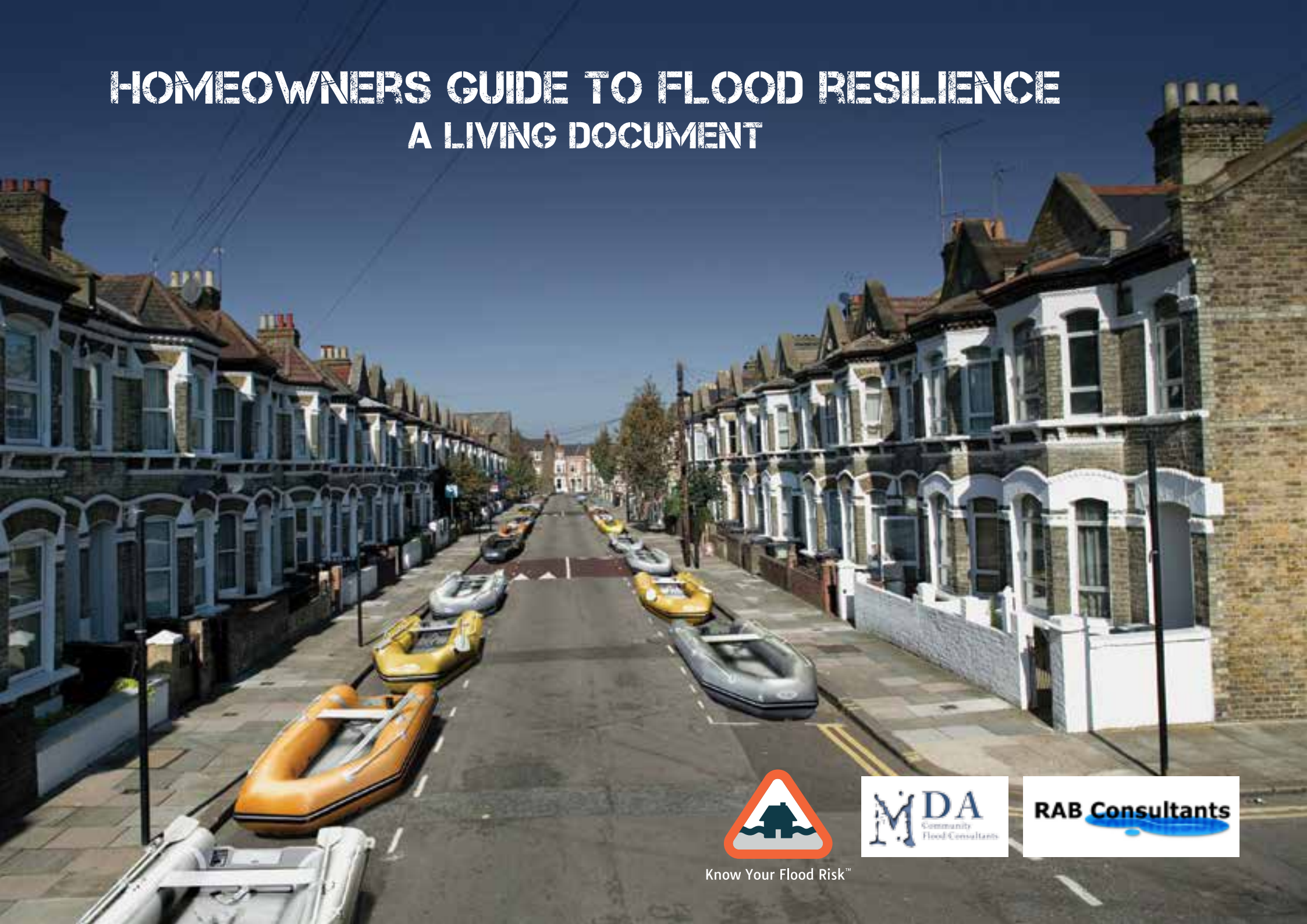
# HOMEOWNERS GUIDE TO FLOOD RESILIENCE

## A LIVING DOCUMENT



Know Your Flood Risk™

MDA Community Flood Consultants

RAB Consultants

## Contents


| | |
|---|---|
| Foreword | 1 |
| 1. Why should I think about flood risk? - For a personal perspective from Mary Dhonau | 3 |
| 2. What is the risk to houses from flooding? | 5 |
| 3. How do I find out if my home is at risk from flooding? | 6 |
| 4. Should I consider protecting my home from flooding? | 7 |
| 5. How best to protect myself, my family and my home from flooding? | 8 |
| 6. Where can I find help? | 12 |
| 7. The flood protection product information tables | 13 |
| 8. Permanent resistance | 15 |
| 9. Temporary resistance | 22 |
| 10. Resilience | 27 |
| 11. Community solutions | 32 |
| 12. Case studies | 36 |
| 13. Directory of flood protection product manufacturers and suppliers featured in this handbook | 46 |
| 14. Useful links and references | 52 |

# Foreword

Flooding can have a devastating impact on homes and families. This was clearly shown by the terrible floods, which hit so many parts of England and Wales in 2007, Cumbria in both 2009 and 2012, and many areas over the winter of 2013/14.

According to Environment Agency figures, in England alone over 5 million people live and work in properties that are at risk of being flooded, by rivers, the sea, surface water flooding or a combination of these*.

At the time of writing (October 2015), the way in which flood insurance will be dealt with in the UK is about to undergo a major change. The insurance industry and the Government have agreed on a new 'not-for-profit' scheme, to be called 'Flood Re', which will come into force in April 2016. This will replace the previous arrangements, which guaranteed availability of insurance but not affordability. (There are more details on this in the Guide).

Protecting your own home from being flooded still continues to be a very sensible option, however, as insurance arrangements cannot prevent the appalling disruption and emotional trauma that comes with the flooding and its aftermath. The prospect can be a baffling one, with many people not knowing how to go about protecting their homes other than with the humble and inefficient sandbag.

This guide which is written especially with the home owner in mind hopes to reduce the worry about what flood protection products to use, and illustrates the variety of ways a home can be protected, how difficult the product is to fit and when it is appropriate to use them.

It is often the case when the flood water is too high that it is better to let the floodwater in and adapt your home to reduce the devastation the floodwater can have, so there is a section on this too, using case studies from people who have been flooded but have now taken moves to make their homes resilient to flooding.

Sadly, flooding is set to get worse and it is essential that we not only know our own flood risk, prepare in advance and take moves to protect our own homes. Being flooded is an appalling experience. This guide has been written by the Know Your Flood risk campaign in conjunction with RAB Consultants Ltd (first edition) and MDA (2014/15 updates). We hope that it will help inform you as to what can be done to mitigate against floods and help to reduce the misery that being flooded brings with it.

*Ref: Environment Agency (2013) Flooding in England - a national assessment of flood risk [online]. Available at: http://www.environment-agency.gov.uk/research/library/publications/108660.aspx

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Any errors, omissions and/or anomalies are entirely attributable to the authors.
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## 1. Why should I think about flood risk? - For a personal perspective from Mary Dhonau

Having suffered first hand from the effects of being flooded, I know only too well what an appalling experience it is. Being a victim of floodwater ravaging your home has far-reaching and long-term consequences for everyone concerned. Flooding is not just when the media and the minister come to visit. To watch helplessly as everything you have worked so hard for is thrown into a skip is hard enough, but to lose precious sentimental items - such as children's first drawings or photos of relatives who are no longer with us - is completely devastating.

Many people have told me of occasions when they have gone to look for something only to remember it having been lost years earlier in a flood; once again, the pain comes teeming back to haunt them. The misery is further compounded by having to move out of your home into alternative accommodation for months, sometimes years on end and to stand powerlessly by and watch as your precious home becomes a building site. When re-building your home doesn't go to plan, it can often cause more upset than the actual flood itself. It is these intangible consequences of being flooded that are often overlooked when thinking about protecting your home from being flooded again in the future.

Many of us happily invest in smoke alarms and security locks to protect ourselves against fires or thefts but if you live in a floodplain you're far more likely to be flooded than have your house lost in a fire. A flood is the most effective and indiscriminate 'burglar' there is, it will take everything you have including items of no value to anyone else. We don't stop to think about investing in flood prevention as we believe that Government should protect us, or our insurance will cover it. The sad truth is that with so many of us at risk of being flooded, there just isn't enough Government money to protect everyone and your insurance cover might not pick up the full bill.

Whilst protecting a home from being flooded is not cheap, flood insurance is becoming extremely expensive; taking steps to protect your home from flooding may enable you to obtain insurance at a more affordable price than would otherwise have been available, you'll certainly be looked on more favourably than if you do nothing. If you do not put protective measures in place, you may be unable to obtain flood insurance which may well invalidate your mortgage. Couple that with the emotional effects of being flooded, flood resistance (protection) and resilience (adapting your home so that the flood water does the least damage possible) suddenly seems a highly favourable option.

For further information and guidance, click on the following links:

www.defra.gov.uk/publications/files/pb13684-flood-risk-insurance.pdf

www.defra.gov.uk/publications/files/pb13082-flood-insurance.pdf

For information about how to purchase a flood report go to

www.knowyourfloodrisk.co.uk

### Flood insurance cover and resistance and resilience

The UK insurance industry currently provides insurance against flooding as a standard feature of buildings and contents insurance. This contrasts with the approach widely used in other countries, where flood cover is sold as a separate policy, just as motor insurance is here.

An agreement between the industry and the UK Government, known as the 'Statement of Principles' had been in place since 2000, but it was acknowledged that this had become unsustainable and that a new approach was needed. For example, the scheme meant insurers only had commitments to their existing

customers, and were able to refuse cover to new ones whose homes were at flood risk. Also, the Statement did not guarantee affordable flood premiums or manageable excesses, and an increasing number of people were struggling to afford flood insurance. The insurance industry and the Government have therefore agreed on a new 'not-for-profit' scheme, to be called 'Flood Re', due to come into force in April 2016.

The new scheme is intended to ensure flood insurance for the household sector remains both widely available and affordable. The scheme will provide a fund to allow people at high flood risk, who might otherwise struggle to get affordable insurance, to obtain flood cover. Insurance companies will be able to pass on the flood risk element of eligible home insurance policies to Flood Re. Flood Re will charge the insurers a fixed premium for each policy, based on the property's council tax band. Not every home in the UK will be eligible, though, as houses built post 2008 and leasehold properties of 4 or more units are excluded from the scheme.

Once Flood Re has launched, customers will continue to buy their home insurance in the same way and claims will continue to be handled directly by the insurer. Flood Re will be funded from a levy on insurers.

Until the new scheme begins, the insurance industry has agreed to continue with the previous method. During this period, those at high risk can access specialist brokers and insurers who can provide cover in the majority of cases. However, the general public may not be aware of these options, particularly if they rely on price comparison websites which will tend only to show products from mainstream insurers (and properties at flood risk are likely to be refused cover using this method).

More information on Flood Re can be found here: http://www.floodre.co.uk/

There is help on finding a broker here:

http://www.biba.org.uk/UploadedFiles/600floodguide.pdf

The government has also published guidance on obtaining flood insurance here:

http://www.gov.uk/government/publications/obtaining-flood-insurance-in-high-risk-areas

## How can resistance and resilience help people access affordable insurance currently?

Resistance and resilience measures can avoid the need to claim, or reduce the value of any claim made, which can help maintain access to mainstream insurance. It is more common for insurers to take account of flood resilience measures when providing insurance to large commercial and public sector customers. For homes, some specialist insurers will take account of resistance and resilience that are installed to reduce the effects of flooding. These specialist insurers may offer a way for properties at very high risk, with a history of flooding, to maintain access to insurance.

## 2. What is the risk to houses from flooding?

**There are a number of potential sources of flooding that can threaten your home:**

i. **Surface water flooding**. In prolonged, exceptionally heavy downpours, which are becoming more frequent, the ground may saturate and the drains and sewers which carry away surface water may not be able to cope or may even be blocked with debris or hailstones, leading to surface water flooding. Surface water flooding will flow downhill and collect in low-lying areas which means that houses in low basins or at the foot of slopes may be at particular risk of surface water flooding.

ii. **Groundwater flooding** generally occurs during long and intense rainfall when infiltration into the ground raises the level of the water table until it exceeds ground levels. It is most common in low-lying areas overlain by porous soils and rocks, or in areas with a naturally high water table. Groundwater flooding is a particular risk to buildings with basements.

iii. **River flooding.** River flooding occurs following heavy rainfall (or melting snow) across the upstream reaches and tributaries of a watercourse where the normal river channel is unable to carry the resulting high flow of water. Adjacent low-lying properties and land are then liable to flood. River flooding can extend over very large areas causing widespread damage and may be long-lasting and difficult to drain away. Fast-flowing floodwaters can be dangerous to people and animals and can structurally damage buildings.

iv. **Coastal and tidal flooding** is caused by high tides coinciding with a low-pressure storm system which raises sea and tidal water levels, overwhelming coastal defences. This may be made worse by strong winds blowing sea water onto the coast. Coastal flooding may affect not only property on the coast itself but also property in tidal river basins some distance from the coast, due to floodwater being forced up the tidal reaches of rivers.

v. **Reservoir or dam failure.** There are many thousands of reservoirs and retained bodies of raised water across the UK, that pose a flood risk from failure of the retaining dam. Reservoirs larger than 25,000 cubic metres must be registered with the Environment Agency (or equivalent bodies in Scotland and Wales) and will be regularly inspected to ensure their safety. Dam failures in the UK are uncommon, so while the consequences of a dam failure are potentially catastrophic and could affect a large area, the chances of it happening are remote. There are many smaller bodies of raised water, such as mill ponds and agricultural treatment lagoons that may pose a flood risk locally.

vi. **Burst water mains.** Considerable amounts of water may be released, which may flood the street and enter adjacent properties. The flooding is usually comparatively shallow and short-lived, but may nevertheless cause extensive damage to the ground floors or basements.

vii. **Sewer flooding.** When sewage escapes from the pipe through a manhole, drain, or by backing up through toilets, baths and sinks this is known as sewer flooding. Sewer flooding can be caused by: a blockage in a sewer pipe; a failure of equipment; too much water entering the sewers from storm run-off (from roads and fields) and rivers and watercourses which overflowed; or the sewer being too small to deal with the amount of sewage entering it. The cause of the problem may be some distance away from where the flooding is happening.

A flood can happen to any property from one or more of these sources and at any time. For most property in the UK the risk is small, however some premises are more at risk than others because of their geographic location and particular local situation.

Flooding of your home will almost always involve water entering the building from outside. Houses are usually built to prevent 'normal' water sources getting in by the use of damp proof membranes, roof over-hangs, guttering, below ground drains and raised finished floor levels in the ground floor. Normal house construction is not designed to keep flood water out when large amounts of water lie against the building for any period of time.

There are many routes by which external flood water can enter your house. Some are very obvious such as doorways, windows, air bricks and cracks in walls. Others are not so visible such as washing machine outlets, downstairs toilets, soaking through brick walls, below ground gaps in the walls and floors. The chance of water getting into your house will also depend on things like the depth of flood water and the time it takes to drain away.

## 3. How do I find out if my home is at risk from flooding?

The first check that you can do, and which doesn't cost anything, is to investigate whether your property is at risk of flooding from a number of sources, using the maps provided by the Environment Agency (covering both England and Wales) here:

http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?&topic=floodmap#x=357683&y=355134&scale=2

By choosing the relevant map and entering your post code the map will indicate the areas at risk of flooding with dark blue shading for the highest risk, lighter shades where there is some risk and no shading where the risk is very low (meaning that each year, this area has a chance of flooding of less than 1 in 1000 or 0.1%). Click the map at the location of your house and a summary of flood risk at that area will be provided. The risk is graded as 'very low', 'low', 'medium' or 'high'.

An additional map, called 'Flood and coastal risk management activities' shows where new schemes are being planned, and the likely year of the work.

These maps give a general guide only, and are not accurate down to individual properties. They show areas at risk, and if so, whether there are considered to be adequate flood defences in place. However, they do not take into account local variations in physical features, nor the height of a property's lowest floor above the surrounding ground. At the time of writing, the maps do not give any information about the flood risk from raised bodies of water holding less than 25,000 cubic metres (such as agricultural lagoons or mill ponds), nor groundwater flooding. The Know Your Flood Risk campaign is currently uniquely placed to provide information on your groundwater flood risk as part of our (chargeable) Flood Report.

Local knowledge is an important source of information about the flood risk to your home. Long-standing neighbours may have useful knowledge about flooding that occurred in the area before you moved in. Your local council or water company may hold flood records.

For a more accurate assessment of flood risk you can go to a specialist search provider who, for a small fee, will provide you with a more detailed,

'desktop' property-specific report. This will determine the risks from the different types of flooding, including local groundwater flooding risks which are not currently included on the Environment Agency's flood maps. Currently (2015) the VAT exclusive cost of such a search is around £25 for a residential property, though higher for commercial properties depending on the total number of hectares covered.

This type of report will not go to the level of detail where you would know what to expect when a flood occurs, you may still have questions such as: From which direction will water come? How much warning will I get? How deep will the water get? For how long will the water stay? How often will I flood? Will water get into my house? Can I protect my home? A specialist flood risk consultant would be able to answer these questions but you should expect fees of several hundred pounds. These are very modest costs when compared with the overall price of your house, mortgage costs and ongoing insurance fees.

## 4. Should I consider protecting my home from flooding?

Whether and to what extent flood protection measures are necessary will depend on the degree of flood risk, and the vulnerability of your house and occupants. As a minimum you should investigate the degree of risk to your property using the Environment Agency's flood map (see question 3, How do I find out if my home is at risk from flooding?).

If your property does not lie in a shaded area (very low risk) it is very important to note there may still be risk of flooding, for example, from groundwater, or raised bodies of water holding less than 25,000 cubic metres (such as agricultural lagoons or mill ponds).

If there is a low risk, usually meaning that the chance of flooding is less than 1 in 100 (1%) in any year (Insurance Band 1 type properties as a broad guide), but the risk is not serious enough to significantly affect the buildings insurance, you should make some plans about how you would deal with a flood if one was to occur, bearing in mind that floods are happening to many properties which have never previously flooded. As a minimum, you need a Flood Plan (discussed as part of the next question). You may also consider introducing some flood protection measures when convenient, for example when you are carrying out refurbishment and replacement work.

If the risk is medium, there is a chance of flooding between 1 in 100 (1%) and 1 in 30 (3.3%). (Insurance Band 2 properties and some others at local risk), for example if the property has previously been flooded, you should have a Flood Plan (discussed as part of Section 5) and you may also consider whether some flood protection measures to the property would be appropriate. These measures can be implemented when improvements and alterations are undertaken, perhaps as a consequence of new ownership, or may be undertaken solely to ensure peace of mind and maintain market value.

If the risk is high, with a chance of flooding greater than 1 in 30 (3.3%). (Insurance Band 3 properties, and those which have been flooded more than once within the last ten years or so), you will need a Flood Plan (discussed as part of Section 5) and you should actively consider flood protection measures, in order to maintain insurance cover and to minimise the negative impact on market value.

Having decided whether you should apply flood protection, the next question is, of the many options available, which is the best choice for me?

According to a report prepared for Defra in 2007, repairing a house after a flood was estimated to cost between £10,000 and £50,000 depending on the flood depth. This will now have increased still further, owing to inflation*.

Academic research has found flood protection measures to be cost-effective**:

"While resilient repairs were found to be more expensive than traditional methods (average 34% higher) they were found to significantly reduce the repair costs assuming a subsequent flood were to take place. Resilient flood mitigation measures... will help in limiting the cost of repairs up to as much as 73 per cent for properties with a 20 per cent annual chance of flooding... the up-front investment would be recovered following a single subsequent flood event."

* Bowker, P, 2007. Flood Resistance and Resilience Solutions. An R&D Scoping Study. R&D Technical Report.

** Rotimi Joseph, David Proverbs, Jessica Lamond, Peter Wassell, (2011) "An analysis of the costs of resilient reinstatement of flood affected properties: A case study of the 2009 flood event in Cockermouth", Structural Survey, Vol. 29 Iss: 4, pp.279 - 293

## 5. How best to protect myself, my family and my home from flooding?

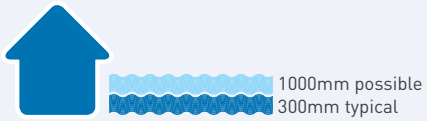
To keep yourself and your family safe and to choose the best option for protecting your home, you are going to need some facts about the flood risk and facts about the vulnerability of your house. The more reliable the facts then the more certain you can be that you have chosen the best option. Factors that influence the best choice of flood protection is discussed below. However you should be aware that many of the important facts can be difficult to establish and require technical knowledge and experience to make reliable estimates. You should obtain specialist advice from surveyors with flood risk experience or specialised flood risk consultants.

The area at risk of flooding should be identified and the mechanism of flooding determined, such as the source of flooding (e.g. rivers, seas, reservoirs, groundwater, surface water, sewers and mains supply) and the pathways that water will take to reach the site.

### Facts about the flood risk

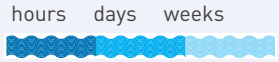
There are four facts about the flood water that are of particular importance:

**Flood depth**




**Flood depths** expected at your house. Low depths, for example 100mm, are unlikely to put people at risk but water damage to buildings and contents may be significant without any flood protection. High water depths, for example 1m, may severely threaten the safety of people and may cause extensive damage to buildings. It may be dangerous to keep deep floods out of a building because of the large weight of water pressing against the walls.

**Flood duration**

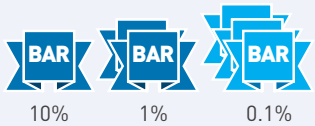



**Flood duration** is the time that flood water is expected to stay at your house. Temporary flood defences may successfully keep water out if flooding is expected to last for just a couple of hours, whereas, long flood durations may give time for water to penetrate into the building. It may be safe to take refuge and stay in a building for short duration floods but this will depend on the other factors.

**Flood onset**

**Flood onset** is the time for flood water to reach your house from its source. Short onset flooding (flash floods) are particularly dangerous as there is little time available to get people to safety or to protect buildings.

**Flood annual probability**




**Flood annual probability** is a measure of the chance of flooding to your house over the course of 1 year. Different approaches to flood protection may be needed depending upon how likely flooding is expected.

{ **Dark blue** indicates strong applicability of products in dealing with flooding, with **light blue** indicating reducing applicability. }

These four key factors are used to decide what you and your family should do when flooding strikes, for example 'evacuation' or 'go-in, stay-in and tune-in'. The factors are also important for guiding the best way to flood protect your home. As well as listing currently available flood protection products, this handbook includes a simple graphical indication of the applicability of the products to flood depth, flood duration, flood onset and flood probability.

There are other important factors that have an impact on flood risk at your home, notably the expected velocity of flood water. Rapidly flowing water at even low depths will increase the risk to both people and buildings.

The effect of flood defences should also be taken into account when estimating the above factors.

Sources of information for the important factors include the Environment Agency, local authority and local library archives. Local knowledge, particularly from long-standing residents, is invaluable. Calculations of things like rainfall, river flows, pipe capacities and measurements of ground levels may be needed to make reliable estimates, for which you should obtain specialist help.

## Facts about your home – a property-level survey

A property level survey should establish facts such as the level of thresholds and floors, the likely points of water entry, whether attempts should be made to keep water out of your home or just to allow the water in and enhance the building in such a way as to limit the damage and promote rapid clean up. The property-level survey of your house should be performed by an experienced professional.

A standard template for surveying property-level flood risk has been developed by the Environment Agency/Defra in association with the Association of British Insurers, British Institution of Insurance Brokers and the National Flood Forum.

The documents can be found at:

http://www.gov.uk/government/publications/property-flood-protection-flood-risk-report

This gives surveyors a recognised framework for assessing flood risk and will help people set out the flood risk information that insurers may ask them to provide. This offers a way of encouraging insurers to accept good property level protection schemes as a way of mitigating insurance, and therefore making insurance more available and affordable. However, it will need to be promoted to people, local authorities and agencies, as well as the insurance industry.

## Choosing the right flood protection products

Flood protection designed to keep water out of your house is referred to as flood 'resistance' products. Temporary flood resistance products are those that need deploying (fitting or activating) prior to flooding arriving whereas permanent flood resistance products do not need activating. Flood 'resilience' refers to measures that reduce flood damage to buildings in situations where water is allowed to enter.

The important facts about the flood risk and the facts about your home, when taken together, will guide the best choice of permanent resistance, temporary resistance or resilience and the product lists in this handbook will help with this. Other factors will play a part in the decision making process, such as cost, visual impact, ease of deployment and product performance.

The best answer for your home will most likely involve a combination of products. Other risks, such as the continued operation of fire exit doors, will need to be considered and competing priorities balanced as well as ensuring that any protection methods do not unnecessarily add to flooding elsewhere. In some situations, such as where surface water is the main source of flooding, the best answer may not involve the products discussed in this handbook, such as improving drainage systems or re-landscaping gardens.

The chosen flood protection products will only be effective if they are used in the right way, at the right time and are stored and maintained correctly to ensure their long term effectiveness. You need to be clear about the best way to act in a flood emergency to protect lives and buildings. A flood plan is essential for achieving these aims.

## Make a Household Flood Plan!

Being prepared for an emergency will reduce the risk to you and your family and limit the damage to your house and its contents.

A Household Flood Plan will need to establish the best emergency actions and who does what when flooding looks set to strike.

The important facts about flood risk and the availability of flood warnings will guide your best action in an emergency. Evacuation is most appropriate where flooding is deep and flood warnings will give you time to move to a place of safety unaided. Identifying a place of safe refuge with possible rescue by the emergency services may be the best approach where rapid flooding occurs and safe evacuation is not possible.

The Household Flood Plan should clearly list actions needed on receipt of a flood warning, such as how to set up any temporary flood protection devices as well as giving a maintenance schedule to ensure correct operation of devices in the future. The plan should take account of the possibility of flood protection devices failing or their design being exceeded.

## Flood warnings

Flood warnings will give you time to prepare for flooding which could save you time, money and heartache. They are also vital in order to know when to carry out your flood plan. The Environment Agency provides a free flood warning service for many of the communities at risk of flooding. To find out if a service is available in your area, and to sign up contact Floodline on:

0345 988 1188

This service sends you a direct message when flooding is expected and may affect your property. You can receive warnings by telephone, mobile, email, SMS text message or fax, whichever you prefer. You can also view flood warnings through the Environment Agency website:

http://apps.environment-agency.gov.uk/flood/31618.aspx

Or via Twitter: follow @EnvAgency OR if you in Wales follow @NatResWales

Or on Facebook: www.facebook.com/FloodAlerts (England and Wales)

The Environment Agency issues flood warnings for specific areas. There are three flood warning codes:

**FLOOD ALERT**

A Flood Alert means that flooding is possible and that you need to be prepared.

**FLOOD WARNING**

A Flood Warning means that flooding is expected and that you should take immediate action. You should take action when a flood warning is issued and not wait for a Severe Flood Warning.

**SEVERE FLOOD WARNING**

A Severe Flood Warning means that there is severe flooding and danger to life. These are issued when flooding is posing significant risk to life or disruption to communities.

There are other warning services that are available where an area isn't covered by a formal flood warning service, for example the Met Office provides a National Severe Weather Warning Service (NSWWS) to warn the public of severe weather, including heavy rainfall. The NSWWS issues alerts when severe weather is expected more than 24 hours ahead, and warnings when severe weather is expected in the next 24 hours.

All warnings and alerts appear on the Met Office website:

http://www.metoffice.gov.uk/public/weather/warnings/#?tab=map&map=Warnings&zoom=5&lon=-3.50&lat=55.50&fcTime=1404082800

and are also communicated to the public via electronic and broadcast media. Some local authorities may also issue warnings to residents. Private flood level alarms are also available for purchase (refer to page 20).

It is vital that your Household Flood Plan is kept up to date, such as when circumstances change, and to make sure that everyone knows what to do what flooding occurs.

Your local council is an important resource when creating a Household Flood Plan for things such as finding a place to evacuate and whether you are best to evacuate or stay in your house. They may have an emergency planning officer to offer assistance.

The Environment Agency provides a guide for preparing a Flood Plan and offers a template to follow on the website. You can access this by visiting:

https://www.gov.uk/prepare-for-a-flood/make-a-flood-plan

## 6. Where can I find help?

There is a list of useful links at the end of this document where you can get further help and advice.

### Environment Agency (England)/Natural Resources Wales

These organisations have responsibility for building, maintaining and operating flood defences, as well as for issuing flood warnings to the public, with a particular emphasis on rivers, seas and reservoirs.

The Environment Agency provides information on flood risks and what to do to prepare for a flood, during a flood and after a flood.

Following the floods of 2007 and the subsequent Pitt report, the Flood and Water Management Act 2010, Lead Local Flood Authorities (LLFA) were set up within local authority structures to manage local flood risk. Your LLFA will work with emergency responders during flooding events and during severe events they will provide advice to the local public about the incident and what action to take. This may include organising rest centres for evacuated people.

Both the Environment Agency and LLFA will be able to assist you with understanding your flood risk and deciding how best to protect yourself. If you are at particular flood risk and have previously flooded, your local council may be able to offer some financial assistance for flood protection measures through Property-Level Flood Protection funding or from other local authority funds.

## 7. The flood protection product information tables

The following pages of this handbook provide a list of flood protection products grouped into categories to help you understand the way they work and to assist with choosing the best product. Each category is described with simple graphics showing the kind of flood situation to which that group of products is most applicable. Advice on flood plans is given within the product categories, such as the importance of warning systems to deploy products in good time or training needed to correctly erect flood defences.

A list of products currently available for each category is provided with notes on advantages/disadvantages and the current suppliers of such items. The indicative costs (for application to a single dwelling) are banded as follows:

| | |
|---|---|
| < £100 | Low |
| £100 - £750 | Low-medium |
| £750 - £1500 | Medium |
| £1500 - £5000 | Medium-high |
| > £5000 | High |
| > £10000 | Very high |

Flood protection products that have been performance tested and comply with the relevant kitemark standards are indicated by 'BSi'.

### Kitemarked products

'PAS 1188' is an industry driven standard, which provides a benchmark for flood resilience technologies. A 'publicly available specification' (PAS) typically forms the first stage in formulating a full British Standard. Testing involves static water, waves and currents. It was first developed by the British Standards Institution (BSi) in association with the Environment Agency in 2003, updated in 2009, and again in 2014. The 2014 edition is a more stringent standard (with lower permitted leakage rates, for example). The categories are as follows:

**Building aperture products PAS1188-1** This includes parts of the building which allow people to enter or provide ventilation to the building (e.g. windows) up to a width of 2,400 mm. The products are tested in conditions for static flood water rising up to a level between 600 mm and 900 mm above ground level. The permissible leakage rate is now reduced from one litre to a maximum of 500ml per hour per metre of seal under the designated maximum water depth.

**Temporary products PAS1188-2** A temporary flood protection product is for use away from buildings but may be sealed against structures or buildings at section ends. They can also help to reduce the seepage of groundwater into the lower foundations and ground floor level of the property. The 2009 maximum leakage rate was 40 litres per hour per metre of product measured along its base where it forms a seal.

**Building skirt and wall sealant systems PAS1188-3** It is intended for the temporary sealing of the above ground external faces of buildings and properties, in the event of flood water rising up to a level between 600 mm and 900 mm above ground level. (There are no products licensed in this category at the time of writing, October 2015).

**Demountable products PAS1188-4** A demountable flood protection product is capable of being removed and reinstalled on permanent mountings. It is for use away from buildings and may be sealed against structures or buildings at section ends. The 2009 maximum leakage rate was 40 litres per hour per metre of product measured along its base where it forms a seal.

For more information please visit the British Standards Institute website:

http://www.bsigroup.com/en-GB/our-services/product-certification/industry-sector-schemes/construction/flood-protection-and-waterproofing-materials/

## Other relevant standards

**BS EN 13564** Anti-flooding devices for buildings (covers Non Return Valves for Sewers)

Note - European standards (beginning BS EN) have the status of British standards.

This specifies types and requirements for materials, performance, design, construction and marking for factory made anti-flooding devices for faecal and/or non-faecal wastewater for use in drainage systems of buildings operating under gravity in accordance with EN 12056-1.

**PAS 64:2013** Mitigation and recovery of water damaged buildings (code of practice). There are also International Standards (beginning ISO), one of which applies to rendering products.

**ISO 15148:2002** Hygrothermal performance of building materials and products - Determination of water absorption coefficient by partial immersion.

This European Standard is intended to assess the rate of absorption of water, by capillary action from continuous or driving rain during on site storage or construction, by insulating and other materials, which are normally protected.

The method is suitable for renders or coatings tested in conjunction with the substrate on which they are normally mounted. It is not intended to assess the absorption of water by materials used under water or in overall contact with saturated ground, where a total immersion test is more appropriate.

The information contained in the handbook was originally obtained from a literature review, by consultation with industry experts and a wide range of manufacturers and suppliers of products. In June 2014 and again in October 2015, web searches were undertaken to update the information to include companies and/or products new to the market; this revised guide contains the information obtained through this process and provides the correct and up to date contact information for the companies listed in Section 13.

No endorsement is given of any products or services listed. The information is designed to act as a directory for your assistance. This is a living document. Updates and amendments are encouraged from users, manufacturers and suppliers. Please refer to the foreword for details.

## 8. Permanent resistance

Permanent resistance products are designed to stop water entering your home either through existing openings (doors, windows, airbricks, vents and pipes) or to stop it penetrating the walls. Flood protection is permanently in place, with no action needed to deploy the device, which is why it is often described as a 'fit and forget' approach. These measures are designed to lessen the damage that floodwater can do and also to give homeowners extra time to move ground floor contents. The measures may only be effective for a limited time and limited water depth.

These products will only keep water out if they are correctly used as part of a package of measures identified from a property-level flood protection survey carried out by a qualified and experienced surveyor. **No particular action is required by you to make the product work and so they will protect even while you are away from your home and if flooding arrives quickly with no warning**. The products are designed to keep water out for long periods, however seepage is possible (depending upon both workmanship and flood conditions) and the BSI Kitemark standard allows for some seepage.

There is a risk to the structure of your home if deep water is held back by the external walls due to the pressure of water. For this reason the products are only suitable for limited flood depths. A structural assessment of the building is recommended where **flood depths in excess of 300mm** (about a foot) are intended to be resisted.

### Flood plan considerations

These products do not require activating to make them work and so protection to your home **does not depend** upon receiving and acting on a flood warning. No training is needed to operate the products and no long term storage of items is required. Routine inspection and maintenance of the products is however essential.

Creating a flood plan is important for protecting people and your property in an emergency. As well as stating who does what when flooding is expected, the flood plan should say what to do in a 'worst case scenario' such as water seepage through flood protection devices, flooding that is higher than the flood protection products are designed to resist and people being trapped in the home with rising water.

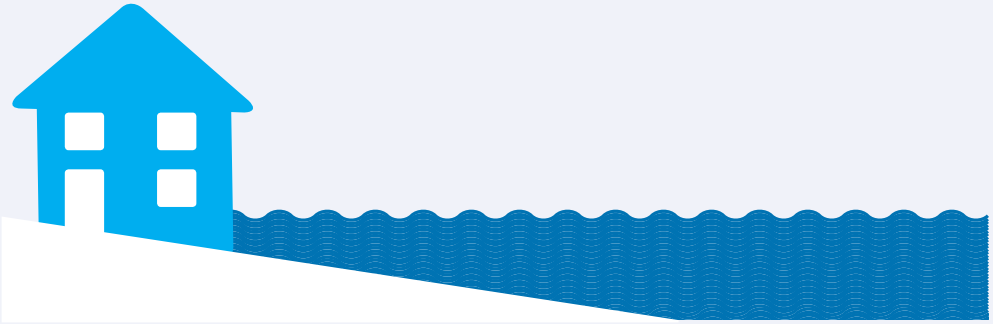
## Private flood level alarms

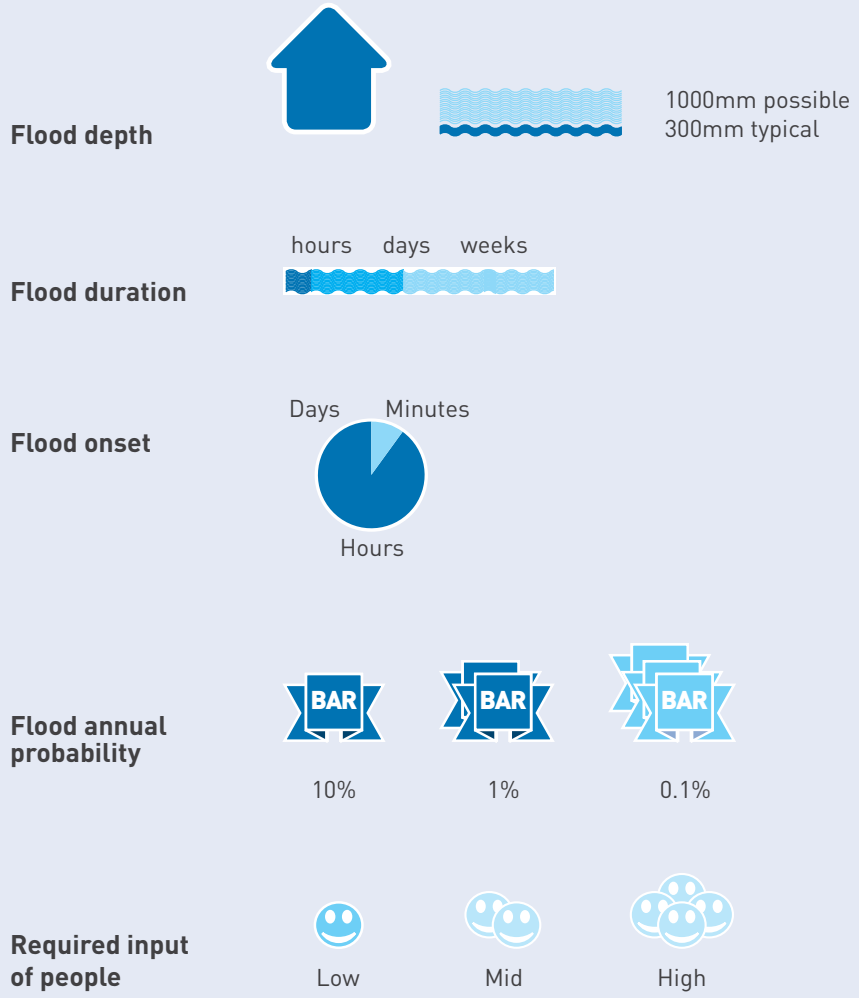
As the devices themselves are permanently installed, details of these products are included in this section, although they are also relevant to the sections on temporary and resilient measures.

Even though your home and its contents may be protected by permanent measures, **you may benefit from prior warning to take other actions**, such as moving cars or caravans to higher ground. If your home is in an area not served by official flood warnings, you may be able to install a private flood level alarm system.

These normally include a water sensor and an alarm unit. The sensor will detect flood water and send a signal to the alarm unit that will make a sound an alert to warn you of the approaching flood risk.

The sensor will need to be carefully installed at a location where rising flood water will be detected well before flooding commences to alert you to the risk (such as during the night) and to give you time to take action. It is recommended that you obtain expert help choose the right system and correctly install it. Permission from landowners and local authorities may be needed prior to installing the sensor.





| Product type | Indicative cost | Available products/suppliers | Comments | Images |
|---|---|---|---|---|
| **Auto-barriers** | High to Very high | 'SAFB' (self activating flood barrier – inc both small-scale domestic AND large area types) (UK Flood Barriers)<br>Self Closing Flood Barrier (Flood Control International)<br>'Auto Roller shutter'; 'FloodBreak' (Aquobex)<br>'Spring Dam' (Tilt-dam Ltd) | Powered by floodwater itself, no electrics.<br>*Unobtrusive. Structure of building is not the limiting factor. High initial cost, including below-ground work; May need additional seepage measure.* | <br>SAFB resting position – UK Flood Barriers<br> <br>SAFB deployed – UK Flood Barriers |
| **Water-resisting external doors / windows** | Medium-high | 'Flood Safety Door' BSi (Aquobex);<br>'Flash Flood Door' BSi (Flash Flood Doors Ltd)<br>Flood Resistant Doors (Flood Divert Ltd)<br>'FloodProof' doors (FloodGuard Uk Ltd)<br>'StormMeister' flood doors (StormMeister Flood Protection)<br>'Flood Defender' BSi (UK Flood Barriers)<br>'Flood Plan door' (Stormguard)<br>'Whitehouse Flood Door' (Whitehouse Construction Co Ltd)<br>Flood Defence Door BSi (Lakeside)<br>'Hydrodoor' wooden, composite or UPVC doors (The Flood Company)<br>Flood Windows (Defence Doors Ltd)<br>'Manor Prime' windows (The Flood Company) | Some models include 'Escape hatch' option, built in to the top half of the door, to aid rescue/delivery of emergency supplies etc whilst keeping water out of the property.<br>*Unobtrusive - look the same as normal doors. Some types may need measures to deal with seepage. May be difficult to evacuate if people are trapped inside with rising water. A door may keep water out at depths that are dangerous to the structure of the building.*<br>These windows still open when required; designed to withstand collision from floating debris. | <br>Flash Flood Door (BSi)<br> <br>Defence Doors Ltd Flood Windows |

| Product type | Indicative cost | Available products/suppliers | Comments | Images |
|---|---|---|---|---|
| **Sealing around external doors / windows** | Low | 'Soudal Fixall' (Available from builders merchants/ironmongers)<br>'Flood Angel Silicone' (UK Flood Barriers) | Permanently elastic after curing<br>Remains flexible; contains fungicide.<br>*Unobtrusive and inexpensive, but needs careful application. Not appropriate in conjunction with normal doors/ windows, which are not designed to resist high water pressure. May also need measures to deal with seepage.* | |
| **Sealing cracks / weep-holes / service inlets and service entry and exit points; duct sealing products** | Low | MD III Duct Sealing System; MD II Duct Sealing System; MD IV Duct Sealing System; CSD duct sealing solutions (Aquobex)<br>'Soudal Fixall' (Available from builders merchants/ironmongers)<br>'Slipsil' service entry point seal/duct plugs (Aquobex)<br>'Flood Angel Silicone' (UK Flood Barriers) | *Unobtrusive and inexpensive. Needs careful application, using water-resistant formula (not standard product). May just reduce penetration rate. Damp problems could result if weep-holes are permanently covered.* | <br>An uncovered 'weep hole' in brickwork |
| **Render / external tanking** | Medium to High | 'Polyprufe' ext tanking (Aquobex)<br>'Vandex' cementitious range (Safeguard Europe) | *Should seal all cracks even when walls are in relatively poor condition.*<br>*Below-ground work involved. May just reduce penetration rate. May need facing bricks as well. May need planning approval - visually alters building. May lead to damp within the walls.* | <br>Ref: Severn Trent |

| Product type | Indicative cost | Available products/suppliers | Comments | Images |
|---|---|---|---|---|
| **Re-pointing** | Low-medium | For example, Stormdry Repointing Additive No.2 (Safeguard Europe) | *May just reduce penetration rate.*<br>*Unobtrusive. Brickwork needs to be in good condition to be effective. May lead to damp within the walls.* | |
| **Wall sealant** | Medium (including labour) | 'Aquastop'/'InsuDry' liquid (DrainAngel Ltd)<br>Nanoshell'; 'Stone Water-Guard' (Aquobex)<br>'Waterstop' coating (UK Flood Barriers)<br>'S500 wall sealant' (Watertight International) | Aquastop = For painting DPC joints and below; dries to cement colour. (For above DPC, InsuDry recommended.)<br>Note – 'Water repellent coatings' (also called 'damp-proofing masonry creams') are not intended for under-water use (in accordance with ISO 15148:2002(E) - Hygrothermal performance.) | <br>Nano-technology sealant applied to right of breeze block, none on left (Aquobex) |
| **Tanking (internal), including cavity drain membrane systems** | Very high | Internal cavity wall tanking with membrane/drain channel/pump system plus joint sealant (Aquobex/ FloodGuards)<br>'Flood Angel Tanking Polymer' (UK Flood Barriers)<br>'Kiltox' cavity drain membrane/tanking<br>'Newton System 500' (John Newton & Co Ltd)<br>'Oldroyd' range (Safeguard Europe)<br>'Triton cavity drain membranes' (Triton Chemicals)<br>'Wykamol cavity drain membranes'/ sump/pump systems | *Designed to be completely waterproof. Offers groundwater protection.*<br>*Needs sump and pump. Vulnerable to damage due to later alterations. Primarily designed to protect against groundwater.* | <br>Aquobex |

| Product type | Indicative cost | Available products/suppliers | Comments | Images |
|---|---|---|---|---|
| **Bolt-down manhole covers** | Bespoke | Saint Gobain PAM | *May require liaison with local authority/ sewerage agency.* | |
| **Water resisting airbricks / permanent airbrick covers** | Low (single product)<br>Medium (including fitting costs for multiple units) | 'SMART airbrick' BSi (Aquobex/ FloodGuards; Crocodile; CSI Flood-products; Floodgate Ltd; Lakeside; Multi Flood Solutions)<br>Automatic anti-flood airbrick (FloodArk; UK Flood Barriers; Whitehouse Construction Co Ltd)<br>'Snorkelvent' (from 310 to 900mm height) (Aquobex; Donite Plastics) | *Inexpensive and unobtrusive. Needs careful installation and maintenance. May need measures to deal with seepage.*<br>Need to choose correct height from range available to avoid overtopping. | <br>SMARTairbricks (BSi)<br> <br>Snorkelvent |
| **Anti-backflow valves for sewer pipes (backwater valves)**<br>**Non-return valves (NRVs) for appliance waste-pipes** | Low to medium | Optima 160 (Aquobex)<br>'Kessel' NRV BSi (Mission Rubber; Redi) 'Watertight International NRV' BSi (Floodgate Ltd) Anti-flood valves BSi (Marley) ACO 'QUATRIX' BSi (ACO Building Drainage)Flood Angel NRV BSi (Flood Angel; Lakeside)<br>Other: 'Forge' antiflood sewer valve (Drain technology); Flood Ark; Multi Flood Solutions; Whitehouse Construction Co Ltd)<br>NRV/'Flusher' combination (Aquobex; Crocodile)<br>Appliance NRVs (washing machine outlets etc); FloodArk; Flood Divert Ltd) | Relevant standard is BS EN 13564 - 'Anti-flooding devices for buildings'<br>*Unobtrusive and inexpensive. May need to assess the impact on neighbours.* | <br>Optima 160 – Aquobex<br> <br>Waste pipe NRV – Aquobex |

| Product type | Indicative cost | Available products/suppliers | Comments | Images |
|---|---|---|---|---|
| **Built-in sump and pump systems** | Low (pump only)<br>Medium-high (system) | Aquobex; Flood Ark; Flood Divert; UK Flood Barriers; Whitehouse Construction Co Ltd | *Rapid deployment. Relatively low cost. Helps where a resistance product leaks. Can remove flood water in an emergency.*<br>*Must be positioned and sized correctly. May require ancillary power supply. Will need servicing and maintenance.* | |
| **Flood alarm systems (domestic)** | Low-medium<br><br>Bespoke | 'FloodSafe 3000' flood alarm (Flood Safe)<br>Other - Crocodile; Flood Angel<br>Telemetry early warning (UK Flood Barriers) | *24/7 monitoring. Needs careful installation. Needs regular testing/maintenance.*<br>*May need to obtain permission from landowners/ local authorities.*<br>See also Community section for mass warning types. | <br>IBS flood gate (installer Yorkshire Dampcourse) |
| **Permanent barrier walls with demountable gates / concealed gates / permanent swing gates** | Medium-high to Very high (depending on length required / groundworks involved) | Glazed barriers (Aquobex; Defence Doors Ltd; IBS Engineered Products Ltd)<br>Flip-up hydraulic gates (IBS Engineered Products Ltd)<br>Flood gates (Whitehouse Construction Co Ltd; IBS Engineered Products; The Flood Company)<br>Hardwood flood gates and fences (Flood Divert Ltd)<br>HDPE flood fencing (The Flood Company)<br>Drop-down barrier (Aquobex) | *Structure of building is not a limiting factor.*<br>See also Community section for wider area systems. | |
| **Raised porch / threshold**<br><br>**Brick-facing using engineering bricks** | Medium-high to High<br><br>Medium | Property level survey needed to establish appropriate threshold height.<br><br>Engineering bricks must conform to British Standard BS 3921: Class A (blue) water absorption <4.5%; Class B (red) water absorption <7%. | *Unobtrusive, but disabled access may need to be considered. Low flood depths only; waterproof door may also be needed.*<br>Note 'Clay Engineering bricks' are made to a lower standard.<br>*More effective than sealing existing wall. Needs good workmanship; below-ground work involved. May just reduce penetration rate. May need planning approval - visually alters building.* | |

## 9. Temporary Resistance

Temporary resistance measures are aimed at keeping floodwater out of a building by putting in place devices that block doors, windows, airbricks, vents and pipes. In order to be protected, these products will need to be installed **before** flood water arrives. They are designed to lessen the damage that floodwater can do and also to give homeowners extra time to move ground floor contents. The measures may only be effective for a limited time and limited water depth.

These products will only keep water out if they are correctly used as part of a package of measures identified from a property-level flood protection survey carried out by a qualified and experienced surveyor. **The products will need to be put into place in good time before flood water arrives** and then removed once the flood risk has passed. The products are designed to keep water out for long periods, however seepage is possible (depending upon both workmanship and flood conditions) and the BSi Kitemark standard allows for some seepage. There is a risk to the structure of your home if deep water is held back by the external walls due to the pressure of water. For this reason the products are only suitable for limited flood depths. A structural assessment of the building is recommended where flood depths in excess of 300mm (about a foot) are intended to be resisted.

### Flood plan considerations

These products require activating to make them work and so protection to your home **depends upon receiving and acting on a flood warning**. Some training may be needed to correctly operate the products and long term storage of items may be required, in a location that is easily accessed. Routine inspection and maintenance of the products is however essential.

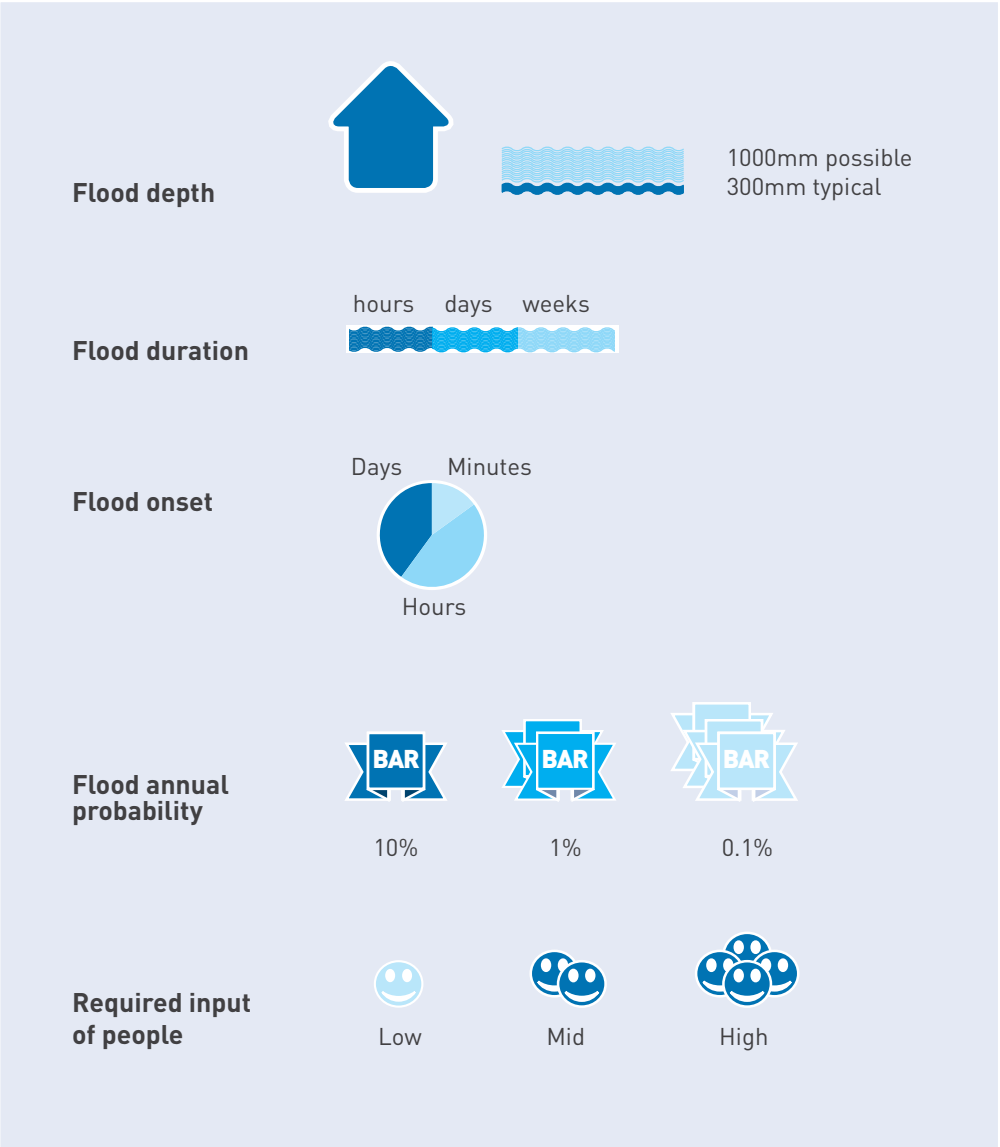
Creating a flood plan is important for protecting people and your property in an emergency. As well as stating who does what when flooding is expected, the flood plan should say what to do in a 'worst case scenario' such as water seepage through flood protection devices, flooding that exceeds the design of the flood protection products, people being trapped in the home with rising water.

### Private flood level alarms

As the devices themselves are permanently installed, details of these products are included in the previous section.

If your home is in an area not served by official flood warnings, you may be able to install a private flood level alarm system. These normally include a water sensor and an alarm unit. The sensor will detect flood water and send a signal to the alarm unit that will make a sound an alert to warn you of the approaching flood risk. The sensor will need to be carefully installed at a location where rising flood water will be detected well before your home is about to flood to alert you to the risk (such as during the night) and to give you time to take action. It is recommended that you obtain expert help choose the right system and correctly install it. Permission from landowners and local authorities may be needed prior to installing the sensor.

Always remember, where the home is attached to others (semi-detached or terraced properties) water may also enter via party walls, unless the neighbouring homeowner takes similar steps.



| Product type | Indicative cost | Available products/suppliers | Comments | Images |
|---|---|---|---|---|
| **Barriers for doors / windows / garages** | Low-medium (single product)<br><br>Medium-high (whole home package) | 'FloodArk' barriers BSi (Flood Ark)<br>Flood Angel 'Defender' and 'Sentinel' barriers BSi (UK Flood Barriers)<br>'FloodBarriers' (Watertight Int)<br>'Floodgate' BSi (Aquobex; CSI Flood-products; JTA Flood)<br>'Floodguards' BSi (Aquobex)<br>'Floodtite' panels (Aquobex; Crocodile; CSI Flood-products)<br>Caro barriers bespoke solutions for Listed Buildings (Aquobex)<br>Stop log system (Defence Doors Ltd; Flood Divert Ltd)<br>'Flood Plan' boards (Stormguard)<br>'Floodshield' door barrier (Flood shield; Multi Flood Solutions)<br>'Floodwall' BSi (AST Floodwall systems)<br>'HydroGuard' barriers (HydroGuard)<br>'FloodBuddy' (Newlands)<br>'FloodDoor' (Snorklevent; Whitehouse Const)<br>Nautilus barriers (Crocodile)<br>'Hydroshield' barrier BSi (The Flood Company) | Many temp barriers require a fixed frame, others do not – eg FloodBarriers from Watertight Int; FloodGate.<br>*Rapid deployment. Low weight and easily deployed products available.*<br>*Items require storage space. Some barriers need tools for deployment.*<br>*Permanent fixings on the building with most products. Deployment may be physically difficult for some individuals. May need measures to deal with seepage.*<br>Note - For demountable options (requiring permanent groundworks) see Community section. | <br>Floodguards (courtesy Aquobex) |

| Product type | Indicative cost | Available products/suppliers | Comments | Images |
|---|---|---|---|---|
| **Covers / barriers for appliance vents / airbricks / pet-flaps** | Low-medium (single product) | Airbrick covers BSi (Flood Ark; Aquobex; Floodtite; JTA Flood; Flood Divert Ltd; AST Floodwall Systems; UK Flood Barriers; Watertight International)<br>Flood Sentry seals (self-adhesive) BSi (Amazon online 'Flood Management Company')<br>'Ventguard' cover (Aquobex; CSI Flood-products; Easifit; Flood Ark; Floodgate Ltd)<br>'VentBuddy' (Newlands)<br>'Ventshield' (Multi Flood Solutions)<br>'Airvent guards' (FloodGuard UK Ltd)<br>Other: Watertight International | *Need sufficient warning. Requires storage space. May need measures to deal with seepage.* | <br>UK Flood Barriers<br> <br>Flood Ark |
| **Modern versions of sandbags** | Low to Low-medium (for multi-packs) | 'Absorbeez' (Action Dry Group)<br>'Aqua-sac' (AET; Flood Divert Ltd; Multi Flood Solutions)<br>'Hydrosacks/Hydrosnakes' (Crocodile; CSI flood products; Flood Divert Ltd)<br>'Quickdam' (Easy Innovations Ltd)<br>'Floodsax' (Floodsax Direct online); JTA Flood; builders' merchants (eg Travis Perkins)<br>'FloodBags' (Amazon online 'Flood Management Company')<br>'FloodBag' (Maynard group)<br>Floodwater bags (self-inflating) (Murlac)<br>Floodlock's 'Flood-Less' door strips (Allups Ltd) | *Absorbent bags, lightweight, quick to deploy. Can hold tens of litres of water.*<br>*Sufficient bags must be stored ready for use. Some types of used bags need to be disposed of after use.* | <br>Floodsax |

| Product type | Indicative cost | Available products/suppliers | Comments | Images |
|---|---|---|---|---|
| **Toilet seals / bungs** | Low | 'Panseal' (CSI Flood-products; Flood Angel; Flood Divert Ltd; Floodtite; JTA Flood; Lakeside)<br>'Flood-Guard Drain Sealer' (CSI Flood-products) | *No permanent installation required. Need sufficient warning. Requires storage space.* | <br>Panseal – Floodtite |
| **Pipe bungs/seals** | Low | Drain/toilet bungs; shower seals; overflow bungs (CSI Flood-products; ASt Floodwall Systems; InstantSandbags.com; Mullti Flood Solutions; UK Flood Barriers) | | |
| **Free-standing pumps** | Low-medium | 'Puddlesucker' and similar models (CSI Flood-products; Whitehouse Const) | *Must be sized, positioned and deployed correctly. May require ancillary power supply. Will need servicing and maintenance.* | |
| **Free standing barriers for larger areas (eg driveways)** | Medium-high to Very high (depending on length required) | 'Rapidam' BSi (Aquobex)<br>'Ecodam' (Aquobex)<br>'AquaDam' (Aquadam Europe Ltd)<br>'Floodstop' modular barrier (CSI Flood-products; Flood Divert Ltd; Fluvial Innovations; JTA Flood)<br>'Water-Gate' self-inflating barrier (Flood Protection Solutions) | Typically designed more for communities rather than individuals, but some smaller barriers designed to can be installed by 1 person.<br>*Property protected to design height of product.*<br>*Structure of buildings is not a limiting factor. Can be installed in water. Needs sufficient warning. May need significant manpower to deploy. Most products need separate storage. May need measures to deal with seepage.*<br>Note - for demountable systems (requiring permanent groundworks) see Community pages. | <br>Rapidam – Aquobex |

## 10. Resilience

Resilience measures are aimed at allowing a building to flood, but constructing the interior from materials that are not damaged by water.

Following flooding, a clean-up will be needed but not major drying and refurbishment. Correctly applied resilience should ensure that no permanent damage is caused, the structure of the building is protected and drying and cleaning are quickened.

These resilience measures are designed to reduce the amount of damage caused when water enters a building. Ideally a package of products should be used to lessen the harm that water does to a building, based on a property-level flood protection survey carried out by a qualified and experienced surveyor. Most resilience measures will, however, reduce the aftermath of flooding **even while you are away from your home**, or if flooding arrives quickly with no warning.

In situations where flood water is expected to arrive very quickly and with high depth and velocity the building structure may still be at risk. In these cases a structural survey is recommended, but resilience up to one metre (over 3 feet) of water is potentially achievable.

### Flood plan considerations

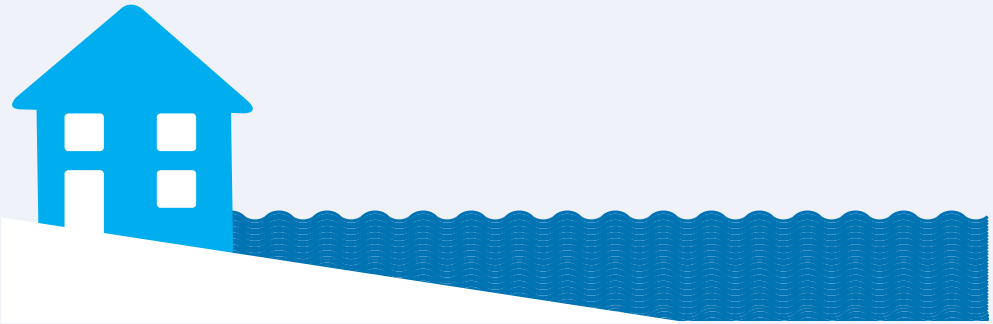
As a few of the methods in this section require you to take action (for example, removing internal doors, or moving valuables to an upper floor) **so the best possible protection for your home and its contents depends upon receiving and acting on a flood warning**. Pumping systems can be automatic and so no specific action may be required, but, where the pump is not automatic no flood protection will be provided when you are away from your home. Some training may be needed to operate products such as pumps, and no long term storage of items is required (except for free-standing pumps). Routine inspection and maintenance of the resilience measures is however essential.

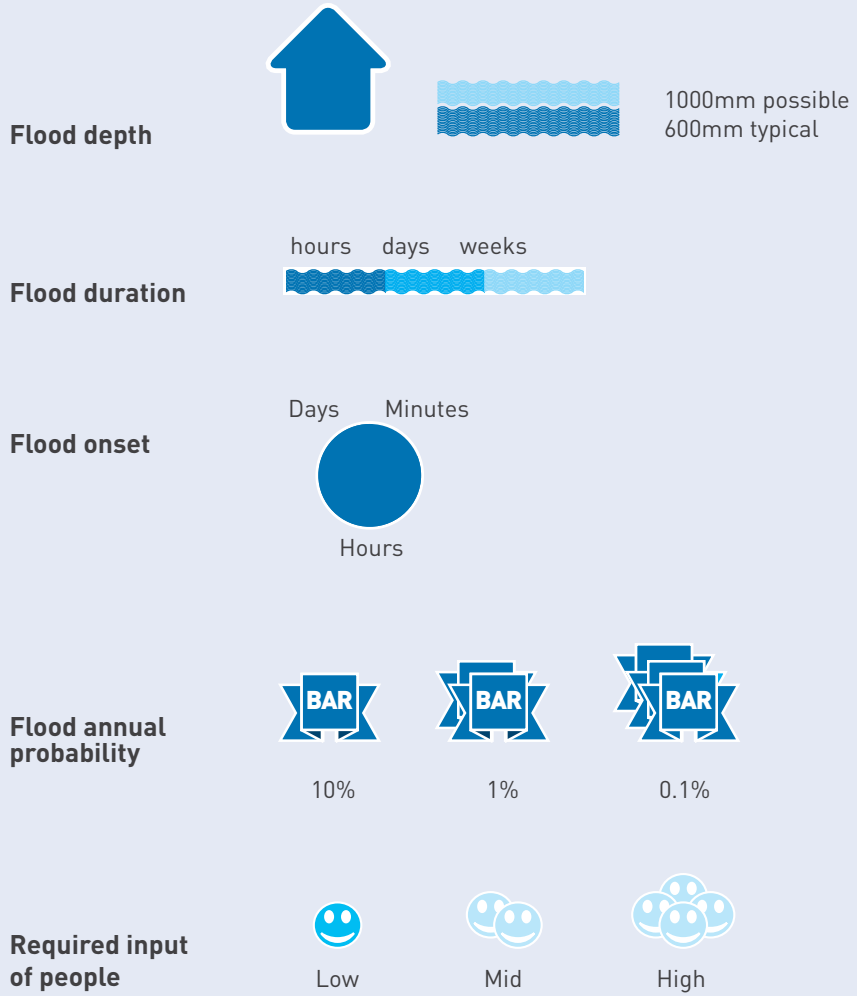
Creating a flood plan is important for protecting people and your property in an emergency. As well as stating who does what when flooding is expected, the flood plan should say what to do in a 'worst case scenario' such as when flooding is worse than expected and the risk of people being trapped in the home with rising water.

## Private flood level alarms

As the devices themselves are permanently installed, details of these products are included in the first section.

If your home is in an area not served by official flood warnings, you may be able to install a private flood level alarm system. These normally include a water sensor and an alarm unit. The sensor will detect flood water and send a signal to the alarm unit that will make a sound an alert to warn you of the approaching flood risk. The sensor will need to be carefully installed at a location where rising flood water will be detected well before your home is about to flood to alert you to the risk (such as during the night) and to give you time to take action. It is recommended that you obtain expert help choose the right system and correctly install it. Permission from landowners and local authorities may be needed prior to installing the sensor.





| Product type | Indicative cost | Available products/suppliers | Comments | Images |
|---|---|---|---|---|
| **Water compatible internal walls** | Medium | Silicon/mineral board (Aquobex)<br><br>Technitherm cavity wall insulation (Aquobex/Isothane Ltd) | Also provides fireproof/thermal insulation.<br><br>Closed cell cavity insulation.<br><br>*Permanently in place.*<br><br>*There are still cleaning and drying costs following a flood. Probably only cost effective as part of flood damage repair work.* | |
| **Water compatible flooring** | Medium to High | Silicon/mineral board (Aquobex)<br><br>Tiled flooring, rather than fitted carpets/ laminate.<br><br>Concrete floor to replace timber | Also fireproof/thermal insulation.<br><br>*Permanently in place.*<br><br>*There are still cleaning and drying costs following a flood. Probably only cost effective as part of flood damage repair work.* | |
| **Water compatible kitchen and bathroom fittings** | Medium-high to High | Steel kitchen units (Steelplan Kitchens)<br><br>'Sealwise' (Waterproof Construction Board) (Aquobex/Sealwise)<br><br>Waterproof fitted furniture (Castles Designs) | Products originally developed for hospital/industrial use.<br><br>*Permanently in place.*<br><br>*There are still cleaning and drying costs following a flood. Probably only cost effective as part of flood damage repair work.* | <br>Steelplan Kitchens |
| **Sump and pump systems** | Medium-high | Suitable pumps include:<br><br>BPS80A; OMA2 Domestic; VA600 Easy flow; LSC 1.4S Tsurumi (Aquobex) | *Permanently in place.*<br><br>*There are still cleaning and drying costs following a flood. Probably only cost effective as part of flood damage repair work.* | |

| Product type | Indicative cost | Available products/suppliers | Comments | Images |
|---|---|---|---|---|
| **Raised electrics / meters** | Medium-high | Local electricians. | *Permanently in place.*<br>*There is a practical limit to how high electrics/kitchen appliances can be raised. There are still cleaning and drying costs following a flood. Probably only cost effective as part of flood damage repair work.* | <br>Raised electrics/meters |
| **Plinths for kitchen white goods; wall-mounted boiler** | Medium | Local builders/electricians/gas-qualified engineers | | <br>Plinths for white goods (Bowker 2007) |
| **Water compatible steps / stairs (concrete / hardwood / steel)** | Bespoke | Specialist firms. | | <br>Water compatible steps/stairs |
| **Water-tight covers for furniture / appliances** | Low | 'Flood Possessions Protector' for valuables/furniture/TVs (Amazon online 'Flood Management Company')<br>Waterproof storage bags for furniture /white goods (Flood Buddy flood protection systems) | These products have watertight zip fastenings, unlike ordinary storage bags.<br>*Requires occupant to store bags and deploy. Larger items may be difficult to move.* | <br>Furniture-size waterproof bag - Flood Buddy |

| Product type | Indicative cost | Available products/suppliers | Comments | Images |
|---|---|---|---|---|
| **Relocate valuables** | No cost | Keep/move valuables/memorabilia on high shelves or in upstairs rooms. Raise valuables on tables/plinths. | *Requires occupant to maintain and deploy. Needs sufficient warning.* | |
| **Removable internal doors** | Low | Use quick-release hinges, or avoid painting over door hinges, to permit easy removal; doors may then be placed on top of tables etc to create storage above water level (in low level flooding). | | |

## 11. Community solutions

Where a particularly large property or a number of homes are involved, there are a number of potential solutions available, in both the temporary and permanent categories. For temporary products, the same general considerations highlighted in the previous sections will still apply (such as expected water depth, duration of flood and the human resources needed to deploy the device/s).

For permanent structures designed to protect larger areas, however, obtaining expert guidance is essential. For example, a detailed understanding of the local geological conditions will be of vital importance in designing and building extensive permanent walls, or undertaking the groundworks required for the demountable barrier options, as illustrated in the example.

### Telemetry / mass notification & warning systems

If your area is not served by official flood warnings, specialist companies can install flood level alarm systems with the capability of notifying multiple households, by means such as sirens, or text messages. The sensor will need to be carefully installed at a location where rising flood water will be detected well before flooding commences to alert residents to the risk (such as during the night) and to give them time to take action. Although the initial outlay for such systems may be relatively high, community groups such as Parish Councils may be able to lead on fundraising initiatives whilst the appropriate Regional Flood and Coastal Committees should also be approached to check project eligibility for 'local levy' funding. Permission from landowners and local authorities may be needed prior to installing the sensor.

**Frankwell flood alleviation scheme Shrewsbury**

In non-flood conditions, the visible parts of the finished scheme (on the right of the picture) consist of permanent walls, of varying heights, with sockets and mountings for insertion of the removable posts and barriers.

What is not visible here are the underground walls, consisting of steel sheet piling up to 16 meters (over fifty feet) deep, without which water would still be able to flow under the defences. The visible walls themselves are substantial structures, designed to remain safe despite very high water pressure on the river-facing side.

**Photo courtesy J E Lamond**

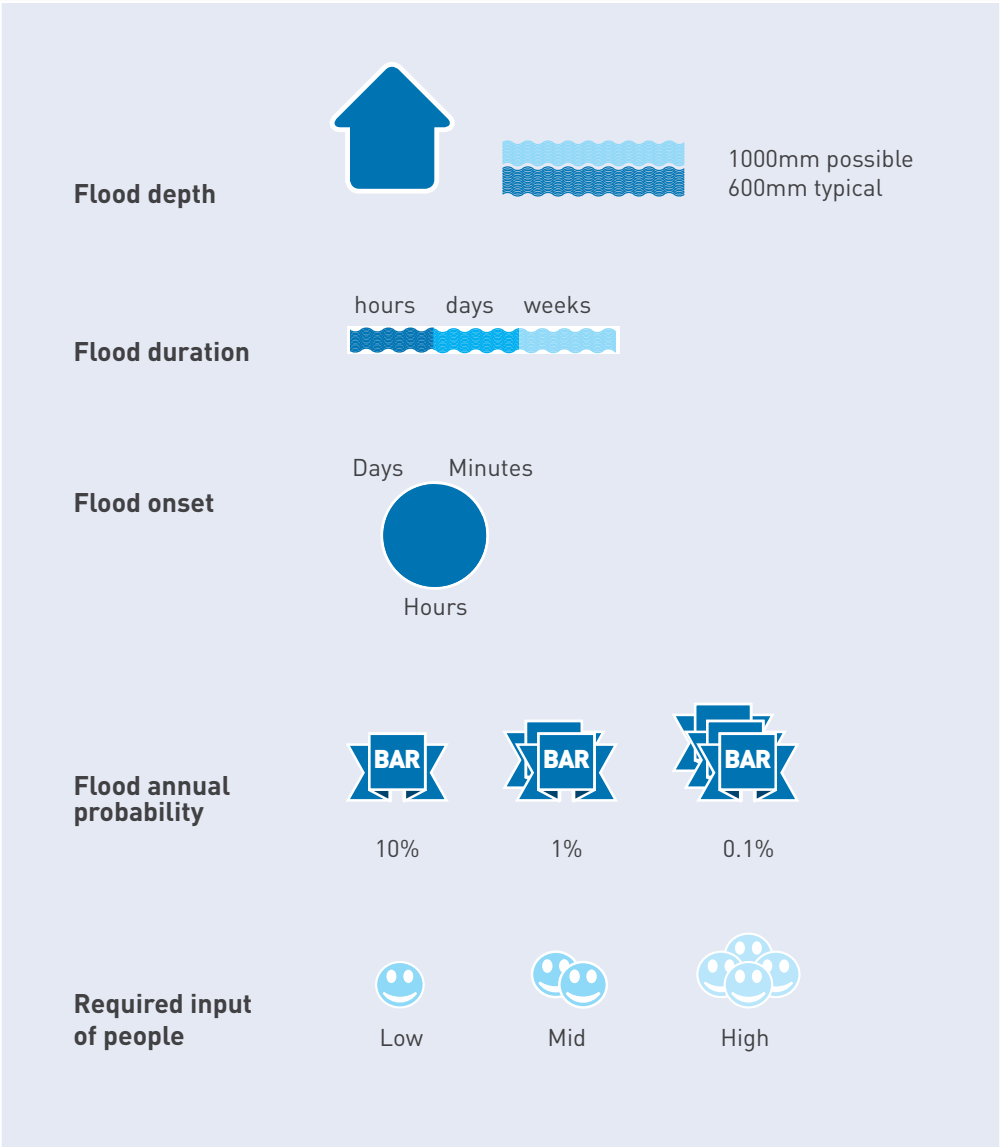
## Landscaped floodwalls

Flood defences can be incorporated into private gardens via imaginative design. Where the gardens form part of an active floodplain, the defence should ideally be set back from the river's edge so that loss of floodplain is minimised. The residents retain some garden which is defended, and some which is not. Flood gates can be provided if steps over the defence are not acceptable.

Detailed guidance for professionals engaged in the design and construction of large schemes, is published by the Environment Agency, with Chapter 9 (Flood walls and flood embankments) being of particular relevance:

http://www.gov.uk/government/publications/fluvial-design-guide

**Photo courtesy Environment Agency**



| Product type | Indicative cost | Available products/suppliers | Comments | Images |
|---|---|---|---|---|
| **Free standing barriers** | Very high | 'Rapidam' BSi; 'Ecodam' (Aquobex/ Floodguards)<br>GeoDesign AB BSi (GeoDesign Barriers Ltd)<br>'K-system floodwall' (IBS Engineered Products)<br>'Floodstop' modular barrier (CSI Flood-products; Flood Divert Ltd; Fluvial Innovations)<br>'Alteau' Flood Barrier (AET; Flood Divert Ltd)<br>'AquaDam' (Aquadam Europe Ltd)<br>'AquaFence' (Aquafence Ltd)<br>'Watergate Self-inflating' (Flood Protection Solutions)<br>Cold Flood Barrier - water filled (Cold Flood Prevention) | Typically designed more for communities rather than individuals, but some smaller barriers designed to be installed by 1 person.<br>*Property/ies protected to design height of product. Structure of buildings is not a limiting factor. Can be installed in water.*<br>*Needs sufficient warning. May need significant manpower to deploy. Most products need separate storage. May need measures to deal with seepage.* | <br>Geodesign Barrier (BSi)<br> <br>K-System |
| **Demountable barriers (groundworks required)** | Very high | Caro 'WaterWall'/'WaterDoor' (Aquobex)<br>Flip-up Barrier (Aquobex)<br>IBS demountable flood protection system (IBS Engineered Products Ltd)<br>Demountable stop-log system (Flood Control International)<br>'Aquabarrier' (Aquabarrier Systems Ltd)<br>Demountable barriers (Lakeside Flood Solutions) | *Unobtrusive in non-flood conditions. Property/ies protected to design height of product. Structure of buildings is not a limiting factor.*<br>*Needs sufficient warning. Needs significant manpower to deploy. Most products need separate storage.*<br>*Needs careful design and construction (needs continuity of barrier/roundworks). May need measures to deal with seepage. Security may be needed to prevent barrier theft.* | <br>IBS demountable |

| Product type | Indicative cost | Available products/suppliers | Comments | Images |
|---|---|---|---|---|
| **Perimeter walls / permanent barrier systems with gates (fixed or demountable)** | High to Very high (depending on length required/any groundworks involved) | 'Spring Dam' (Tilt-dam Ltd)<br>Pivot barrier/Flip-up barrier (Aquobex)<br>Glazed barriers (Defence Doors Ltd; IBS Engineered Products; Flood Control International)<br>'DriFence' (Flood Divert Ltd)<br>'FloodBreak' automatic barriers (Aquobex)<br>Swing gate (Aquobex; (Flood Control International)<br>Lift hinge/pivot hinge gates; Flip-up/hydraulic gates (Flood Control International)<br>Polymer Fencing (Crocodile) | *Glazed types minimise visual impact. Property/ies protected to design height of product. Structure of buildings is not a limiting factor.*<br>*Needs careful design and construction; needs continuity of barrier. May need measures to deal with seepage.* | <br>Spring Dam in raised position (top) and lowered (below) – Tilt-Dam Ltd |
| **Telemetry / mass notification & warning systems** | Medium to High | Aquobex; Campbell Scientific; Casella Solutions ('STORM Guardian' rain gauges); Environmental Innovations Ltd; Hydro-Logic Services LLP ('Isodaq' flood level sensors) | *Ideal where there is no formal flood warning service. Round the clock monitoring.*<br>*Needs careful installation. Needs regular testing/ maintenance. May need to obtain permission from landowners/ local authorities.* | <br>Level sensor |

# 12. Case Studies

## 12.1 Judy Gibson – A cottage in Worcestershire badly flooded in July 2007 now with resilience measures

Judy Gibson lives in a small village near the River Severn midway between Upton-Upon-Severn and Tewkesbury. She has experienced two major floods in 2000 & 2007, the latter resulting in a two year incarceration in a touring caravan (with no direct water/waste supply!), whilst her 16th century cottage was restored. Such was the damage to the original oak beams uncovered following the removal of all the original plaster that the ceiling, staircase, ingle-nook fireplace and the rear elevation required replacing. Her insurance company was sympathetic but the enormous amount of time, paperwork and supervision of the builders certainly took its toll! Judy was determined to ensure that as her cottage required a complete rebuild, it should be constructed and refurbished to ensure that it was not only flood resilient, but was designed to ensure that everything on the ground floor could be moved to safety as quickly as possible.

The prospect of needing to live in a caravan again for another two years was definitely not an option! It can be done!

**Figure 1**
Cottage during floods

**Figure 2**
Demolition!

The images below show work that was undertaken to improve the property's resilience.

**Figure 3**
Fuel oil tank on raised plinth

**Figure 4**
Boiler on plinth

**Figure 5**
Demountable waterproof radiators by Jaga

**Figure 6**
Raised fireplace

**Figure 7**
Powdered coated steel carcass kitchen units by Steelplan

**Figure 8**
Figure 8 Steel kick boards on kitchen

**Figure 9**
kitchen plinth on chrome leg & plastic stools

**Figure 10**
Raised fuse box

**Figure 11**
Downstairs sink – no vanity unit

**Figure12**
Unfixed bookcase for easy removal

**Figure 13**
Lightweight settees – easy to lift!

**Figure 14**
TV hung on the wall

## 12.2 A single property with a comprehensive range of flood resistance/resilience measures in Tadcaster

The location is a single house near Tadcaster, North Yorkshire. The house is not within the floodplain of a river and is not shown to be at flood risk on the Environment Agency's flood map. There is no formal data available for flood depth, duration, onset and probability, so an understanding of flood risk must be gained from local knowledge. Flooding has occurred at least 5 times between 2000 and 2007 due to runoff from surrounding hills passing through this location in the village and overwhelming an adjacent drainage ditch. Water depth has typically been approximately 300mm but an internal water depth of up to 900mm has affected parts of the interior of the house.

**Figure 1** Flooding outside the house near Tadcaster

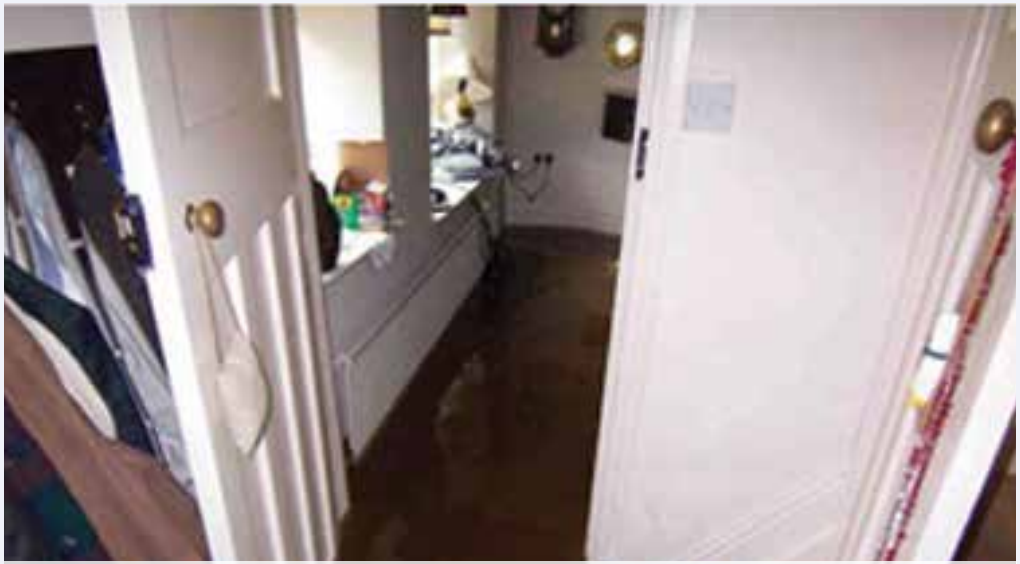


**Figure 2** Internal flooding

The owner of the house privately funded a large range of resistance and resilience techniques:

- The ground floors were originally constructed from stone bedded on to mortar/earth. The original floor was dug up and the exterior walls were tanked. A new concrete floor with water-resistant membrane was laid. Ceramic tiles were used as the final finish on all ground floors.
- Water-resistant cement-based plaster was coated on to internal walls.
- All major joinery was replaced with hardwood.
- Raised electrics.
- Bespoke temporary door guards were obtained for front and rear outside doors and secondary door guards for the internal doorway.
- The floor of the conservatory was raised 300mm.
- New permanent flood defence walls were constructed at front and rear of house.
- Six submersible pumps were installed in the front a rear garden to keep the water level down behind defence walls.
- All through-wall service connections were raised 900mm above the ground floor level.
- A downstairs gravity drained toilet was replaced with a pumped system.
- Silicone sealant was applied to exterior walls.
- A stock of water absorbing bags are kept available to assist with any resistance measure that shows seepage.

It is not known whether a formal flood plan has been produced. A plan will assess the risk to people and provide a clear emergency strategy upon receipt of a warning (the warning is likely to be based upon Met Office information and local observation). The plan will ensure the ongoing effectiveness of the flood protection measures and will be invaluable to new owners of the property.

No flood incident has occurred so far since the measures have been put in place.

**Figure 3** Door guard fitted to the internal door way

## 12.3 Properties in Chew Magna received temporary flood resistance measures

Chew Magna is a village in the River Chew valley, south of Bristol and west of Bath. The Chew Valley and surrounding catchments were devastated in July 1968 when a summer storm caused widespread destruction and flooding of at least 88 properties. Despite the flooding, a community wide flood defence scheme could not be justified for the village.

Flooding at Chew Magna comes about from intense local rainfall events causing flooding of the Winford Brook (for the northern part of the village) and from the River Chew (for the southern part of the village). Depths of flooding vary from 0.02m to 1.77m for a 4% annual probability event up to 0.09m to 1.98m for a 0.1% annual probability event. For events with an annual probability of greater than 1%, there are five properties which are predicted to be inundated to a depth of 1m or more. 97 properties were identified as being within the Flood Zone 2 boundary, and 69 of these were targeted for flood protection measures as part of a Defra funded Property Protection Grant Scheme.

Surveyors inspected each property and recommended generic measures that were required to protect the properties. Measures that were adopted included:

- Door barriers (screw-in and slide in types).
- Air brick protection.
- Toilet bungs.
- Sewer / drain non-return valves and mini sink waste non return valves.
- One property was also fitted with a sump and pump system.

The total cost of the project was £325k. A representative of the local parish council was instrumental in driving the delivery of the project forward, liaising with local residents throughout delivery. The same person was also actively involved in working with the community and managing community flood plans and a local Flood Action Group. The Flood Action Group includes a buddy system to ensure that all measures are deployed at times of floods, providing assistance for example to elderly people who live in a small community within the village, and for people who work away or are away on holiday.

**Figure 1**
Silver Street, Chew Magna in 1968. The dark line by the porch top marks the water height

**Figure 2**
Door guard fitted to the front door

**Figure 3**
Pet flap cover

## 12.4 Properties in Dallam received temporary flood resistance measures

This project was undertaken in Densham Avenue and Gough Avenue in the district of Dallam in Warrington as part of a Defra funded Property Protection Grant Scheme. 17 properties were identified as being at flood risk as a result of surface water from storms with annual probability of up to 5%. Flooding had previously occurred in this area 5 times between 2004 and 2008 with internal flooding of up to 20 properties.

Property surveys were undertaken and appropriate BSi kite-marked flood protection products were implemented:

- Guards fitted to front and patio doors.
- Automatically closing air bricks.
- Air brick covers for low level vents.

The cost of the project was £32k. This part of Warrington falls within an Environment Agency flood warning area for high water on Dallam Brook. However, past floods appear to be as a result of local surface water and not directly as a result of the brook. For this reason, Warrington Borough Council are looking into appointing a neighbourhood co-ordinator to manage flood warnings to residents in the event of adverse weather conditions.

**Figure 1**
Flooding in Dallam

**Figure 2**
Flooding in Dallam

**Figure 3**
Door guard fixtures on a house in Dallam

**Figure 4**
Door guard fixtures and auto-closing airbricks on a house in Dallam

## 12.5 Properties at Eamont Bridge received temporary flood resistance measures

This project involved 45 homes at Eamont Bridge in Cumbria and was partly funded by the Defra funded Property Protection Grant Scheme and also by the Environment Agency. Flooding arises from the River Eamont. Flooding to properties begins during a 5% annual probability flood event and lasts approximately 24 hours. 45 properties flooded in November 2009 during an approximately 1.33% annual probability flood.

Property surveys were undertaken and appropriate flood resistance products were fitted including:

- Guards fitted to external doors.
- Air brick covers and automatically closing air bricks.

The total cost of the project was approximately £190k.

The Environment Agency provides a Flood Warning Service with 2 hour lead-time for this area, so the equipment can be installed in good time. A Flood Action Group was created in order to pull everyone together and implement a community flood plan.

## 12.6 A single property in Worcester with a range of resistance and resilience products

The project involved a single property on the banks of the River Severn in Worcester that had consistently flooded since its construction. Severe flooding in 2007 saw the water level rise above the ground floor window sills. Over time the original floor slab had become cracked and the damp-proof membrane had failed meaning that there was frequent water ingress into the ground floor whenever the river level rose or during heavy rain.

The owner of the house arranged for a property-level flood survey and privately funded a range of resistance and resilience measures:

- A watertight membrane was fitted behind the floor and walls on the ground floor with cavity drainage linked to a sump and pump system (twin sumps each with twin pumps for high discharge and fail-safe).
- Removable flood barriers across doors, windows and entry points between terraces.
- Non-return valves on service pipes.

The Environment Agency provides a Flood Warning Service for this area, so the temporary flood resistance measures can be installed in good time. An informal flood action group has been created so that local residents can help each other with the flood barriers.

**Figure 1** Flooding at the property in Worcester

**Figure 2**
Water-proof membranes with one of the sumps ready for pump installation

(Source: Triton Chemicals)

## 12.7 Community flash flood warning system, Northamptonshire

Northamptonshire County Council engaged Casella Solutions to supply a system for 15 communities at risk of surface water or river flooding. This uses the 'STORM Guardian' rain gauge, which collects rainfall data remotely. The data logger and all the main components are housed together, making for easy installation. The system helps mitigate the risk from the increasing incidence of high intensity rainfall and flash flooding in the communities it covers.

**Figure 1**
Casella Solutions

## 12.8 Single property in West Yorkshire – permanent gate/wall barrier

This location is close to a relatively small watercourse, much of which is culverted. It is prone to flash flooding, as was seen in the 2007 summer floods. The area has been assessed as having a 'medium' risk of flooding (between 1% and 3.3% in any one year) and is not covered by publically available flood warnings, so the owners chose to adopt a permanent flood protection solution, with a gate that can easily be closed when heavy rainfall occurs.

**Figure 1**
Yorkshire Dampcourse/IBS
Engineered products

## 12.9 A Car Park in Chichester – Installing Flood Barriers Successfully Keeps the Water Out

After the arduous task of clearing seaweed and other debris following a storm surge and wind assisted tidal flood of their car park in 2008, a group of neighbours decided to install a flood barrier. The barrier was installed later the same year and fortunately, it has only been needed once – despite extreme rainfall and the immediate area suffering extensive flooding.

One of the cottage owners commented: "Our home was built around 20 years ago and, whilst it is not susceptible to the flooding that the local area has experienced in recent years, the car park in which I and my three neighbours keep our cars becomes flooded about once every four years. The water rises to about four inches which, although doesn't necessarily sound as high as flood waters in other areas of the country, with waves on top it is more than enough to cause a real mess with all of seaweed and grass cutting sloshing around in Chichester Harbour being dumped in front of our cottages."

"Once the flood water finally recedes, the car park is full of debris and is in a terrible mess; it takes hours for us to be able to start using the car park again and is a real nuisance – I can only image how utterly terrible it must be for people to experience this in their homes.

"When the car park was at risk of flooding in October 2012, we were delighted to be able to relax after quickly erecting the Flood Control International barrier. The impact has been quite incredible; only a drop of water escaped beneath the barrier and came into our car park. It is quite extraordinary seeing the barriers in action, literally holding back the floods. If I hadn't seen it for myself I wouldn't have believed they would be quite so effective.

"It was absolutely money well spent. I have no concerns now whatsoever of our car park flooding, regardless of how high the storm surge is. I wouldn't hesitate to recommend to homeowners that they install flood prevention and protection measures to their homes; they really do work and can save an enormous amount of heartache, disruption and, if homes are at risk, a lot of money."

**Figure 1**
Postman in Bosham braves the flood waters

**Figure 2**
Flood barrier in action

## 13. Directory of flood protection product manufacturers and suppliers featured in this handbook

| | | | |
|---|---|---|---|
| **Action Dry Group**<br>PO Box 139<br>Upminster<br>Essex<br>RM14 2YD<br><br>**T** 0500 510 052<br>**E** info@absorbeez.com<br>**W** www.absorbeez.com | **AET**<br>PO BOX 4706<br>Sheffield<br>S17 9BU<br><br>**T** 0114 289 9094<br>**E** www.aetflooddefence.com/aqua-sac<br>**W** info@aetflooddefence.com | **Allups Ltd**<br>Prospect House, Prospect Street<br>Huddersfield<br>West Yorkshire<br>HD1 2NU<br><br>**T** 0161 408 3751<br>**E** allupsltd@gmail.com<br>**W** www.allupsltd.co.uk | **AquaBarrier Systems Limited**<br>10 Cavalry Ride<br>Norwich<br>NR3 1UA<br><br>**T** 01603 625 999<br>**E** sales@aquabarrier-systems.com<br>**W** www.aquabarrier-systems.com |
| **AquaDam Europe Ltd**<br>The Regus Building<br>Windmill Hill Business Park<br>Whitehill Way<br>Swindon<br>SN5 6QR<br><br>**T** 01793 251 700<br>**E** sales@aquadam-europe.com<br>**W** www.aquadam-europe.com | **AquaFence Ltd**<br>Europe Sales<br>Nedre skøyen vei 3<br>0275 Oslo<br>Norway<br><br>**T** + (47) 69 20 71 70<br>**E** info@aquafence.com<br>**W** www.aquafence.com | **Aquobex Ltd**<br>(Incorporating Floodguards)<br>Building 69, BRE<br>Bucknalls Lane, Garston<br>Watford<br>WD25 9XX<br><br>**T** 01923 518 582<br>**E** enquiries@aquobex.com<br>**W** www.aquobex.com | **AST Floodwall Systems Ltd**<br>Matrix House<br>12-16 Lionel Road<br>Canvey Island<br>Essex<br>SS8 9DE<br><br>**T** 0800 160 1659 / 1657<br>**E** [Online contact form]<br>**W** www.astfloodwall.com |
| **Campbell Scientific**<br>Campbell Park,<br>80 Hathern Road<br>Shepshed<br>Loughborough<br>LE12 9GX<br><br>**T** 01509 828 888<br>**E** sales@campbellsci.co.uk<br>**W** www.campbellsci.co.uk | **Caro Flood Defence Systems**<br>Edge Barn<br>11 Market Hill<br>Royston<br>Hertfordshire<br>SG8 9JN<br><br>**T** 01763 244 446<br>**E** info@caro.co.uk<br>**W** www.caro.co.uk/flood-defence-systems | **Casella**<br>Regent House<br>Wolseley Road<br>Kempston<br>Bedford<br>MK42 7JY<br><br>**T** 01234 844 100<br>**E** info@casellasolutions.com<br>**W** www.casellasolutions.com/uk/en/products/met/met-environmental/tbrg.aspx | **Castles Designs**<br>8 Barnfield Hill<br>Exeter.<br>EX1 1SR<br><br>**T** 01392 984101<br>**E** enquires@castlesdesigns.co.uk |

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|---|---|---|---|
| **Cold Flood Prevention ApS**<br><br>Pastelvej 14<br>9850 Hirtshals<br>Denmark<br><br>**T** +45 6124 6112<br>**E** info@coldflood.dk<br>**W** coldflood.dk/en/ | **Crocodile Flood Solutions**<br><br>Hamilton House<br>9, Hucknall Rd<br>Nottingham<br>NG5 1AE<br><br>**T** 0845 094 1281<br>**E** info@crocodilefs.co.uk<br>**W** www.crocodilefs.co.uk | **CSI Flood-products**<br><br>3 Dunlop Court<br>Deans Industrial Estate<br>Livingston<br>EH54 8SL<br><br>**T** 0800 083 0953<br>**E** [Online contact form]<br>**W** www.flood-products.co.uk/index.php | **Defence Doors Ltd**<br><br>Unit 12 Llanelli Gate<br>Dafen<br>Llanelli<br>SA14 8LQ<br><br>**T** 0845 1771 665<br>**E** sales@defencedoors.com<br>**W** www.defencedoors.com |
| **Easifit Ventguard Products Ltd**<br><br>8 Gairloch Road<br>Dundee<br>DD5 3HZ<br><br>**T** 01382 679 254<br>**E** sales@ventguard.co.uk<br>**W** www.ventguard.org | **Easy Innovations Ltd**<br><br>Unit 6d Thomas Way<br>Lakesview International<br>Business Park<br>Hersden, Canterbury<br>CT3 4JZ<br><br>**T** 01227 712 833<br>**E** sales@easyinnovations.co.uk<br>**W** www.easyinnovations.co.uk/products/quick-dam/ | **Environmental Defence Systems Ltd**<br><br>PO Box 92<br>Huddersfield<br>HD7 4WQ<br><br>**T** 01484 641 009<br>**E** info@edslimited.co.uk<br>**W** www.floodsax.co.uk | **Environmental Innovations Ltd**<br><br>The Innovation Farm<br>Sawbridgeworth Road<br>Little Hallingbury<br>Bishop's Stortford<br>CM22 7QU<br><br>**T** 01279 600 440<br>**E** [Online contact form]<br>**W** www.environmental-innovations.biz |
| **Flash Flood Doors Ltd**<br><br>Unit 6, Bevan Close<br>Finedon Road Industrial Estate<br>Wellingborough<br>Northamptonshire<br>NN8 4BL<br><br>**T** 01933 770 272<br>**E** info@flashflooddoors.co.uk<br>**W** www.flashflooddoors.co.uk | **Flood Ark Ltd**<br><br>The Forge, The Street<br>Lyng<br>Norwich<br>NR9 5QZ<br><br>**T** 01603 879 977<br>**E** info@floodark.com<br>**W** www.floodark.com | **Flood Buddy**<br><br>(Online only)<br><br>**T** 0800 6125665<br>**E** [Online contact form]<br>**W** www.floodbuddy-uk.co.uk/flood-protection-products/ | **Flood Control International Ltd**<br><br>Kilworthy Park<br>Tavistock<br>PL19 0FZ<br><br>**T** 01822 619 730<br>**E** [Online contact form]<br>**W** www.floodcontrolinternational.com |

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| **Flood Divert Ltd**<br>Unit G7b<br>Elvington Industrial Estate<br>York Road, Elvington<br>York<br>YO41 4AR<br><br>**T** 01904 360 204<br>**E** [Online contact form]<br>**W** www.flooddivert.co.uk | **Flood Guards Systems Ltd**<br>Building 69, BRE<br>Bucknalls Lane, Garston<br>Watford<br>WD25 9XX<br><br>**T** +44 (0)1923 518 582<br>**E** sales@aquobex.com<br>**W** www.floodguards.com/floodguards.aspx | **Flood Management Company**<br>(Online Amazon outlet only)<br><br>**W** www.amazon.co.uk/s/ref=bl_sr_diy?ie=UTF8&field-brandtextbin=Flood+Management+Company&node=79903031 | **Flood Protection Solutions Ltd**<br>140 Main Street<br>Woodborough<br>Nottingham<br>NG14 6DD<br><br>**T** 07850 498 568<br>**T** 07792 750 791<br>**E** enquiries@floodprotectionsolutions.co.uk<br>**W** www.floodprotectionsolutions.co.uk |
| **Floodgate Limited**<br>49/51 Lammas Street<br>Carmarthen<br>Wales<br>SA31 3AL<br><br>**T** 01267 234 205<br>**E** sales@floodgate.ltd.uk<br>**W** www.floodgate.ltd.uk | **Flood Guard UK Ltd**<br>7 Ormskirk Rd<br>Wigan<br>WN5 0XD<br><br>**T** 0800 073 5455<br>**E** [Online contact form]<br>**W** www.floodguarduk.co.uk | **Flood Protection Solutions**<br>140 Main Street<br>Woodborough<br>Nottingham<br>NG14 6DD<br><br>**T** 0115 9870358<br>**E** enquiries@floodprotectionsolutions.co.uk<br>**W** www.floodprotectionsolutions.co.uk | **FloodSafe Flood Alarms**<br>[PC-Q Solutions Ltd]<br>Cambrian House<br>1 Cambrian Place<br>Llanidloes<br>Wales<br>SY18 6BX<br><br>**E** info@floodalarms.co.uk<br>**W** www.floodalarms.co.uk |
| **Floodtite Systems Ltd**<br>500 The Broadway<br>Muswell Hill<br>London<br>N10 1BT<br><br>**T** 0208 442 0872<br>**T** 07885 801 802<br>**E** sales@floodtite.com<br>**W** www.floodtite.com | **Flowstop Ltd**<br>1 Kingdom Avenue<br>Northacre Industrial Estate<br>Westbury<br>BA13 4WE<br><br>**T** 01373 858 234<br>**E** office@flowstop.co.uk<br>**W** www.flowstop.co.uk | **Fluvial Innovations**<br>2-3 Harwell Road<br>Nuffield Industrial Estate<br>Poole<br>BH17 0GE<br><br>**T** 01202 678 580<br>**E** info@fluvial-innovations.co.uk<br>**W** www.fluvial-innovations.co.uk | **Geodesign Barriers Ltd**<br>1 Chapel Street<br>Warwick<br>CV34 4HL<br><br>**T** 01793 538565<br>**E** britt.warg@palletbarrier.com<br>**W** www.geodesignbarriers.com |

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| **Hydro-Logic LLP**<br><br>Old Grammar School<br>Church Street<br>Bromyard<br>HR7 4DP<br><br>**T** 0118 933 1325<br>**E** enquiries@hydrologic.co.uk<br>**W** www.hydro-logic.co.uk | **IBS Engineered Products Ltd**<br><br>Unit 7 Brunel Park<br>Off Blyth Road<br>Harworth<br>DONCASTER<br>DN11 8NE<br><br>**T** 01302 630015<br>**E** info@ibsengineeredproducts.com<br>**W** www.ibsengineeredproducts.com | **Isothane Ltd**<br><br>Newhouse Road<br>Huncoat Business Park<br>Accrington<br>BB5 6NT<br><br>**T** 01254 872 555<br>**E** [Online contact form]<br>**W** www.isothane.com | **John Newton & Co Ltd**<br><br>Newton House<br>17-19 Sovereign Way<br>Tonbridge<br>TN9 1RH<br><br>**T** 01732 360 095<br>**E** info@newtonwaterproofing.co.uk<br>**W** www.newtonwaterproofing.co.uk |
| **J T Atkinson & Sons Ltd**<br><br>(Builders Merchants)<br>Thornton House<br>Cargo Fleet Lane<br>Middlesbrough<br>TS3 8DE<br><br>**T** n/a<br>**E** [Online contact form]<br>**W** www.jtatkinson.co.uk/search/flood | **Kiltox**<br><br>Unit 6<br>Chiltonian Industrial Estate<br>203 Manor Lane, Lee<br>London<br>SE12 0TX<br><br>**T** 08451 662 040<br>**E** info@kiltox.co.uk<br>**W** www.kiltox.co.uk | **Lakeside Flood Solutions**<br><br>Invest House<br>Bruce Road, Fforestfach<br>Swansea<br>SA5 4HS<br><br>**T** 01792 561117<br>**E** sales@lakesidefloodsolutions.co.uk<br>**W** www.lakesidefloodsolutions.co.uk | **Marley Plumbing and Drainage**<br><br>Lenham<br>Maidstone<br>ME17 2DE<br><br>**T** 01622 858 888<br>**E** marketing@marleyext.com<br>**W** www.marleyplumbinganddrainage.com |
| **Maynard Technologies**<br><br>Beech Lane House<br>Beech Lane<br>Wilmslow<br>SK9 5ES<br><br>**T** 01625 252 000<br>**E** (Online contact form)<br>**W** www.flood-bags.com | **MISSION Rubber UK Limited**<br><br>Units 4+5 Atlas Business Park<br>Starnhill Close<br>Ecclesfield<br>Sheffield<br>S35 9TG<br><br>**T** 0114 257 0040<br>**E** sales@missionrubber.co.uk<br>**W** www.missionrubber.co.uk | **Multi Flood Solutions**<br><br>[Multi Mac Ltd]<br>Southfields<br>Boraston Lane<br>Tenbury Wells<br>WR15 8RB<br><br>**T** 01584 819 233<br>**E** multimaclimited@aol.com<br>**W** www.multifloodsolutions.co.uk | **The MURLAC Group**<br><br>Common Barn Farm<br>Tamworth Road<br>Hopwas<br>Staffordshire<br>WS14 9PX<br><br>**T** 01213 131 008<br>**E** info@murlac.com<br>**W** www.murlac.com |

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| **Newlands Conservatories & Garden Buildings**<br>Evesham Road<br>Norton<br>Evesham<br>WR11 4TW<br><br>**T** 01386 446 089<br>**E** [Online contact form]<br>**W** www.m0rad.demon.co.uk | **Safeguard Europe Ltd**<br>Redkiln Close<br>Horsham<br>RH13 5QL<br><br>**T** 01403 210 204<br>**E** (Online contact form)<br>**W** www.safeguardeurope.com | **Saint Gobain PAM**<br>Lows Lane<br>Stanton-by-Dale<br>Ilkeston<br>DE7 4QU<br><br>**T** 01159 305 000<br>**E** sales.uk.pam@saint-gobain.com<br>**W** www.saint-gobain-pam.co.uk | **Sealwise Ltd & Wood Wise Trading Ltd**<br>Unit 5 Mendip Business Park<br>Mendip Rd<br>Axbridge<br>BS26 2UG<br><br>**T** 01934 750 084<br>**E** info@sealwise.co.uk<br>**W** www.sealwise.co.uk |
| **Snorkel Vent**<br>[Donite Plastics Ltd]<br>Prima Business Park<br>280 Comber Road<br>Lisburn<br>Northern Ireland<br>BT27 6TA<br><br>**T** 02892 639 995<br>**E** info@snorkelvent.co.uk<br>**W** www.snorkelvent.co.uk | **Steelplan Kitchens**<br>Wealdstone Road<br>Kimpton Industrial Estate<br>Sutton<br>SM3 9RW<br><br>**T** 0844 809 9186<br>**E** sales@steelplan.com<br>**W** www.steelplan.com | **Stormguard Floodplan**<br>Regency Mill<br>Macclesfield<br>SK11 8HR<br><br>**T** 01260 289 089<br>**E** info@floodplan.co.uk<br>**W** stormguardfloodplan.com | **StormMeister Flood Protection**<br>Unit 1.<br>West View,<br>Preston,<br>PR1 5EP<br><br>**T** 01772 704429<br>**E** contact@stormmeister.com<br>**W** stormmeister.com |
| **Synseal**<br>Synseal<br>Common Road<br>Huthwaite<br>NG17 6AD<br><br>**T** 01623 443 200<br>**E** info@synseal.co.uk<br>**W** www.synseal.com/flood-resistance | **The Flood Company**<br>The Flood Company<br>Lunnclough House<br>10 Kaffir Road, Edgerton<br>Huddersfield<br>HD2 2AN<br><br>**T** 0800 999 5355<br>**E** [Online contact form]<br>**W** www.thefloodcompany.co.uk | **Tilt Dam Limited**<br>3 Northbrook House<br>Free Street<br>Bishop`s Waltham<br>Southampton<br>SO32 1NP<br><br>**T** 0124 252 4212<br>**E** sales@tiltdam.co.uk<br>**W** www.tiltdam.co.uk | **Total Flood Solutions**<br>Unit 12<br>Llanelli Gate<br>Llanelli<br>SA14 8LQ<br><br>**T** 08454 567 175<br>**E** info@totalfloodsolutions.com<br>**W** www.totalfloodsolutions.com |

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| **Triton Systems**<br><br>Units 3 - 5 Crayford Commercial Centre<br>Greyhound Way<br>Crayford<br>DA1 4HF<br><br>**T** 01322 318 830<br>**E** info@tritonsystems.co.uk<br>**W** www.triton-chemicals.com | **UK Flood Barriers Limited**<br><br>(incorporating Flood Angel)<br>9a Wassage Way<br>Hampton Lovett Industrial Estate<br>Droitwich<br>WR9 ONX<br><br>**T** 01905 773 282<br>**E** info@ukfloodbarriers.co.uk<br>**W** www.ukfloodbarriers.co.uk | **UK Flood Defence Alliance**<br><br>UK Flood Defence Alliance<br>Floodtite Systems Limited<br>500, Muswell Hill<br>London<br>N10 1BT<br><br>**T** 0208 442 0872<br>**E** [Online contact form]<br>**W** www.ukflooddefencealliance.com | **Watertight International**<br><br>The Old Rectory<br>Church Lane<br>Thornby<br>Northampton<br>NN6 8SN<br><br>**T** 0800 093 3463<br>**E** [Online contact form]<br>**W** www.watertightinternational.com |
| **Whitehouse Construction Co. Ltd**<br><br>Blenheim Road<br>Ashbourne<br>DE6 1JU<br><br>**T** 01335 344 000<br>**E** (Online contact form)<br>**W** www.whitehouseconstruction.co.uk | **Wykamol Group**<br><br>Unit 3, Boran Court Network<br>65 Business Park<br>Burnley<br>BB11 5TH<br><br>**T** 08454 006 666<br>**E** info@wykamol.com<br>**W** www.wykamol.com/waterproofing | | |

## 14. Useful contacts

The Environment Agency offers advice on flood protection measures and flood planning and provides many useful guides and templates: **https://www.gov.uk/government/publications/flooding-what-to-do-before-during-and-after-a-flood**

Met Office: **www.metoffice.gov.uk**

The Flood Protection Group of the Property Care Association provides information about flood restoration on their website here: **http://www.property-care.org/skill/flood-protection/**

The Chartered Institution of Water and Environmental Management (CIWEM) maintain a professionals directory where a list of flood risk consultants can be found: **www.ciwem.org**

The National Flood Forum provides support and advice to communities and individuals that have been flooded or are at risk of flooding, which includes the 'blue pages' directory of flood protection products and services **www.floodforum.org.uk**

Mary Dhonau Associates (MDA) not only provide advice on flood protection products and methods via their website, but can also offer many years extensive experience of working with communities and individuals at risk, as well as flood-related research initiatives: **www.marydhonau.co.uk**

The Royal Institution of Chartered Surveyors (RICS) has produced a useful guide to flooding for the property owner just follow the link to useful guides on the UK website. RICS also maintain a list of chartered surveyors: **www.rics.org/uk**

RAB Consultants Ltd can provide advice and assistance on flood risk and property-level protection surveys: **www.rabconsultants.co.uk**

Know Your Flood Risk™