>  Cost per visit = £689  Disposal of silt by truck with mechanical grab (assuming it is not special waste) £51.18/m <sup>3</sup>	
Extra cost if silt, grass cuttings, etc are removed from site during routine maintenance	To suit other operations	Ideally all cuttings should be used on site to construct and maintain wildlife piles but this may not be the best option in public open space and removal from the site may be needed.	£2.65/100m <sup>2</sup> cleared.  Assumes the waste is not classified as special waste and proportion of silt is minor (which should be the case if source control is in place upstream). Disposal of silt by truck with mechanical grab (assuming it is not hazardous or special waste) £55/m <sup>3</sup>	

 = SUDS Specific Items

Maintenance schedules and costs for SUDS

Ponds and Wetlands

No per year	General rates - cost per visit to site		10000 m2 site		Total per visit for site inc all SUDS 10000 m2 site	Page reference in SPON'S
	Item	No	Unit	Rate		
	12 Litter removal	10000	100m2	0.67	67	Pg 216 collection and disposal of litter from isolated grassed area
	Inspect control structures to pond or wetland (assumes surface features and no special tools required)	4	No	5	20	Allow £5 per structure
	Grass cutting on slopes around pond 12 above temporary water level - amenity grass	10000	100m2	1.14	114	Page 214 self propelled rotary mower, 91cm cut width, removing arisings not exceeding 30 deg from horizontal (0.36 + 0.78 = 1.14)
	1 Scrub clearance from bankside	10000	100m2	5.83	583	Page 216 use rate for clearing leaf and other debris from verges by hand
	1 Cut 25% to 30% wetland vegetation and remove to site wildlife piles	2500	100m2	3.38	84.5	Page 214 cutting grass or light woody undergrowth using strimmer not exceeding 30 deg
	1 Removal of all arisings (scrub clearance and wetland vegetation)	2500	100m2	2.65	66.25	Page 216 use rate for removal of arisings from areas containing shrub beds.
Total per visit if all items completed					934.75	
Total per visit for litter removal, inspection and gress cutting					201	
Total annual cost					3145.75	
Contingency to allow for ad hoc work such as repairing erosion, vandalism, etc. Allow 15%					471.86	
Cost per visit based on labour rates						
Item	No	Unit	Rate	Half day (4 hours)	Full day (8 hours)	Page reference in SPON'S
Labourers x 3	8	hour	15.5	186.00	372.00	Page 8 includes overheads, tools, site kit, etc but not profit
Light van (eg transit)	1	day	36	18.00	36.00	Page 8 includes fuel, insurance, etc
Small ride on mower	8	hour	8.75	35.00	70.00	Assumes rate for mower is same as for a mini excavator, self drive and no delivery charge or minimum hire
Ancillary tools and equipment	1	day	20	10.00	20.00	Allowance for tools such as strimmers, etc
Disposal of cuttings off site	1	Item	150	150.00	150.00	Cost based on small skip specific for disposal from a particular site - 6m <sup>3</sup> (The more sites that are maintained the less this cost may become)
Total per visit				249.00	498.00	
Total for 12 visits per year				2988.00	5976.00	
Contingency to allow for ad hoc work such as repairing erosion, vandalism, etc. Allow one extra visit per year				249.00	498.00	
Pond silt removal every 5 years						
Assume a specific visit is made for this work	No	Unit	Rate	Half day (4 hours)	Full day (8 hours)	Page reference in SPON'S
Labourers x 3	8	hour	15.5	186.00	372.00	Page 8 includes overheads, tools, site kit, etc but not profit
Light van (eg transit)	1	day	36	18.00	36.00	Page 8 includes fuel, insurance, etc
Small mini excavator, rubber tracks (self drive)	8	hour	8.75	35.00	70.00	Page 15, self drive and no delivery charge. Minimum hire 8 hours
Delivery charge in Cambridge from local hire company	1	Item	30	30.00	30.00	Assume £30 for both ways
Ancillary tools and equipment	1	day	20	10.00	20.00	Allowance for tools such as strimmers, etc
Disposal of silt for SUDS serving 1 Ha site (volume depends on catchment area)	0.63	m <sup>3</sup>	51.18	161.00	161.00	Allow 0.63m <sup>3</sup> per year per ha of catchment area (impermeable), based on 755kg/ha/yr and density of 1200kg/m <sup>3</sup> from Darcy et al (2000). Cost from Page 106, wet clay
Total				440.00	689.00	
Notes						
All rates and base costs taken from SPON'S External Works and Landscape Price Book 2008						
Silt loading						
Parameter	Units		Value			
Silt load (TSS)	kg/ha/yr		755	Maximum load for high density housing		
Silt density in pond	kg/m <sup>3</sup>		1200			
Silt accumulation pond	m <sup>3</sup> /y/ha impermeable catchment area		0.63			

## Maintenance requirements and costs of basins

Most of the maintenance will be required as part of the overall open space maintenance. The costs are based on the assumption that a specific visit to site is made to carry out the maintenance in the SUDS basin. If they are incorporated into the general maintenance there will only be some additional costs where extra work relating to the SUDS feature needs to be undertaken above and beyond the cost for the general landscape. Items that are specific to a basin that will be carried out in addition to general landscape maintenance are highlighted in blue. The costs assume that access to the site is easy. Minimum costs are based on the cost to visit a site and the rates for larger areas are based on information in the SPON's external works and landscape price book 2008 and will be updated as necessary. There is no allowance for profit in the costs.

Item	Frequency	Comments	Cost	
			Minimum cost for small areas of POS (based on fixed cost of a site visit)	£/100m <sup>2</sup> per visit for larger areas of POS
Litter removal	1 per month	Litter quantity and characteristics will be dependant on the site Litter may collect in ponds and wetland features Litter collection may be part of the general landscape maintenance Litter collection should be undertaken at each site visit and the beginning of any maintenance task, particularly grass cutting All litter must be removed from site	1 site visit with 3 men, 1 light van, mower and ancillary equipment.  Half day visit comprises 3 hours on site and 1 hour travelling. Half day maximum area = 4000 m <sup>2</sup> (including pond or wetland vegetation)  Cost per visit = £249	0.67
Inspect control structures to/from basin	1 per month	Surface control structures can be slot weirs, V-notch or gabion baskets with control in the stone fill. They can be inspected without removing covers or special keys. Maintenance of control structures in manhole chambers will be more expensive.		£5/ structure
Grass cutting on slopes and in bottom of basin – amenity grass	1 per month	All grass cuttings managed on site in wildlife or compost piles	Full day visit comprises 7 hours on site and 1 hour travelling. One day maximum area = 10000m <sup>2</sup> (including pond or wetland vegetation) Cost per visit = £498	1.14
Scrub clearance from bankside	1 per year	Overhanging branches and encroaching growth will normally be undertaken as part of landscape maintenance		5.83
Habitat mosaic 30% cut and remove to site wildlife piles (see Section on ponds and wetlands)	1 per year	Carry out September to November if possible to minimise disruption to wildlife		3.38
Scarify and spike base of infiltration basin if necessary at same time	1 per 5 years	This would typically be undertaken at the same time and as part of the visit to remove silt.	Inc in silt removal costs with nominal extra allowance for scarifying plant	1.29
Remove silt from base and place in site piles (see Section on ponds and wetlands)	1 per 5 years	Silt accumulation is slow if 'source control' features are located upstream in the 'management train' Only required once every 5 years	Assume 1 site visit with 3 men, 1 light van, small excavator and ancillary equipment. Basin area up to 1200m <sup>2</sup>  Cost per visit = £689  Disposal of silt by truck with mechanical grab (assuming it is not special waste) £51.18/m <sup>3</sup>	
Extra cost if silt, grass cuttings, etc are removed from site during routine maintenance	To suit other operations	Ideally all cuttings should be used on site to construct and maintain wildlife piles but this may not be the best option in public open space and removal from the site may be needed.	£2.65/m <sup>2</sup> cleared.  Assumes the waste is not classified as special waste and proportion of silt is minor (which should be the case if source control is in place upstream). Disposal of silt by truck with mechanical grab (assuming it is not hazardous or special waste) £55/m <sup>3</sup>	

 = SUDS Specific Items

## Maintenance schedules and costs for SUDS

### Basins

No per year	General rates - cost per visit to site			10000 m <sup>2</sup> site		Page reference in SPON'S
	Item	No	Unit	Rate	Total per visit for site inc all SUDS 10000 m2 site	
12	Litter removal	10000	100m <sup>2</sup>	0.67	67	Pg 216 collection and disposal of litter from isolated grassed area
12	Inspect control structures to basin (assumes surface features and no special tools required)	4	No	5	20	Allow £5 per structure
12	Grass cutting on slopes and in bottom of basin - amenity grass	10000	100m <sup>2</sup>	1.14	114	Page 214 self propelled rotary mower, 91cm cut width, removing arisings not exceeding 30 deg from horizontal (0.36 + 0.78 = 1.14)
1	Scrub clearance from bankside	10000	100m <sup>2</sup>	5.83	583	Page 216 use rate for clearing leaf and other debris from verges by hand
1	Habitat mosaic 30% cut and remove to site wildlife piles	3300	100m <sup>2</sup>	3.38	111.54	Page 214 cutting grass or light woody undergrowth using strimmer not exceeding 30 deg
1	Removal of all arisings (scrub clearance and vegetation)	3300	100m <sup>2</sup>	2.65	87.45	Page 216 use rate for removal of arisings from areas containing shrub beds.
<b>Total per visit if all items completed</b>					<b>982.99</b>	
<b>Total per visit for litter removal, inspection and grass cutting</b>					<b>201</b>	
<b>Total annual cost</b>					<b>3193.99</b>	
<b>Contingency to allow for ad hoc work such as repairing erosion, vandalism, etc. Allow 15%</b>					<b>479.10</b>	

Cost per visit based on labour rates						
Item	No	Unit	Rate	Half day (4 hours)	Full day (8 hours)	Page reference in SPON'S
Labourers x 3	8	hour	15.5	186.00	372.00	Page 8 includes overheads, tools, site kit, etc but not profit
Light van (eg transit)	1	day	36	18.00	36.00	Page 8 includes fuel, insurance, etc
Small ride on mower	8	hour	8.75	35.00	70.00	Assumes rate for mower is same as for a mini excavator, self drive and no delivery charge or minimum hire
Ancillary tools and equipment	1	day	20	10.00	20.00	Allowance for tools such as strimmers, etc
Disposal of cuttings off site	1	Item	150	150.00	150.00	Cost based on small skip specific for disposal from a particular site - 6m <sup>3</sup> (The more sites that are maintained the less this cost may become)
<b>Total per visit</b>				<b>249.00</b>	<b>498.00</b>	
<b>Total for 12 visits per year</b>				<b>2988.00</b>	<b>5976.00</b>	
<b>Contingency to allow for ad hoc work such as repairing erosion, vandalism, etc. Allow one extra visit per year</b>				<b>249.00</b>	<b>498.00</b>	

Basin silt removal, scarifying and spiking every 5 years						
Assume a specific visit is made for this work	No	Unit	Rate	Half day (4 hours)	Full day (8 hours)	Page reference in SPON'S
Labourers x 3	8	hour	15.5	186.00	372.00	Page 8 includes overheads, tools, site kit, etc but not profit
Light van (eg transit)	1	day	36	18.00	36.00	Page 8 includes fuel, insurance, etc
Small mini excavator, rubber tracks (self drive)	8	hour	8.75	70.00	70.00	Page 15, self drive and no delivery charge. Minimum hire 8 hours
Delivery charge in Cambridge from local hire company	1	Item	30	30.00	30.00	Assume £30 for both ways
Ancillary tools and equipment to scarify and spike	1	day	40	20.00	40.00	Allowance for tools such as strimmers, pedestrian operated scarifying equipment, etc
Disposal of silt from SUDS serving 1 Ha catchment (volume depends on catchment area)	0.63	m <sup>3</sup>	51.18	161.00	161.00	Allow 0.63m <sup>3</sup> per year per ha of catchment area (impermeable), based on 755kg/ha/yr and density of 1200kg/m <sup>3</sup> from Darcy et al (2000). Cost from Page 106, wet clay
<b>Total</b>				<b>485.00</b>	<b>709.00</b>	

#### Notes

All rates and base costs taken from SPON'S External Works and Landscape Price Book 2008

Scarifying and spiking every five years						
General rates - cost per visit to site, 10000m <sup>2</sup> site						
Item	No	Unit	Rate	Total per visit for 4000m <sup>2</sup> site inc all SUDS	Page reference in SPON'S	
Scarifying using pedestrian operated plant	10000	100m <sup>2</sup>	1.29	129	Pg 215 Scarifying mechanical	
Removal and disposal of arisings	10000	100m <sup>2</sup>	11.41	1141	Pg 215	

Silt loading			
Parameter	Units	Value	
Silt load (TSS)	kg/ha/yr	755	Maximum load for high density housing
Silt density in basin	kg/m <sup>3</sup>	1200	
Silt accumulation basin	m <sup>3</sup> /y/ha impermeable catchment area	0.63	



## Maintenance requirements and costs of swales and filter strips

Most of the maintenance will be required as part of the overall open space maintenance. The costs are based on the assumption that a specific visit to site is made to carry out the maintenance in the SUDS swale or filter strip. If they are incorporated into the general maintenance there will only be some additional costs where extra work relating to the SUDS feature needs to be undertaken above and beyond the cost for the general landscape. Items that are specific to a SUDS swale or filter strip that will be carried out in addition to general landscape maintenance are highlighted in blue. The costs assume that access to the site is easy. Minimum costs are based on the cost to visit a site and the rates for larger areas are based on information in the SPON's External Works and Landscape Price Book 2008 and will be updated as necessary. There is no allowance for profit in the costs.

Item	Frequency	Comments	Cost	
			Minimum cost for small areas of POS (based on fixed cost of a site visit)	£/100m <sup>2</sup> per visit for larger areas of POS
Litter removal	1 per month	Litter quantity and characteristics will be dependant on the site Litter may collect in swales Litter collection may be part of the general landscape maintenance Litter collection should be undertaken at each site visit and the beginning of any maintenance task, particularly grass cutting All litter must be removed from site	1 site visit with 3 men, 1 light van, mower and ancillary equipment.  Half day visit comprises 3 hours on site and 1 hour travelling. Half day maximum area = 4000 m <sup>2</sup> (including pond or wetland vegetation) Cost per visit = £249	0.67
Inspect control structures to/from swale	1 per month	Surface control structures can be slot weirs, V-notch or gabion baskets with control in the stone fill. They can be inspected without removing covers or special keys. Maintenance of control structures in manhole chambers will be more expensive.	Full day visit comprises 7 hours on site and 1 hour travelling. One day maximum area = 10000m <sup>2</sup> (including pond or wetland vegetation) Cost per visit = £498	£5/ structure
Grass cutting in swale – amenity grass	1 per month	All grass cuttings managed on site in wildlife or compost piles		1.14
Scrub clearance from bankside	1 per year	Overhanging branches and encroaching growth will normally be undertaken as part of landscape maintenance		5.83
Remove planting and silt from 25% to 30% of base and place in site piles	1 per 5 years	Silt accumulation is slow if swale is designed as a source control feature. Carry out September to November if possible to minimise disruption to wildlife. Only required once every 5 years	Assume 1 site visit with 3 men, 1 light van, small excavator and ancillary equipment. Pond area up to 1200m <sup>2</sup> Cost per visit = £689 Disposal of silt by truck with mechanical grab (assuming it is not special waste) £51.18/m <sup>3</sup>	
Extra cost if silt, grass cuttings, etc are removed from site during routine maintenance	To suit other operations	Ideally all cuttings should be used on site to construct and maintain wildlife piles but this may not be the best option in public open space and removal from the site may be needed.	£2.65/100m <sup>2</sup> cleared. Assumes the waste is not classified as special waste and proportion of silt is minor (which should be the case if swale is designed as a source control feature). Disposal of silt by truck with mechanical grab (assuming it is not hazardous or special waste) £55/m <sup>3</sup>	

 = SUDS Specific Items

Maintenance schedules and costs for SUDS

Swales and filter strips

No per year	General rates - cost per visit to site		10000 m <sup>2</sup> site			Page reference in SPON'S
	Item	No	Unit	Rate	Total per visit for site inc all SUDS 10000 m2 site	
12	Litter removal	10000	100m <sup>2</sup>	0.67	67	Pg 216 collection and disposal of litter from isolated grassed area
12	Inspect control structures to swale (assumes surface features and no special tools required)	4	No	5	20	Allow £5 per structure
12	Grass cutting on slopes and in bottom of swale - amenity grass	10000	100m <sup>2</sup>	1.14	114	Page 214 self propelled rotary mower, 91cm cut width, removing arisings not exceeding 30 deg from horizontal (0.36 + 0.78 = 1.14)
1	Scrub clearance from bankside	10000	100m <sup>2</sup>	5.83	583	Page 216 use rate for clearing leaf and other debris from verges by hand
1	Removal of all arisings (scrub clearance and vegetation)	3300	100m <sup>2</sup>	2.65	87.45	Page 216 use rate for removal of arisings from areas containing shrub beds.
Total per visit if all items completed					871.45	
Total per visit for litter removal, inspection and gress cutting					201	
Total annual cost					3082.45	
Contingency to allow for ad hoc work such as repairing erosion, vandalism, etc. Allow 15%					462.37	

Cost per visit based on labour rates						
Item	No	Unit	Rate	Half day (4 hours)	Full day (8 hours)	Page reference in SPON'S
Labourers x 3	8	hour	15.5	186.00	372.00	Page 8 includes overheads, tools, site kit, etc but not profit
Light van (eg transit)	1	day	36	18.00	36.00	Page 8 includes fuel, insurance, etc
Small ride on mower	8	hour	8.75	35.00	70.00	Assumes rate for mower is same as for a mini excavator, self drive and no delivery charge or minimum hire
Ancillary tools and equipment	1	day	20	10.00	20.00	Allowance for tools such as strimmers, etc
Disposal of cuttings off site	1	Item	150	150.00	150.00	Cost based on small skip specific for disposal from a particular site - 6m <sup>3</sup> (The more sites that are maintained the less this cost may become)
Total per visit				249.00	498.00	
Total for 12 visits per year				2988.00	5976.00	
Contingency to allow for ad hoc work such as repairing erosion, vandalism, etc. Allow one extra visit per year				249.00	498.00	

Swale silt removal every 5 years						
Assume a specific visit is made for this work	No	Unit	Rate	Half day (4 hours)	Full day (8 hours)	Page reference in SPON'S
Labourers x 3	8	hour	15.5	186.00	372.00	Page 8 includes overheads, tools, site kit, etc but not profit
Light van (eg transit)	1	day	36	18.00	36.00	Page 8 includes fuel, insurance, etc
Small mini excavator, rubber tracks (self drive)	8	hour	8.75	70.00	70.00	Page 15, self drive and no delivery charge. Minimum hire 8 hours
Delivery charge in Cambridge from local hire company	1	Item	30	30.00	30.00	Assume £30 for both ways
Ancillary tools and equipment	1	day	40	20.00	40.00	Allowance for tools such as strimmers, pedestrian operated scarifying equipment, etc
Disposal of silt assuming SUDS serves 1 Ha catchment (volume depends on catchment area)	0.63	m <sup>3</sup>	51.18	161.00	161.00	Allow 0.63m <sup>3</sup> per year per ha of catchment area (impermeable), based on 755kg/ha/yr and density of 1200kg/m <sup>3</sup> from Darcy et al (2000). Cost from Page 106, wet clay
Total				485.00	709.00	

**Notes**  
All rates and base costs taken from SPON'S External Works and Landscape Price Book 2008

Alternative rate per metre of swale			
Clear vegetation from swale with strimmer	100 m	149.12	Pg 256 Ditching clear only vegetation from ditch not exceeding 1.5m deep. Dispose to spoil heaps width at top 2.5m to 4m
Disposal of vegetation off site	100 m	1193	Allow extra for disposal off site by truck. Use rate from page 216 for disposal of arisings from leaf clearance based on plan area of 1m length of swale - 4.5m <sup>2</sup> and a rate of £2.65/m <sup>2</sup> typically if shallow as required in this guide. Deeper swales will be more expensive.
Total cost per 100 metre of swale		1342.12	

Silt loading			
Parameter	Units	Value	
Silt load (TSS)	kg/ha/yr	755	Maximum load for high density housing
Silt density in swale	kg/m <sup>3</sup>	1200	
Silt accumulation swale	m <sup>3</sup> /y/ha impermeable catchment area	0.63	

## Maintenance requirements and costs of filter drains

Most of the maintenance will be required as part of the overall open space maintenance. The costs are based on the assumption that a specific visit to site is made to carry out the maintenance in the SUDS filter drain. If they are incorporated into the general maintenance there will only be some additional costs where extra work relating to the SUDS feature needs to be undertaken above and beyond the cost for the general landscape. Items that are specific to a SUDS filter drain that will be carried out in addition to general landscape maintenance are highlighted in blue. The costs assume that access to the site is easy. Minimum costs are based on the cost to visit a site and the rates for larger areas are based on information in the SPON's External Works and Landscape Price Book 2008 and will be updated as necessary. There is no allowance for profit in the costs.

Item	Frequency	Comments	Cost	
			Minimum cost for small areas of POS (based on fixed cost of a site visit)	£/m per visit for longer lengths
Litter removal	1 per month	Litter quantity and characteristics will be dependant on the site Litter may collect on top of filter drains Litter collection may be part of the general landscape maintenance Litter collection should be undertaken at each site visit and the beginning of any maintenance task, particularly grass cutting All litter must be removed from site	1 site visit with 2 men, 1 light van and ancillary equipment.  Half day visit comprises 3 hours on site and 1 hour travelling. Half day (including any other open areas or SUDS in site) Cost per visit = £152	0.67
Inspect control structures to/from filter drains	1 per month	Surface control structures can be slot weirs, V-notch or gabion baskets with control in the stone fill. They can be inspected without removing covers or special keys  Filter drains may well have control structures located in manholes or inspection chambers. Maintenance of control structures in manhole chambers will be more expensive.	Full day visit comprises 7 hours on site and 1 hour travelling. Full day (including any other open areas or SUDS in site) Cost per visit = £304	£20/structure
Remove top 300mm of gravel, clean and replace.  Remove silt from site	1 per 5 years	Silt accumulation is slow if filter drain is protected by a filter strip or other source control feature	Assume 1 site visit with 3 men, 1 light van, small excavator and ancillary equipment. Filter drain up to 100m length Cost per visit = £866  Disposal of silt by truck with mechanical grab (assuming it is not hazardous or special waste) £55/m <sup>3</sup>	

 = SUDS Specific Items

## Maintenance schedules and costs for SUDS

### Filter drains

General rates - cost per visit to site		10000 m <sup>2</sup> site				
No per year	Item	No	Unit	Rate	Total per visit for site inc all SUDS 10000 m2 site	Page reference in SPON'S
12	Litter removal	10000	100m <sup>2</sup>	0.67	67	Pg 216 collection and disposal of litter from isolated grassed area assume filter drain is maintained as part of wider management of area
12	Inspect control structures to filter drain (assumes surface features and no special tools required)	4	No	20	20	Allow £20 per structure as they are more likley to be in manholes for filter drains
Total per visit if all items completed					87	
Total per visit for litter removal, inspection and gress cutting					87	
Total annual cost					1044	
Contingency to allow for ad hoc work such as repairing erosion, vandalism, etc. Allow 15%					156.6	

Cost per visit based on labour rates						
Item	No	Unit	Rate	Half day (4 hours)	Full day (8 hours)	Page reference in SPON'S
Labourers x 2	8	hour	15.5	124.00	248.00	Page 8 includes overheads, tools, site kit, etc but not profit. Assume that if visit is specifically to maintain filter drain then a gang of 2 men will be used.
Light van (eg transit)	1	day	36	18.00	36.00	Page 8 includes fuel, insurance, etc
Ancillary tools and equipment	1	day	20	10.00	20.00	Allowance for tools
Total per visit				152.00	304.00	
Total for 12 visits per year				1824.00	3648.00	
Contingency to allow for ad hoc work such as repairing erosion, vandalism, etc. Allow one extra visit per year				152.00	304.00	

Gravel removal by machine every 5 years						
Assume a specific visit is made for this work	No	Unit	Rate	Half day (4 hours)	Full day (8 hours)	Page reference in SPON'S
Labourers x 2	8	hour	15.5	124.00	248.00	Page 8 includes overheads, tools, site kit, etc but not profit
Light van (eg transit)	1	day	36	18.00	36.00	Page 8 includes fuel, insurance, etc
Small mini excavator, rubber tracks (self drive)	8	hour	8.75	35.00	70.00	Page 15, self drive and no delivery charge. Minimum hire 8 hours
Delivery charge in Cambridge from local hire company	1	Item	30	30.00	30.00	Assume £30 for both ways
Disposal of gravel (top 300mm). This is worst case costs. Ideally the gravel would be cleaned and replaced. Only the geotextile would require replacement. Assume 100m length	18.00	m <sup>3</sup>	26.77	240.93	481.86	Assume can excavate and replace 100m per day. Excavation = 0.3 x 0.6 x 100 = 18m <sup>3</sup> . 0.6m wide drain and disposal rate is for slightly contaminated material (majority will be the clean gravel pieces) Pg 105 disposal mechanical Recycled Materials Ltd
Install new geotextile assume 100m length	60.00	m <sup>2</sup>	0.95	28.50	57.00	Pg 261 extra over for filter wrapping pipes with Terram or similar filter fabric. Replace top geotextile 0.6m by 100mm per metre length of drain
Replace gravel assume 100m length	18.00	m <sup>3</sup>	40.7	366.30	732.60	Gravel = 0.3 x 0.6 x 100 = 18m <sup>3</sup> . 0.6m wide drain Page 137 Type 1 granular fill (rate /m <sup>3</sup> compacted material and compaction only)
Total				447.93	865.86	
Notes All rates and base costs taken from SPON'S External Works and Landscape Price Book 2008						
Alternative rate per metre of filter drain						
Excavate gravel and replace	1	m	10.89			Pg 367 Excavate trench includes for excavation and filling with Type 2 (cost will be similar for filter drain material) and disposal of surplus soil. Not exceeding 0.5m depth.
Disposal off site	0.18	m <sup>3</sup>	26.77			Allow extra for disposal as the gravel could be slightly contaminated.
Total cost per metre of filter drain			37.66			

## Maintenance of canals, rills and treatment channels

Most of the maintenance will be required as part of the overall open space maintenance. The costs are based on the assumption that a specific visit to site is made to carry out the maintenance in the SUDS channels. If they are incorporated into the general maintenance there will only be some additional costs where extra work relating to the SUDS feature needs to be undertaken above and beyond the cost for the general landscape. Items that are specific to a SUDS channels that will be carried out in addition to general landscape maintenance are highlighted in blue. The costs assume that access to the site is easy. Minimum costs are based on the cost to visit a site and the rates for larger areas are based on information in the SPON's External Works and Landscape Price Book 2008 and will be updated as necessary. There is no allowance for profit in the costs.

Item	Frequency	Comments	Cost	
			Minimum cost for small areas less (based on fixed cost of a site visit)	£ per visit for lengths greater than ??m
Litter removal	1 per month	Litter quantity and characteristics will be dependant on the site Litter may collect on top of filter drains Litter collection may be part of the general landscape maintenance Litter collection should be undertaken at each site visit and the beginning of any maintenance task, particularly grass cutting All litter must be removed from site	1 site visit with 2 men, 1 light van and ancillary equipment.  Half day visit comprises 3 hours on site and 1 hour travelling. Half day Cost per visit = £152	0.67 (general rate for litter removal on whole site)
Inspect control structures to/from filter canals, rills or treatment channels	1 per month	Surface control structures can be slot weirs, V-notch or gabion baskets with control in the stone fill. They can be inspected without removing covers or special keys Maintenance of control structures in manhole chambers will be more expensive.	Full day visit comprises 7 hours on site and 1 hour travelling. Full day Cost per visit = £304	£5/ structure
Remove silt. Remove silt from site	1 per 5 years	Silt accumulation is slow if canal is protected by source control feature Only required once every 5 years	Assume 1 site visit with 3 men, 1 light van and ancillary equipment. canal up to 100m length Cost per visit = £485  Disposal of silt by truck with mechanical grab (assuming it is not hazardous or special waste) £55/m <sup>3</sup>	

 = SUDS Specific Items

Maintenance schedules and costs for SUDS

Canals and Rills

General rates - cost per visit to site		10000 m2 site				Page reference in SPON'S
No per year	Item	No	Unit	Rate	Total per visit for site inc all SUDS	
10000 m2 site						
12	Litter removal	10000	100m2	0.67	67	Pg 216 collection and disposal of litter from isolated grassed area assume rill is maintained as part of wider management of area
12	Inspect control structures to swale (assumes surface features and no special tools required)	4	No	5	20	Allow £5 per structure
1	Scrub clearance and vegetation management in canals and rills	10000	100m2	5.83	583	Page 216 use rate for clearing leaf and other debris from verges by hand
1	Removal of all arisings (scrub clearance and vegetation)	3300	100m2	2.65	87.45	Page 216 use rate for removal of arisings from areas containing shrub beds.
Total per visit if all items completed					757.45	
Total per visit for litter removal, inspection and gress cutting					87	
Total annual cost					1714.45	
Contingency to allow for ad hoc work such as repairing erosion, vandalism, etc. Allow 15%					257.1675	

Cost per visit based on labour rates						
Item	No	Unit	Rate	Half day (4 hours)	Full day (8 hours)	Page reference in SPON'S
Labourers x 2	8	hour	15.5	124.00	248.00	Page 8 includes overheads, tools, site kit, etc but not profit. Assume that if visit is specifically to maintain canals or rills then a gang of 2 men will be used.
Light van (eg transit)	1	day	36	18.00	36.00	Page 8 includes fuel, insurance, etc
Ancillary tools and equipment	1	day	20	10.00	20.00	Allowance for tools such as strimmers, etc
Disposal of cuttings off site	1	Item	150	150.00	150.00	Cost based on small skip specific for disposal from a particular site - 6m <sup>3</sup> (The more sites that are maintained the less this cost may become)
Total per visit				152.00	304.00	
Total for 12 visits per year				1824.00	3648.00	
Contingency to allow for ad hoc work such as repairing erosion, vandalism, etc. Allow one extra visit per year				152.00	304.00	

Silt removal by hand every 5 years						
Assume a specific visit is made for this work	No	Unit	Rate	Half day (4 hours)	Full day (8 hours)	Page reference in SPON'S
Labourers x 2	8	hour	15.5	124.00	248.00	Page 8 includes overheads, tools, site kit, etc but not profit
Light van (eg transit)	1	day	36	18.00	36.00	Page 8 includes fuel, insurance, etc
Ancillary tools and equipment to scarify and spike	1	day	40	20.00	40.00	Allowance for tools such as strimmers, pedestrian operated scarifying equipment, etc
Disposal of silt from SUDS serving 1Ha catchment (volume depends on catchment area)	0.63	m <sup>3</sup>	51.18	161.00	161.00	Allow 0.63m <sup>3</sup> per year per ha of catchment area (impermeable), based on 755kg/ha/yr and density of 1200kg/m <sup>3</sup> from Darcy et al (2000). Cost from Page 106, wet clay
Total				323.00	485.00	

Notes

All rates and base costs taken from SPON'S External Works and Landscape Price Book 2008

Silt loading			
Parameter	Units	Value	
Silt load (TSS)	kg/ha/yr	755	Maximum load for high density housing
Silt density in pond	kg/m <sup>3</sup>	1200	
Silt accumulation pond	m <sup>3</sup> /y/ha impermeable catchment area	0.63	



## APPENDIX VII - PRE APPLICATION CHECK LIST

Requirements	Details ( or ref documentation)	Agreed?
(a) Any planning and environmental objectives for the site that should influence the surface water drainage strategy. These objectives can be put forward by the developer, LPA or relevant flood risk management authorities and should be agreed by all parties.		
(b) The likely environmental or technical constraints to SuDS design for the site. These should be agreed by all parties."		
(c)The requirements of the local adoption or ongoing maintenance arrangements. The LPA have the overriding decision on the appropriateness of the adoption arrangements."		
(d) The suite of design criteria to be applied to the SuDS scheme (taking account of (a) to (c))."		
(e) Evidence that the initial development design proposals have considered the integration and linkage of the surface water management with street layouts, architectural and landscape proposals."		
(f) An assessment of strategic opportunities for the surface water management system to deliver multiple benefits for the site (see Table 5, British Standard 8582). This should be provided by the developer and should include the strategic use of public open space for SuDS."		
(g) The statutory and recommended non-statutory consultees for the site. This should be provided by the LPA."		
(h) The likely land and infrastructure ownership for drainage routes and points of discharge (including sewerage assets)."		
(i) An assessment of statutory consultee responsibilities and requirements, including timescales for any likely required approvals/consents."		
(j) Any potential local community impacts, health and safety issues or specific local community concerns/requirements that should be addressed by the detailed design."		
(k) An assessment of cost implications of stakeholder obligations."		
(l) An agreed approach to the design and maintenance of the surface water management for the proposed site.		

## APPENDIX VIII – SURFACE WATER DRAINAGE PRO-FORMA

### Surface water drainage pro-forma for new developments

We advise that developers should complete this form and submit it to the Local Planning Authority, referencing from where in their submission documents this information is taken. The pro-forma should be considered alongside other supporting SuDS guidance,

but focuses on ensuring flood risk is not made worse elsewhere.

Pre-app	Outline	Full	Reserved	Discharge	Document submitted
✓	✓	✓			Flood Risk Assessment/Statement (checklist)
✓	✓	✓			Drainage Strategy/Statement & sketch layout plan (checklist)
	✓				Preliminary layout drawings
	✓				Preliminary "Outline" hydraulic calculations
	✓				Preliminary landscape proposals
	✓				Ground investigation report (for infiltration)
	✓	✓			Evidence of third party agreement for discharge to their system (in principle/ consent to discharge)
		✓		✓	Maintenance program and on-going maintenance responsibilities
		✓	✓		Detailed development layout
		✓	✓	✓	Detailed flood & drainage design drawings
		✓	✓	✓	Full Structural, hydraulic & ground investigations
		✓	✓	✓	Geotechnical factual and interpretive reports, including infiltration results
		✓	✓	✓	Detailed landscaping details
		✓	✓	✓	Discharge agreements (temporary and permanent)
		✓	✓	✓	Development Management & Construction Phasing Plan

The table on the right indicates the level of information which would need to be submitted for each type of application or stage within the planning process will vary depending on the size of the development, flood risk, constraints, proposed sustainable drainage system etc.

Additional information may be required under specific site conditions or development proposals.

## 1. Site Details

Site	
Address & post code or LPA reference	
Grid reference	
Is the existing site developed or Greenfield?	
Total Site Area served by drainage system (excluding open space) (Ha)*	

\* The Greenfield runoff off rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA manual for detail on this.

## 2. Impermeable Area

	Existing	Proposed	Difference (Proposed-Existing)	Notes for developers & Local Authorities
Impermeable area (ha)				
Drainage Method (infiltration/sewer/watercourse)			N/A	If different from the existing, please fill in section 3. If existing drainage is by infiltration and the proposed is not, discharge volumes may increase. Section 6 must be filled in

## 3. Proposing to Discharge Surface Water via

	Yes	No	Evidence that this is possible	Notes for developers & Local Authorities
Infiltration				e.g. soakage tests. Section 6 (infiltration) must be filled in if infiltration is proposed.
To watercourse				e.g. Is there a watercourse nearby?
To surface water sewer				Confirmation from sewer provider that sufficient capacity exists for this connection.
Combination of above				e.g. part infiltration part discharge to sewer or watercourse. Provide evidence above.

**4. Peak Discharge Rates** – This is the maximum flow rate at which storm water runoff leaves the site during a particular storm event.

	Existing Rates (l/s)	Post development Rates (l/s)	Difference (l/s) (Post-Existing)	Notes for developers & Local Authorities
<b>Greenfield QBAR</b>		N/A	N/A	QBAR is approx. 1 in 2 storm event. Provide this if Section 6 (QBAR) is proposed.
<b>1 in 1</b>				Proposed discharge rates (with mitigation) should be no greater than <b>1 in 1</b> annual probability for all corresponding storm events. e.g. discharging all flow from site at the existing 1 in 100 event increases flood risk during smaller events.
<b>1 in 30</b>				
<b>1 in 100</b>				
<b>1 in 100 plus climate change</b>	N/A			To mitigate for climate change the proposed 1 in 100 +CC must be no greater than the existing 1 in 1 runoff rate. If not, flood risk increases for small scale return periods and under climate change. <b>70%</b> should be added to the peak rainfall intensity.

**5. Calculate additional volumes for storage** –The total volume of water leaving the development site. New hard surfaces potentially restrict the amount of stormwater that can go to the ground, so this needs to be controlled so not to make flood risk worse to properties downstream.

	Existing Volume (m <sup>3</sup> )	Post development Volume (m <sup>3</sup> )	Difference (m <sup>3</sup> ) (Proposed-Existing)	Notes for developers & Local Authorities
<b>1 in 1</b>				Proposed discharge volumes (without mitigation) should be no greater than existing volumes for the existing <b>1 in 1</b> annual probability storm event. Any increase in volume increases flood risk elsewhere. Where volumes are increased section 6 must be filled in.
<b>1 in 30</b>				
<b>1 in 100</b>				
<b>1 in 100 plus climate change</b>				To mitigate for climate change the volume discharge from site must be no greater than the existing 1 in 1 storm event. If not, flood risk increases under climate change.

**6. Calculate attenuation storage** – Attenuation storage is provided to enable the rate of runoff from the site into the receiving watercourse to be limited to the acceptable rate to protect against erosion and flooding downstream. The attenuation storage volume is a function of the degree of development relative to the greenfield discharge rate.

		<b>Notes for developers &amp; Local Authorities</b>
Storage Attenuation volume (Flow rate control) required to retain rates as existing (m <sup>3</sup> )		Volume of water to attenuate on site if discharging at existing 1 in 1 annual probability rates.

## 7. How is Storm Water stored on site?

Storage is required for the additional volume from site but also for holding back water to slow down the rate from the site. This is known as attenuation storage and long term storage. The idea is that the additional volume does not get into the watercourses, or if it does it is at an exceptionally low rate. You can either infiltrate the stored water back to ground, or if this isn't possible hold it back with on-site storage. Firstly, can infiltration work on site?

			<b>Notes for developers &amp; Local Authorities</b>
Infiltration	State the Site's Geology and known Source Protection Zones (SPZ)		Avoid infiltrating in made ground. Infiltration rates are highly variable and refer to Environment Agency website to identify and source protection zones (SPZ)
	Are infiltration rates suitable?		Permeability tests (BRE 365) must be taken at the depth and location of significant infiltration features. Infiltration rates should be no lower than 1x10 <sup>-6</sup> m/s.
	State the distance between a proposed infiltration device base and the ground water (GW) level		Need 1m (min) between the base of the infiltration device & the water table to protect Groundwater quality & ensure GW doesn't enter infiltration devices. Avoid infiltration where this isn't possible.

	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.		Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
	Yes/No? If the answer is No, please identify how the storm water will be stored prior to release		If infiltration is not feasible how will the additional volume be stored?. The applicant should then consider the following options in the next section.
In light of the above , is infiltration feasible?			

### Storage requirements

The developer must confirm that either of the two methods for dealing with the amount of water that needs to be stored on site.

**Option 1 Simple** – Store both the additional volume and attenuation volume in order to make a final discharge from site at a **1 in 1** annual probability rate. This is preferred if no infiltration can be made on site. This very simply satisfies the runoff rates and volume criteria.

**Option 2 Complex** – If some of the additional volume of water can be infiltrated back into the ground, the remainder can be discharged at a **1 in 1** annual probability rate. A combined storage calculation using the partial infiltration values and the allowed runoff rate needs to be supplied.

Please confirm what option has been chosen and how much storage is required on site.		<b>Notes for developers &amp; Local Authorities</b>
		The developer at this stage should have an idea of the site characteristics and be able to explain what the storage requirements are on site and how it will be achieved.



## 8. Please confirm

		<b>Notes for developers &amp; Local Authorities</b>
Which Drainage Systems measures have been used?		SuDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SuDS devices allows treatment but not infiltration. See CIRIA SuDS Manual C753.
Drainage system can contain in the 1 in 30 storm event without flooding		This is a requirement for sewers for adoption & is good practice even where drainage system is not adopted.
Any flooding between the 1 in 30 & 1 in 100 plus climate change storm events will be safely contained on site.		<b>Safely:</b> not causing property flooding or posing a hazard to site users i.e. no deeper than 100mm on roads/footpaths. Flood waters must drain away at section 6 rates.
How are rates being restricted (hydrobrake etc.)		Hydrobrakes can be used where rates are > 2l/s. Orifices can be used below 5l/s - sufficient anti-siltation measures must be applied.
Please confirm the owners/adopters of the entire drainage systems throughout the development. Please list all the owners.		If there are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Pro-forma.
How is the entire drainage system to be maintained?		If the features are to be maintained directly by the owners as stated in answer to the above question please answer yes to this question and submit the relevant maintenance schedule for each owner. If it is to be maintained by others than above please give details of each feature and the maintenance schedule. Clear details of the maintenance proposals of all element of the proposed drainage system must be provided. Poorly maintained drainage can lead to increased flooding problems in the future.

**10. Evidence** Please identify where the details quoted in the sections above were taken from. i.e. Plans, reports etc. Please also provide relevant drawings that need to accompany your pro-forma, in particular exceedance routes and ownership and location of SuDS maintenance access strips etc.

Pro-forma Section	Document reference where details quoted above are taken from	Page Number
Section 2		
Section 3		
Section 4		
Section 5		
Section 6		

Section 7		

The above form should be completed using evidence from the Flood Risk Assessment and site plans. It should serve as a summary sheet of the drainage proposals and should clearly show that the proposed rate and volume as a result of development will not be increasing and are restricted to the allowed values. If there is an increase in rate or volume due to development, the rate or volume section should be completed to set out how the additional rate/volume is being dealt with.

This form is completed using factual information from the Flood Risk Assessment and Site Plans and can be used as a summary of the surface water drainage strategy on this site.

Form Completed By.....

Qualification of person responsible for signing off this pro-forma.....

Company.....,

On behalf of (Client's details).....

Date.....