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Property Flood Resilience



Stories from homes and businesses who have made adaptations to help them recover more quickly after a flood

Produced by

floodmary

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IMAGE: FLOOD RE



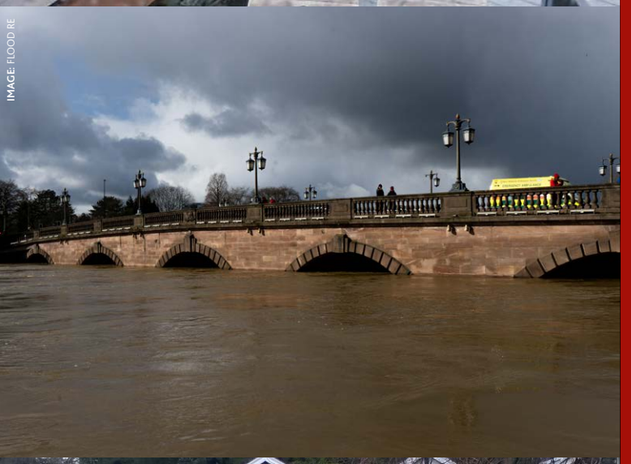


IMAGE: FLOOD RE



IMAGE: ROB SHEPHARD



"I often compare Flood Risk Management to being a bit like a jigsaw puzzle, with many pieces all fitting together to reduce our flood risk. I make no apologies for always focussing on the 'bit in the middle'; our homes and businesses. It is our homes and businesses that are devastated by the flood water, with much loved possessions and memories destroyed forever.

Whilst putting together this guide, I've heard from people who have been out of their homes for 15 months, or businesses that have had to shut for a year or more. People have shared many harrowing accounts of their flood recovery, which without exception, everyone said was worse than the flood itself.

Being flooded often leaves a lasting, detrimental effect on the mental health of those who have been through it; a sobering fact that is so often overlooked.

In 2018, I project managed the adaptation of two properties in Cumbria - a community centre and a home - to make them more resilient to future floods. This means that if they do flood again, they will be able to return sooner and the awful disruption that typically comes with flooding will be significantly reduced.

Having been flooded myself and benefited from my own recoverable measures, I was keen to find out what other people have done to make their own homes resilient to future floods. So, I have taken to the road and travelled all over the country to talk to both homeowners and businesses who have experienced flooding to see first-hand what they had done.

Hopefully, by sharing their experiences within this ebook, it will both inform and inspire those newly flooded when they are thinking about flood resilient/recoverable repair.

One size doesn't fit all, so I have included a variety of different property types and interventions: some large and some small, to hopefully fit all budgets.

With the introduction of Flood Re's Build Back Better scheme, my aim is to showcase the huge benefits of flood adaptation, provide a wealth of information on what is possible and demonstrate just what can really be achieved through real-life examples.

I hope you enjoy reading it!"

Mary Long-Dhonau OBE



IMAGE: MIKE BRYSON PHOTOGRAPHY

Focus on the Severn p5

Resilient Homes p36

Resilient Businesses p76

Building a more resilient future in the face of rising flood risk

Flooding devastates lives and leaves lasting scars on communities long after the waters recede. The emotional impact and trauma can endure for years — and for many, a lifetime. As the effects of climate change accelerate, we are already witnessing more frequent and more severe extreme weather events. The consequence is clear: more homes across the UK than ever before are at increasing risk of flooding.

To protect people, property and peace of mind, building resilience is absolutely essential. This must happen at every level — from individual households to entire communities and national infrastructure. Property Flood Resilience (PFR) measures within the home are an important part of this effort, but they must sit alongside community and government action. True resilience requires collaboration: between government, local authorities, insurers, businesses and householders.

One significant contribution to this effort is Flood Re's Build Back Better initiative. This scheme allows eligible householders to claim an additional £10,000 on top of their insurance repair costs, specifically to install resilience and resistance measures. These can include flood doors and barriers, water-resistant flooring, raised electrical sockets, and other adaptations that ensure homes can recover more quickly and at lower cost after a flood. By reducing the time families spend in alternative accommodation and minimising the damage caused, these measures make an extraordinary difference to recovery and long-term wellbeing.

As resilience becomes a central pillar of flood preparedness, it is vital that installation standards remain consistently high. The industry's Code of Practice plays a crucial role in providing the guidance, assurance and accountability needed. It gives insurers and householders confidence that resilience work has been delivered to a robust, future-proof standard — offering reassurance when facing the increasing threat of flooding.

I am delighted to see the updated edition of this publication. It is an invaluable resource for anyone seeking to make their home or business more resilient to flooding. The stories and guidance within offer practical, achievable steps to help people prepare for the increasing likelihood of extreme weather. They demonstrate just how life-changing resilience measures can be — not only in reducing damage and protecting treasured belongings, but in shortening, or even eliminating, the distressing period of displacement that often follows a flood.



Mary Long-Dhonau has spent many years championing flood awareness and resilience, empowering thousands of homeowners and flood-risk communities across the UK. Her dedication, expertise and tireless advocacy have made a profound difference, and I would like to thank her sincerely for her continued commitment to helping people withstand and recover from flooding.

Kelly Ostler-Coyle, Director of Corporate Affairs, Flood Re

Once the storm is over you won't remember how you made it through, how you managed to survive. You won't even be sure, in fact, whether the storm is really over. But one thing is certain. When you come out of the storm you won't be the same person who walked in. That's what this storm's all about.

Haruki Murakami, Kafka on the Shore

IMAGE: FLOOD RE

Focus on The River Severn

The River Severn is England's longest river. In recent years, flooding has happened on an annual basis. The river has a tendency to rise slowly and then stay high, sometimes for up to three weeks. Sadly, I know of people who have flooded several times in the same year. For those I spoke with, they said they understood the risk and expected to potentially flood occasionally – but not every year!

Due to climate change, they are aware that changing weather patterns means that flooding is likely to become a more regular occurrence.

I have therefore travelled into communities located alongside the River Severn to find out how they are coping and to learn more about the steps homeowners and businesses have taken to help them to recover more quickly when floods occur.

Eamonn and Karen in Gloucester

1850's detached house
Flooded 2007, 2012, 2014 & 2020

Eamonn and Karen have lived in their detached house, which was built in 1850, since 2010.

They were aware of its flood risk and knew it had flooded during the floods of 2007. Since then, the property has flooded three more times – in 2012, 2014 and the worst being 2020, just before lockdown.

The area was deeply flooded for three weeks and only accessible by boat. The couple recounted that the flow of water was phenomenal on the road outside. They have a large garden and a huge log store, many of the logs were washed into the River Severn and the rest were strewn all over their garden and took months to clear up. They now store and secure them above the flood level.

Within months of moving in, Eamonn, who is very skilled at DIY, undertook the following changes:

- Tiled the floors throughout downstairs using stone flooring up to skirting height, waterproof grout and adhesive.
- Sealed the flooring with a breathable liquid.
- Installed electrics up high, which are wired from upstairs to enable them to run two powerful puddle pumps.
- Raised their freezer up high in the garage.
- Lifted their shed so it was out of the reach of the flood water levels.
- Installed flood doors to the front and back of the house.
- Fitted a non-return valve to the drains leading to the septic tank.

As part of ongoing works, the Environment Agency gave the couple a grant to install slot-in flood barriers to the front and back of the house and along their French windows and to purchase two more puddle pumps. The barriers enable the couple to leave the property if it's safe to do so.



Top Tip

Remember, logs can float away in flood water: if you have a log pile, secure it.

After the floods of 2020, they took the following additional measures:

- Eamonn plastered some downstairs rooms with lime plaster to about a metre high.
- Sealed the patio using a standard patio sealant, which enables an easier clean up after the river water goes.
- The stone floor tiles were stained with a rust coloured stain after the floods, but Eamonn researched and found a stain remover, which worked successfully.



Flood doors fitted to the front and back of the house.





Furniture and sofas are lifted onto decorators trestles.

The couple are signed up for a flood warning and have a plan in place so they are prepared: they move all they can out of harm's way, furniture and sofas are lifted onto decorators trestle tables, while oak doors and kitchen unit kickboards are removed.

They generally manage to keep the water indoors down to about 15cm but must keep a regular eye on the pumps, as the silt from the River Severn does have a tendency to clog them up. They previously had never claimed on their insurance, but because the water stayed high for over three weeks in 2020, they did make a claim to cover recovery costs.

They were upset that the restoration and renovation company wanted to gut their home, removing all the plaster including pulling up all the stone tiles, which were only stained, and replace the kitchen which was only slightly damaged. The couple therefore took a cash settlement, which enabled Eamonn to undertake the work himself, which caused far less disruption – this is however only advisable if you have the advanced skills that Eamonn has.

Once the water starts to drop, a pond vacuum is used to pump water from the house, as this helps with the removal of silt, and the drying process can commence. They have bought two large dehumidifiers to get the drying process started immediately and they light their two log burning stoves. This significantly reduces the time it takes to recover.



Stone flooring downstairs up to skirting height.



The shed is lifted out of reach of the flood water.



Immediately light the log burning stoves helps start the drying process and reduces the time it takes to recover.



Electrics installed up high, which come down from the floor above, enabling them to run powerful puddle pumps.



The freezer is raised up high in the garage.

Two ladies in rural Gloucestershire

17th century cottage Flooded 2000 and 2007

Two friends moved into their small timber-framed cottage in August 2000, which is located over a quarter of mile away from the River Severn. They were assured by the vendors that the river had not flooded since 1947.

This, and the fact that the timber framed cottage had stood for over 300yrs, convinced the pair that the threat appeared minimal. Wrong! The cottage was flooded just four months later in December 2000 by about 10cm (4”). At the time, no real damage was sustained as there was sufficient time to place furniture on pallets –– but it provided a stark warning nonetheless.

In the ‘great floods’ of June 2007, the cottage flooded again but this time the level was 0.9m (3’) in the house and over 1.8m (6’) further down the lane.

One ‘useful’ attribute of the middle to lower Severn is the time it takes for water levels to rise as it makes its way from the Welsh hills to the Severn Estuary – a distance of approximately 220 miles. It is not a “flashy” river!

In 2007, the owners had time to move treasured belongings upstairs and drive their cars to higher ground. The downside is the time it takes for the flood water to recede behind its banks – about three weeks! Such a duration will damage even the most solid wooden furniture, permeate walls, floors and inglenook fireplaces.





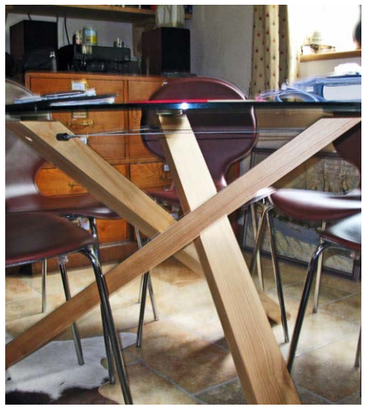
Top Tip

Battery-operated motion sensitive LED lights are ideal to use in a power cut.

People are often unaware of how much damage is done and work is needed after a flood.

The drying out was interminable. The rear elevation required rebuilding, and most of the solid brick inglenook, internal walls, built in staircase and a bedroom ceiling were all demolished.

Due to the scale of flooding in Worcestershire and Gloucestershire, there was a major scarcity of skilled builders and tradesmen, especially for very old buildings. The renovation commenced nearly 10-months after the flood and the ladies lived in a caravan parked outside for two years.



Lightweight dining chairs and table were chosen for ease of removal.

They were determined to ensure that their cottage was rebuilt and refurbished with only one aim: flood resilience!

They were lucky to be covered by an excellent insurance company, which accepted not only their plans to move their downstairs bathroom upstairs, but also to restore the cottage putting resilience and recoverability as the core objective. As the cottage is very old and only a single wall thick, recoverability has been the prime focus.

Recoverable measures included:

- Waterproof membrane up to 90cm (3’). applied to internal walls on ground floor. New plaster painted throughout with ‘breathable’ paint.
- Open tread staircase in solid oak.
- Underfloor (water pipes) heating installed in open-plan dining and sitting room, removing the need for wall radiators.
- Downstairs bathroom converted to an office using a solid wooden plinth with stainless steel legs rather than a traditional desk.
- New boiler raised to 76cm (2’6”) above floor with inbuilt cupboard underneath. Jaga central heating radiators with Low-H2O technology containing 90% less water than steel panel radiators were installed. The front panels can be removed and placed upstairs and internal ‘fins’ are waterproof.
- Impermeable porcelain tiles were laid throughout the ground floor.
- Two original mediaeval oak doors on the ground floor were replaced in solid oak – sad but necessary.
- Kitchen units were fitted with powder-coated steel carcases with solid acrylic doors/draw fronts.
- A wall mounted microwave and oven were fitted.



Easily removed kitchen containers.



New boiler raised above floor with inbuilt cupboard underneath.



Kitchen units were fitted with powder-coated steel carcases with solid acrylic doors/draw fronts.

- All ground floor plug sockets were raised.
- The inglenook was rebuilt, minus the fireplace, and a wood burning stove installed, sited on a 30cm (1’) high brick/ red tile plinth.
- The dining room table was replaced by a modern wooden circular tripod base, which folds together and includes a removable glass top. Lightweight dining chairs with steel legs and leather seats were chosen for ease of removal.
- Traditional style heavy settees and chair were replaced with leather chaise longue light enough to remove to higher garden ground – although they report, it is not as comfortable!
- The original external oil tank floated during the flood, fracturing the oil pipe, which required the fire brigade to attend and make safe. A new oil tank was installed on a concrete plinth raised 1.37m (4’6”) above the ground.
- A landline has been retained to enable communication if the mobile network goes down.
- A flood barrier is ready to slow down the ingress of water through the doors.
- A toilet bung is placed in the loo to stop any back flow of sewage.

In 2011 the Environment Agency built a flood alleviation scheme for the village, which means the River Severn has been held back to date. The ladies are however very aware that due to climate change, it may not do so forever.



Open tread staircase in solid oak.



New oil tank was installed on a concrete plinth.

PHASE 1
2016 - 2022

Nick and Annie in rural Worcestershire

17th century house with extensions and outbuildings Flooded 2007, 2014, 2019 & 2020

Nick and Annie moved into their house in 2016. The main part of the historic house dates back to 1650 and it has had two subsequent extensions; one built around 150 years ago and a more recent addition in the 1980s.

It has not always been a residential property; at one time in its long history it was a pub and also where tenants of a nearby estate went to pay their rent. It finally became a private home in the 1960s.

The couple were very aware of its flood risk, as the previous owner had been open about this risk. He had been flooded in 2007 while undertaking extensive renovations to the property. This enabled him to build back better, making the property flood resilient with these following measures:

- The house was tanked.
- The main part of the house had a cavity membrane system installed that allows any water that comes through the wall to go behind the plaster and into the sump (see Martin's story p42-43 for more details).
- Three submersible sump pumps are in chambers below the floors - all are interlinked with pipework.





Top Tip

Remember to keep your pumps maintained, so they work efficiently when you really need them.

- Two further pumps are located in the cellar.
- Stone floors throughout.
- All plug sockets raised up from floor level.
- Flood barriers are fitted to the doors.
- LPG backup generator provides enough power to run the pumps during a power cut – this was installed after a power cut during floods in 2014.

When Nick and Annie moved in they had three years of calm before the floods of winter 2019/20 happened! They have become keen watchers of the river level gauges and now know when to start preparing for a flood.

After experiencing the four floods of that winter, Nick and Annie have improved what was already there by adding these additional measures:

- Air source heat pumps have been placed up away from flood risk.
- Secondary flood barriers have been fitted to the front of the porches.

LPG Backup generator, strong enough to run the pumps during a power cut.



- Puddle pumps are placed between the two sets of barriers, which manages any water ingress into the porch.
- Absorbent cushions help soak-up any small amounts of water that gets in.
- A pond vacuum has been very useful as it has two separate chambers; one is automatically emptied, whilst the other can continue working.
- The couple keep bees and lift the hives onto nine breeze blocks, which keep the bees and their hives clear of the water.

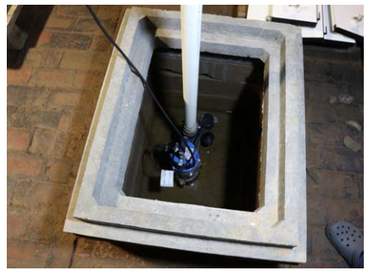
The river water at the bottom of their garden is over head height and therefore flood water surrounds their home for several days.

In all, since they moved in, they have lived through eight floods. When asked if they had their time over again, would they have still bought the property, the answer is a resounding duet of "yes!". They love the rural and beautiful location they live in and think it is all worthwhile.

Building back better allows them to manage the floods to only puddles in the house, without the need to make insurance claims.



Installed three submersible sump pumps in chambers below the floors, all are interlinked with pipework.



...and two more pumps in the cellar.



Air source heat pumps have been placed up away from flood risk.



Secondary flood barriers have been fitted to the front of the porches.



Puddle pumps are placed between the two sets of barriers which manages any water ingress into the porch.

PHASE 2
2022 - 2025

Nick and Annie in rural Worcestershire

17th century house with extensions and outbuildings Flooded 4 times since 2022

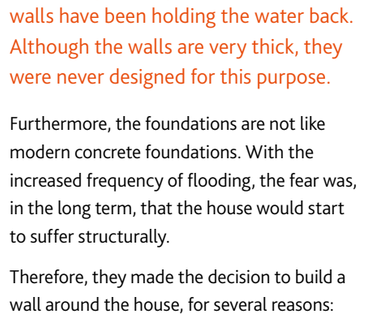
Following the extensive flood defence work completed up to 2022, the house walls have been holding the water back. Although the walls are very thick, they were never designed for this purpose.

Furthermore, the foundations are not like modern concrete foundations. With the increased frequency of flooding, the fear was, in the long term, that the house would start to suffer structurally.

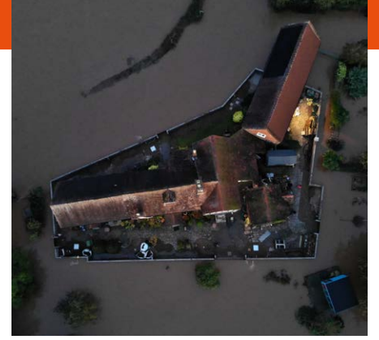
Therefore, they made the decision to build a wall around the house, for several reasons:

- The primary reason was to protect the house from any long-term adverse effects of having water so close to it.
- It provides protection from a bigger flood, accommodating around 30cm above the record flood in February 2020, which was close to breaching their previous mitigations.
- It offers another layer of protection, supplementing the existing house barriers that can still be deployed.
- There was also the aspect of making life a lot easier for Nick and Annie during a flood. There is considerable comfort and convenience in having a dry land barrier around the house, allowing them to walk freely around the property during a flood.

The wall withstood four floods since it was built, and was a massive news story all around the world!



Watch the BBC interview >



Building a wall is certainly not a simple project but Nick has written an e-book with all the steps he went through from planning permission, surveys, design, materials and procurement, to the actual building, barrier installation, drains and pumping systems and even the lessons learnt.

It really is a fascinating read and is available to download for free.

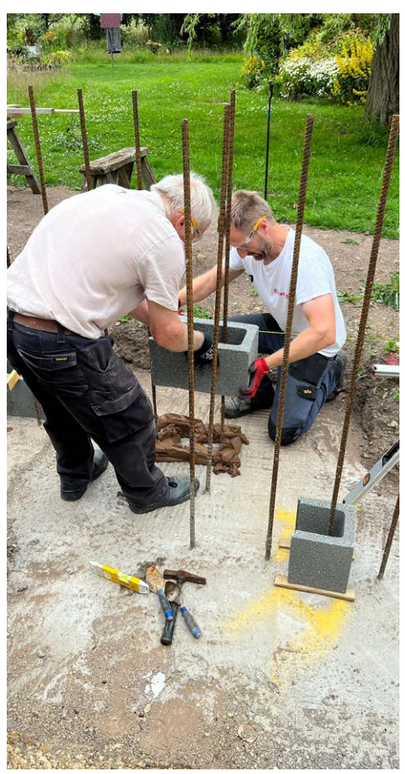


Download the FREE ebook >













This terrace of riverside homes in Worcester flood regularly. I visited the residents of three different homes in the terrace. Each had used different ways to reduce the impact of a flood, tailored their own preferences and circumstances. Each home recovered quickly.

Anne in Worcester

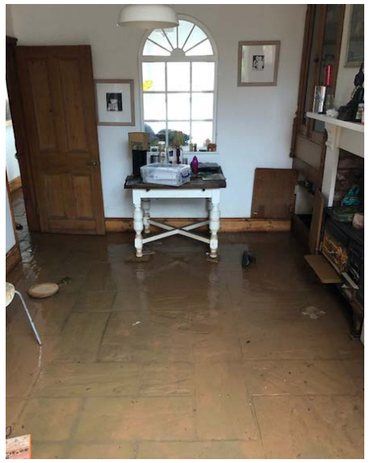
Terraced Edwardian House Floods frequently

Anne moved into her terraced Edwardian house in Worcester four years ago.

Having lived locally for the last 20 years, she was well aware of its flood risk. When she bought the property, her searches indicated it would flood every seven years or so. Unfortunately, her home has been flooded every year since she moved in!

Her worst flood was during 2020, which happened just before the Covid-19 lockdown. The water rose very quickly and took many people by surprise. She had inherited some waders from the previous owner, as the flood water in her home was too deep for wellies; she had to resort to wearing them indoors, as the water was well above her knees.

Anne had also inherited flood barriers with the property, but they were overwhelmed by the deluge. For this flood event, she had to make a large insurance claim of £45,000!



Anne has been flooded every year since she moved in.



Her storage cupboards in her living room are metal.



Top Tip

Make sure anything of sentimental value is kept upstairs

The floor was tiled using porcelain tiles with waterproof grout and adhesive.

After that experience, Anne decided to build back better and took the following measures:

- Continues to use the slot-in flood barriers.
- Knocked two rooms into one and concreted the floor, raising it by around 20cm (9”).
- The floor was tiled using porcelain tiles with waterproof grout and adhesive, and the skirting boards were tiled around.
- Two submersible pumps were fitted; one to the front of her house and one to the back in the kitchen.



- Waterproof plaster to the walls.
- The first four steps to the upstairs staircase are now made of stone.
- A stainless-steel kitchen was fitted with the base units raised above floor level.
- White goods are sited higher up in an enclosed cupboard.
- A small dishwasher is raised up off the floor.
- Living room storage cupboards are made of metal.



The floor is raised by around 23cm (9”).

Anne keeps all of her sentimental belongings upstairs and only has second hand furniture downstairs.

Anne was flooded again in 2022 and the steps taken proved their worth; only 5cm (under 2”) entered her home and she was able to hose it out, carry on living there, and not make an insurance claim.



The first three steps of the staircase are now made of stone.



Stainless-steel kitchen, the units are raised up on legs.

PHASES 1&2
2016 - 2022

Ian in Worcester

Terraced Edwardian House Floods frequently

In December 2016, Ian and his wife moved into their 100-year-old terraced house in Worcester, which is situated in very close proximity to the River Severn.

They were very aware of its flood risk. The previous owner had installed a composite waterproof floor and allowed the water into the property, washing it down after the flood had gone.

Ian however wanted to do his best to try to keep the water out, so made changes to his home before he had lived through a flood. He worked with a local company and some of the work was sadly done to a poor standard – in fact, the company is no longer in existence.

The work included:

- Pulling the floorboards up and filling the floor with concrete. This revealed that all the mortar in the bricks around the bay window had been washed away by floodwater ingress and the bricks were lying in a heap on the floor! This could have caused serious structural damage to the house, and it had to be underpinned as a matter of urgency.
- Waterproof slurry was applied to the floor and the walls up to a metre high. Ian soon discovered there were holes in the application, as he could see brickwork through it, so the company had to return and redo the work.

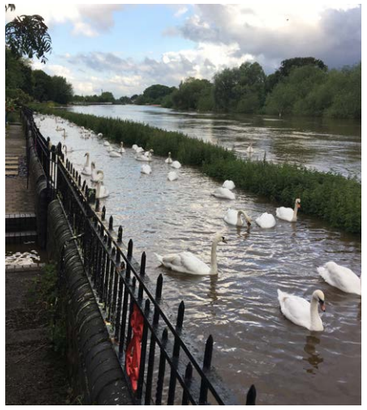




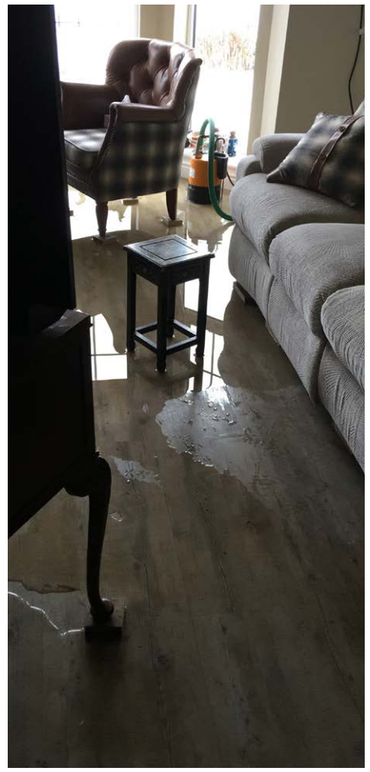
Top Tip

I have fitted a 'stable' type flood door to my rear exit, so if anyone does need to evacuate in an emergency, we can.

- A floodproof door was fitted to the front of the house.
- Flood proof windows installed in the bay window.
- A flood barrier was fitted to the back door.
- A non-return valve was fitted to prevent sewage entering the house via the drains.
- A puddle pump was purchased ready to pump out any leakage.
- All electrics were raised to 1m height.



The swans swimming on a nearby path.



Ian managed to keep the flood water down to only puddles on the floor in the 2022 flood.

Ian and his wife were on holiday in 2020 when the river flooded. His son was at home and moved the furniture, fitted the barriers but did not know how to prime the pump to enable it to work, which involves filling it with water before it is turned on. Sadly, the house flooded to a depth of 30cm (1') mostly through the barriers, which were poorly installed in the first place.

Ian then bought a new, more robust, puddle pump (pictured), and this kept the water down to 1cm (1/4") when the floods of 2021 occurred. The barriers did not work again so



Waterproof slurry was applied to the floor and the walls up to a metre high.

Ian has now fitted a 'stable type' flood door, which was chosen deliberately to provide an escape route if one is ever needed. The door was tested in the floods of 2022 and although Ian could see it had 50cm (1'6") of floodwater up against it, the door successfully kept the water out. The flood door at the front and the flood-proof bay windows also worked.

Ian commented that it was a surreal experience seeing the flood water rising up against the outside of his windows, and he recalls that they managed to keep the flood water down to only puddles on the floor and stated they were able to walk about in shoes during the flood. He said the flood was a minor inconvenience this time round.

Ever determined, Ian has recently put a grey crystallising mineral waterproofing slurry system onto the walls and floor in his back lobby and cloakroom area. He then tiled the floor using waterproof grout and adhesive and has also fitted a storage cupboard on legs.

If this new slurry system works, when the next flood comes (something, he says, he is looking forward to!) Ian will consider pulling up the flooring in their open plan living room and kitchen and replacing the old slurry with this new system!



BSI tested flood door and flood proof windows.



Built in storage cupboard on legs and a 'stable' type flood door to the rear exit.



Powerful puddle pump can pump down to only 1mm.

PHASE 3
2025

Ian in Worcester

Terraced Edwardian House. Floods frequently.

Since moving into his home in 2016, the River Severn has taken to flooding Ian's home at least once every year. As mentioned in Ian's early story, he had noticed that the original tanking had holes in it and water found its way in through them. He also said if the application of slurry used in his back lobby was successful, he would consider pulling up the flooring in the open-plan living room and would redo his entire downstairs using this system. It was and so, in 2025, he decided to do just that.

This work involved moving out for many months and considerable expense, however Ian believes it was all worth it, as he loves living in the house with such a fabulous view of the River Severn.

Whilst the strip out was taking place, Ian noticed the bottom of his staircase was starting to rot due to repeated floods. He also found all the holes in the original tanking, which was poorly installed. Ian had extensive expert advice before starting this huge retrofit and also used a builder who was skilled at undertaking this type of work.

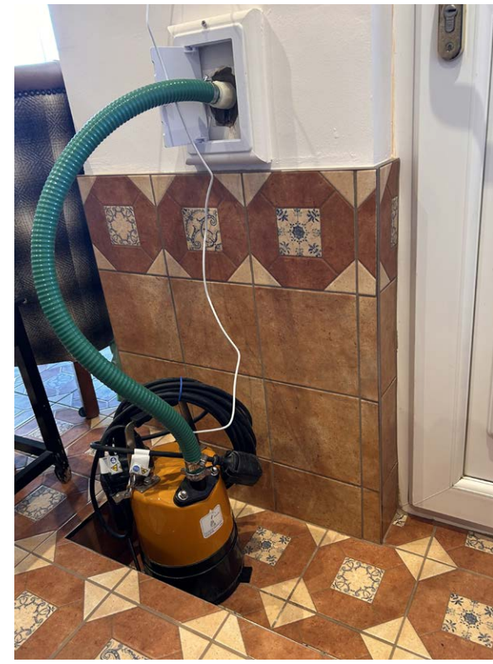
In total, the work undertaken included:

- Remove inner wall and stairs
- Seal all gaps around floors/wall with waterproof cement, add joint fillet.
- Waterproof tanking (Koster) applied to floor/walls
- Floor raised 15cm to max height - making the floor level with the windowsill
- Replace pendant lights with downlights, due to the loss of head height in the room
- Waterproof tanking second layer to floor/walls
- Epoxy based liquid waterproof membrane
- Tiling floor/lower walls, including slight inclines on floor towards pump wells
- New raised kitchen installed on stainless steel legs
- New open-plan stairs, raised on a plinth.
- Installation of hose points to front exterior and interior
- Installation of Sump & Pump areas front/rear, with permanent pump placement/outlet.

At time of writing, Ian's work has not been challenged by the River Severn, however he says, 'Bring it on!' - I will keep you updated!



Floor tiles run up the wall to make washing out easier.

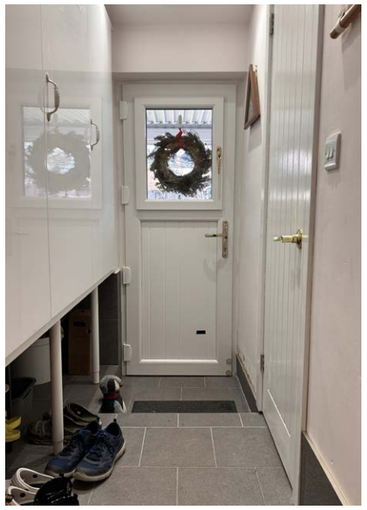


Permanent sump pump all set up and ready to go.





Floor raised 15cm to max height - making the floor level with the windowsill



Seal all gaps around floors/wall with waterproof cement, add joint fillet



New open-plan stairs, raised on a plinth, with space for water to flow past to the pumps.



Dining furniture on metal legs.



Installation of hose points to front exterior and interior.



New raised kitchen installed on stainless steel legs.

Lynn in Worcester

Terraced Edwardian House. Floods frequently

Lynn has lived in the terrace for 25 years. She purchased her present Edwardian home in 2007, as it was the only property in the avenue with the potential to extend. Extension work was undertaken and subsequently completed in 2010.

Lynn talks with real fondness of where she lives: she loves the wonderful view of the river and feels as if she is living in the countryside, yet can walk into the centre of Worcester city in less than 10 minutes.

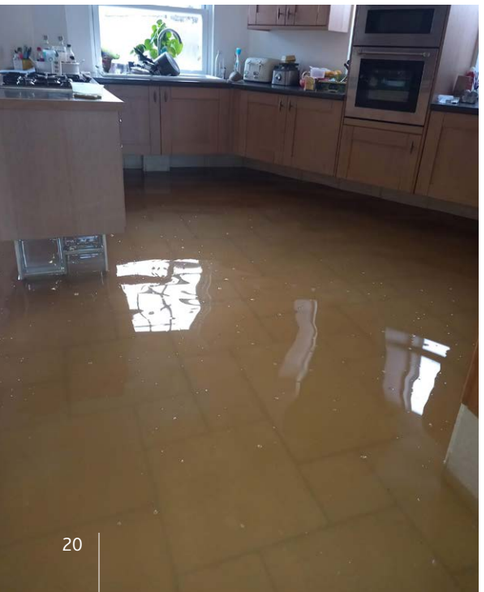
Since moving in, Lynn has however been flooded on seven separate occasions; her worst flood was in the summer of 2007 when she was away on holiday and was unable to prepare.

She says that she expected to flood living by a river, and she was aware that it used to flood approximately once every seven years, which was not too much of a problem. For the last three years however, she has flooded every year and this becomes a whole different proposition.

Lynn has made several refinements to her property to alleviate the necessity for remedial measures that can be required when flooding occurs:

- Floors have been lifted and re-built on block and beam to aid faster drying.
- Water fed underfloor heating to assist drying.
- Closed-cell insulation under floor.

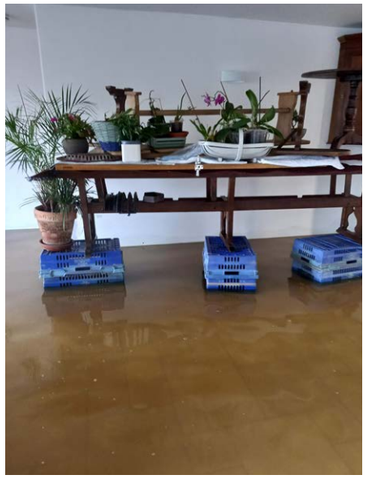
The kitchen has survived four floods since 2010.



- Marble floor tiles.
- Tiled skirtings have been inset into the plaster to stop moisture being drawn up into the plaster.
- Limelite plaster to the walls.
- Instead of metal beading to the edges, plastic beading has been used. This is normally used on the outside of rendered properties. The plaster has now successfully survived two floods.
- Kitchen units do not come down to the floor and are a smaller size - 58mm (23”), instead of the standard 72cm (28”). They were installed in 2010 as part of the extension and have survived four floods.
- All white goods are positioned high up on a brick-built plinth that is hollow underneath to allow water to drain. They are also sited inside a cupboard.
- The first few stairs have been built of stone.

Lynn knows exactly at what level the flood water will come into her home and says it takes about an hour to prepare for a flood. She has plastic crates stored in the garage and lifts some of her furniture up onto them, the remaining furniture and soft furnishings are taken upstairs. All sofas have metal frames and can survive a flood, she also removes and takes some of her doors upstairs.

Lynn has not made a flood insurance claim since 2020, when the replastering was done.



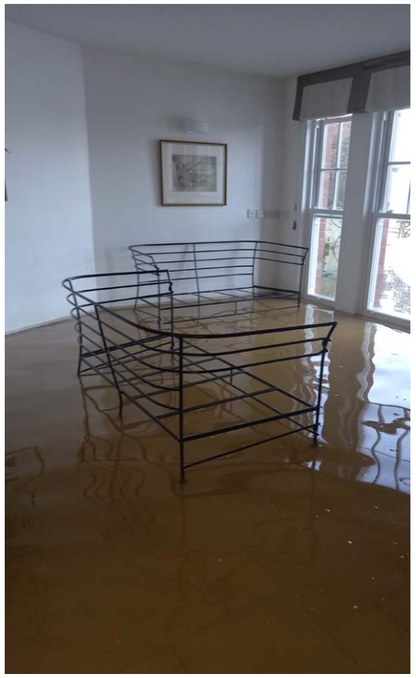
Some of the furniture is lifted up onto plastic crates.

Top Tip

If you regularly flood, consider changing the first three bottom steps of your staircase into stone.



The floors have been lifted, have water fed underfloor heating and closed cell insulation with marble tiling.



The sofas have metal frames and can survive a flood.



The kitchen units do not come down to the floor and are of a smaller size than standard kitchen units.



Lynn’s first four stairs are now built of stone.





White goods are positioned high up, on a brick-built plinth and are sited inside a cupboard.

Lyndsay in Bewdley

Grade II listed 18th century brick built cottage. Flooded several times

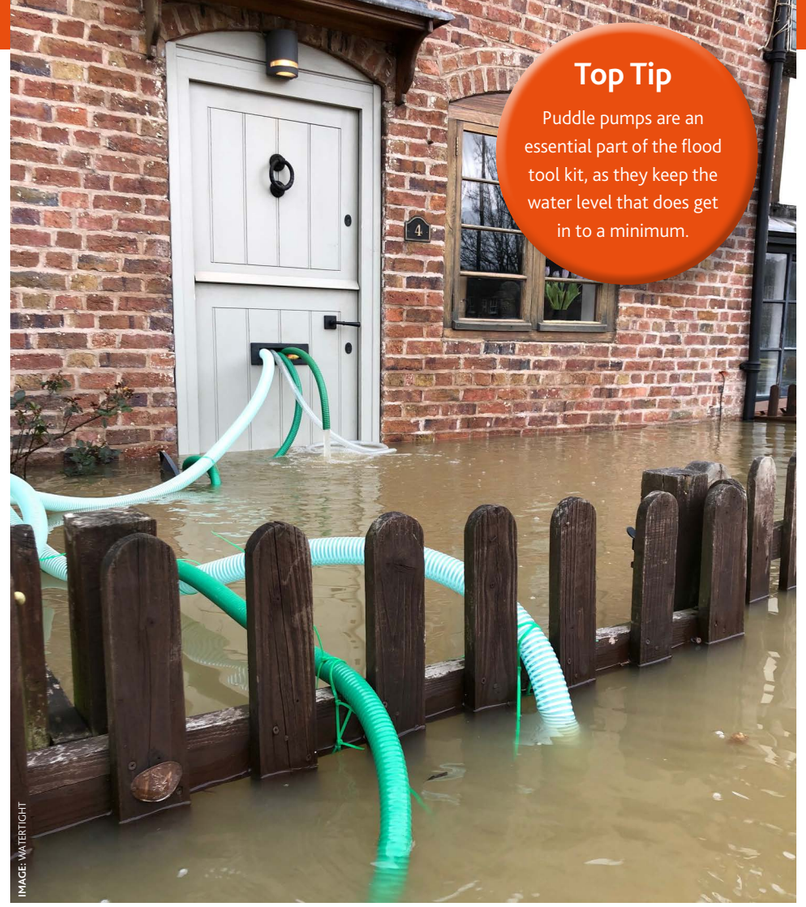
Lyndsay bought her mid-terraced Grade II-listed cottage, which was built in 1723, at an auction in 2004, along with another nearby cottage.

The cottage is situated on Beales Corner in Bewdley, an area that is known to flood. Lyndsay spent many years restoring the cottage and has built back better to enable it to recover quickly after a flood.

Due to climate change, flooding along the River Severn has become more frequent and, despite having temporary barriers in place, the close proximity to the river and the complex drainage system in that area means that the cottage still floods.

Lyndsay has undertaken and funded the following work:

- Solid floor with quarry tiles.
- Cement render to the walls.
- Plug sockets are raised.
- Fitted plastic skirting boards.
- Non return valves to outlet pipes.
- Three powerful puddle pumps.
- A grant part-funded a stainless-steel kitchen.



Top Tip

Puddle pumps are an essential part of the flood tool kit, as they keep the water level that does get in to a minimum.

- Fitted two flood doors, which are approved for listed buildings (funded by the Environment Agency). Both doors leaked from underneath, so were sealed with silicone sealant, which stopped water from entering. They have now been refitted to work properly. The new Code of Practice recommends a 'wet test' is undertaken to test for any leakage straight after installation, do insist this takes place.

Lyndsay does not live in the cottage but rents it out and, at present, she cannot obtain flood insurance. It is therefore essential that her property can recover quickly, without having to spend more money on repair work.

As soon as the flood water has gone, the cottage has been cleaned and sanitised, her tenant is able to return to the cottage, with dehumidifiers in place.



Flood doors, which are approved for listed buildings.



Powerful puddle pumps keep the water level to a minimum.



Stainless-steel kitchen and solid floor with quarry tiles.

Paul and Tracey in Bewdley

Grade II* listed terraced house Flooded on many occasions

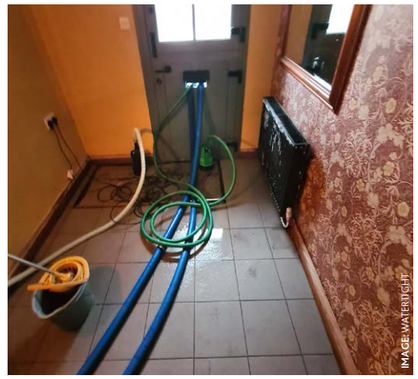
Paul and Tracey moved into their Grade II* listed terraced home in 2012. They knew it had flooded before but felt relatively safe as temporary barriers are put in place before a flood happens. There is also the prospect of permanent defences being built in the local area in the future.

Just before the Covid-19 lockdown, they experienced their first flood. They had to move out and live in a 2-bedroomed rented flat with four children, two dogs and two cats for a total of 15 months.

Due to lockdown, builders were unable to repair their home due to the restrictions in place, which as you can imagine, made both the flood and the recovery period very stressful for the family.

They had taken every move they possibly could try to keep their home dry. This included:

- The fitting of an approved flood door for listed buildings, following planning permission.
- A flood barrier to the back door.
- Pumps in the cellar.
- Puddle pump in the entrance hall.
- Porcelain tiled floors in the living area.
- Waterproof plaster.
- Hardwood skirting boards and doors.
- Tiled cellar floors to enable a quick clean up.



The puddle pump worked constantly to keep the water flowing through the adjoining wall to a minimum.

Top Tip

If you live in a terraced house and are planning to install PFR, work with your neighbours to encourage them to do the same



Porcelain tiled floors in the living area.

Paul and Tracey do however have a very sad story to tell, which they want me to share with everyone who lives in a terraced property:

When the flood of 2022 happened, the company who had been contracted to install the Property Flood Resilience scheme supported Paul and Tracey to block up every external hole in the property to stop flood water from coming in, and Paul couldn't praise them highly enough.

Sadly, their neighbour did not make their home flood resilient or install any pumps, which would have kept the water level down. This meant that as fast as water was being pumped out of their property, it was coming in from their neighbour's adjoining wall. They are both convinced that their home would have stayed dry had this not happened.

Paul and Tracy want me to raise awareness of this fact and said that in terraced and semi-detached properties, neighbours must work together to try to keep flood water out of all adjoining properties. They must all pump water away, or no one will achieve the goal.



Tiled cellar floors and pump.

The couple had to work extremely hard to keep the water that entered their home down to puddles in the hallway and found it very stressful. Before the flood had happened, they had sold their house and due to the success of their property flood resilience, the sale went through.

I have since spoken to the new owners; they were happy to proceed with the purchase as they knew the house had been made flood recoverable and they feel reassured that new permanent barriers will be built in Bewdley.

They have signed-up to receive free Environment Agency Flood Warnings and are in the process of creating a household flood plan.



Flood door that is approved for listed buildings.

Irene and Michael in Bewdley

18th century end of terrace house Flooded numerous times

Irene and Michael Buxton have lived in their end of terrace eighteenth century house in the riverside town of Bewdley, in Worcestershire, for 22 years.

They knew the house had flooded before they moved in and immediately took action to reduce their flood risk.

Michael bought pumps for the cellar, flood gates for external doors and moved the plug sockets up the walls. They said they have had many near misses but did not actually flood internally until February 2020. The flood water reached just below their raised plug sockets.

They were advised to evacuate their home on this occasion but on doing so regretted it, as they could not manage the situation and believe the damage was worse because of it. They lived upstairs for over five months whilst the property was repaired.

They made some significant changes to their home after this, so they were better prepared to manage the next flood and enable their home to recover quickly.



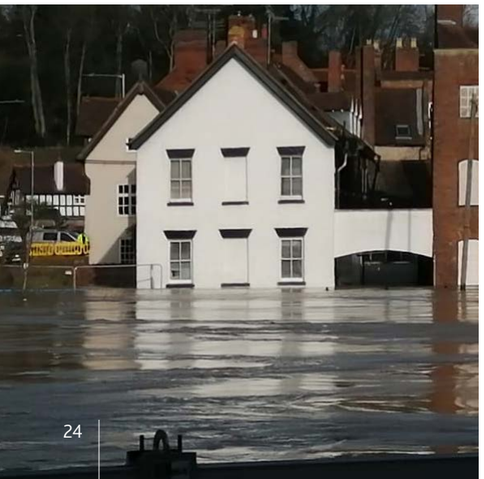
IMAGE: WATERLIGHT

Top Tip

We put a flood barrier between our hall and living room, it helped to keep it dry in the last floods.



The aftermath of a previous flood.



The changes made were:

- Knocked down the back porch as it had a manhole inside, making sure it was outside for the next flood.
- Relocated the boiler from the floor of the old porch to higher up, under the stairs.
- Built a balcony above where they park their cars to enable them to safely watch the river rise and provide them with a place to evacuate from if the occasion arose. It also doubles up as somewhere to sit and enjoy the river in the summer.
- Installed two flood doors to the front and back of the house and a flood barrier as a backup to the front flood door.
- Tiled the kitchen and hall floors.
- Fitted a stainless-steel kitchen with integral cooker.
- Acquired three strong submersible pumps for the cellar and a puddle pump for the hall. The water is pumped out of the letter box and through the waste outlet in the kitchen sink.
- Four self-closing airbricks.
- Michael has dug down to the house's footings and concreted up to ground level.
- The external walls have been sprayed with a waterproof membrane.
- The walls in the kitchen and living room have been tanked.
- The washing machine has been sited on a shelf.
- Non-return valves fitted to all drainage outlets.
- Toilet bung.
- Flood gate installed between the hall and living room.



Flood door at the front of the house has a flood barrier as a backup.



Pan seal as a backup to the non return valves.



Tiled kitchen floor and stainless-steel kitchen.

Since incorporating these measures, they have experienced two more floods – one in February 2021 and another in February 2022 – and have managed to keep the water down to about 2cm (less than 1") in the hall only and have been able to sweep that out once the flood water recedes outside. On each occasion, the couple chose to stay in their home to manage the pumps and keep an eye on everything.

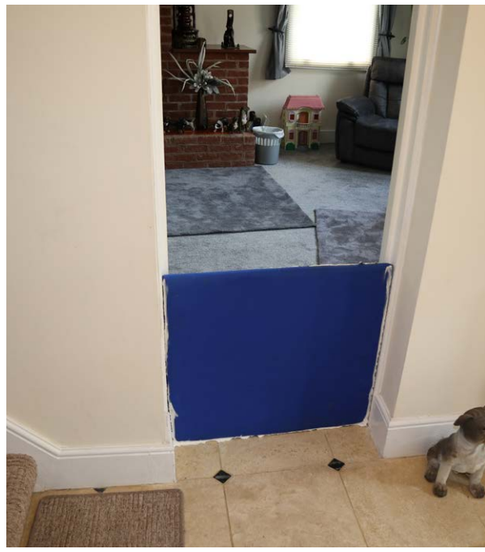
They learn new things every time it floods and refine all they do. For example, Irene and Michael know by watching the river and the water in their cellar rise, when they are going to flood and move their kitchen table upstairs, remove the lower kitchen drawers, raise their sofas onto the kitchen chairs and remove the lower portion of the stair carpet 'just in case.'

They do not want to be complacent, in case the river rises higher up. They freely admit it is hard work and stressful (especially as they say they "are not getting any younger!"), however all the preparation and adaptation allows them to stay in their home, recover very quickly and not make an insurance claim.

The couple love where they live and would not want to live anywhere else, as they do enjoy being near the river!



Self-closing airbricks.



Flood gate fitted between the hall and living room.



Non return valves fitted to all drainage outlets.

Michael in Shrewsbury

1970s detached house. Flooded 2000, 2020 & 2021

Michael and his wife, Lucy, moved into their late 1970s, 3-storey detached house in September 2015. They were aware of its flood risk and knew the lower ground floor, which opens up onto the garden that runs down to the banks of the mighty River Severn, had flooded in 2000.

The previous owner had taken some small measures to reduce the impact, which subsequently proved ineffective. Prior to their first flood, which occurred in 2020, they had suffered from a burst water main and as a result had tanked the walls using a flexible waterproofing slurry coating and tiled the floors, not really thinking about flood resilience.

In 2020, they were flooded through the patio doors and up through the tiled floors twice in a matter of days to 10cm (4") and 30cm (12"), respectively. They had managed to move most of their furniture upstairs but a large built-in furniture unit was ruined. The tanking survived. They were flooded again in 2021.

Using a combination of a government grant and their own money, they primarily focussed on keeping the water out and also built in some recoverability.

The River Severn completely engulfs the garden when it starts to rise.

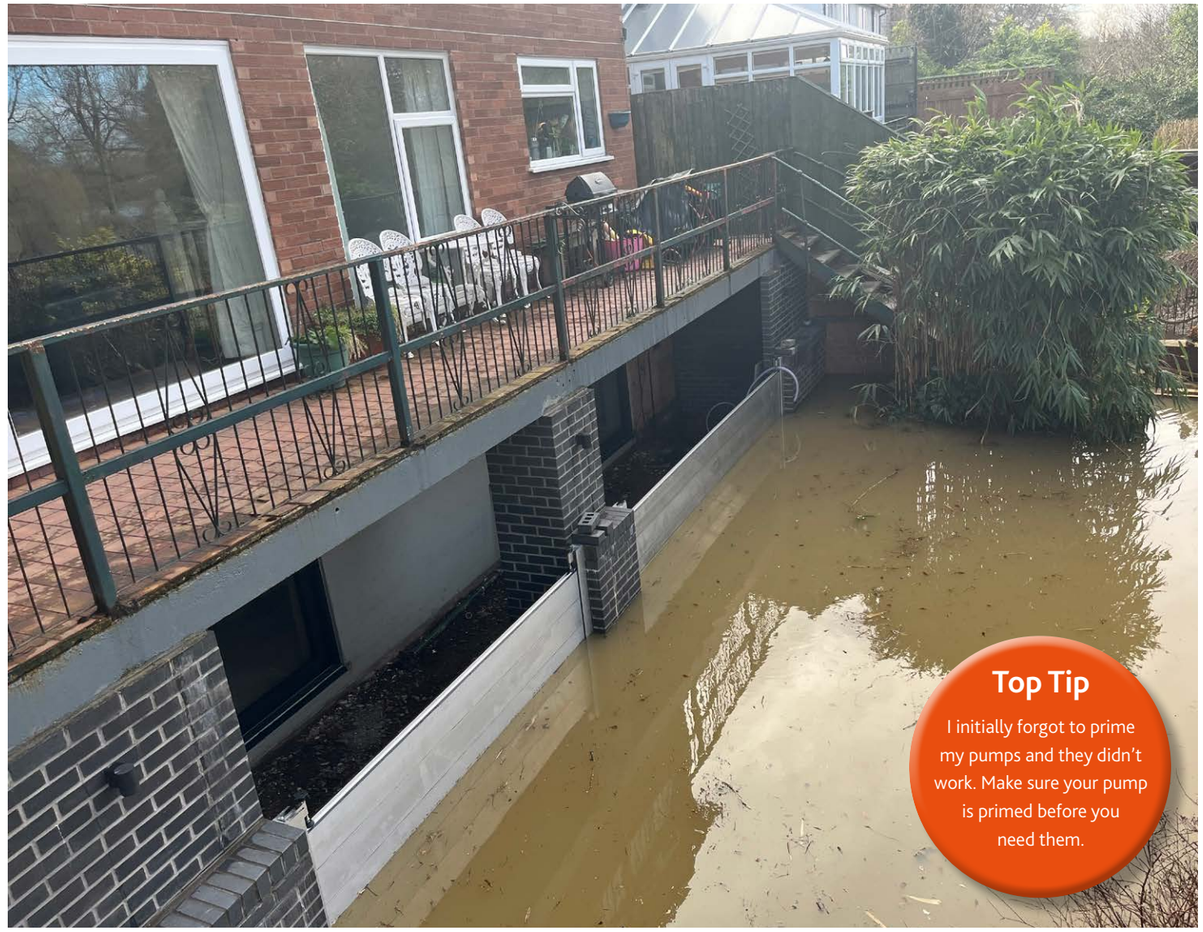


This included:

- A flood wall was built to accommodate flood barriers, the side edge of which joins onto a pre-existing neighbour's flood wall. The foundations are a metre deep. The wall is a cavity wall, which was reinforced internally with concrete and also tanked at the junctions.
- An old brick pier, which supports the centre of a balcony on the next floor, was rebuilt with new foundations.
- Two powerful sump pumps were installed at either end within the enclosed area behind the wall with a French drain system connecting them.
- Two long runs of metal slot-in barriers (2.5 metres and 4.5 metres long) can be installed between the walls and the supporting pier.
- The tanked walls on the ground floor have had studs glued (so as to not penetrate the tanking) and magnesium-oxide boarding fitted to the lower section of the wall, which was finished in lime plaster to allow for breathability.
- Large tiles were glued to the floor using waterproof adhesive and grout.
- The existing carpeted stairs were rebuilt using solid oak.
- A mobile puddle sucker pump was purchased to mitigate any water that breached the defences.

When the floods of February 2022 occurred, the barriers were fitted and successfully held back most of the floodwater. Once the pumps were successfully primed, they worked well. Michael then discovered another problem: whilst they were successfully keeping the flood water behind the barriers, a build-up of water from their neighbour's unprotected property started to gush through behind the barriers at the bottom of the wall retaining their side footpath. Michael made a channel with his own hands to direct the water into the sump pumps, where it was successfully pumped away.

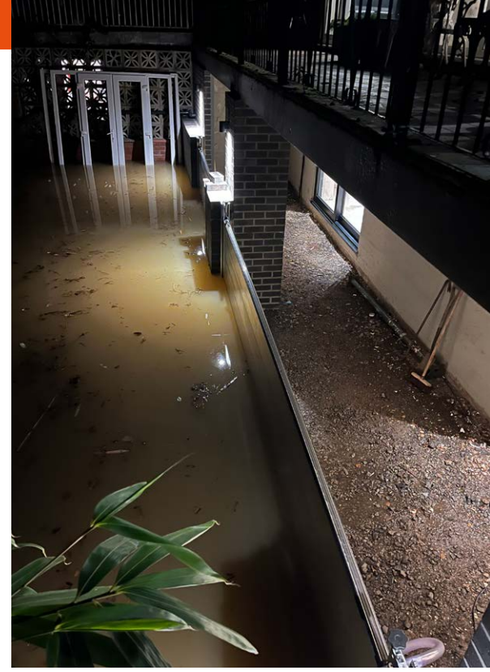
Like everyone I have talked to, Michael learns more after each flood and refines what he does on each occasion to help prepare, in addition to recover more quickly.



Top Tip

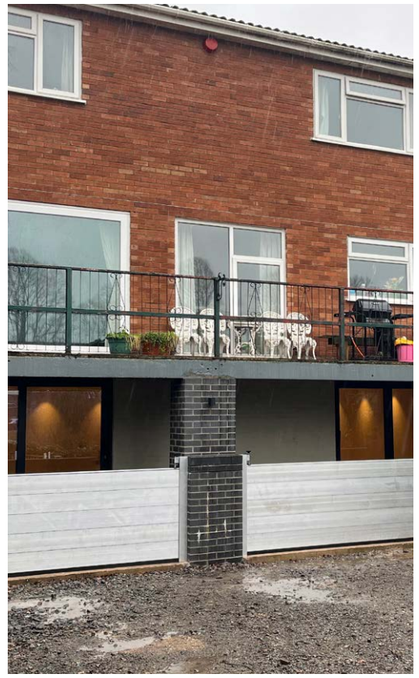
I initially forgot to prime my pumps and they didn't work. Make sure your pump is primed before you need them.

In the floods of February 2022 the barriers were fitted and successfully held back most of the floodwater.



Powerful sump pumps installed behind the barrier.





An old brick support pier was completely rebuilt.



Tanked walls with magnesium-oxide boarding on lower section and finished in lime plaster. Large tiles used on the floor and the existing stairs were rebuilt using solid oak.

House of Coffee in Shrewsbury

Coffee shop and café. Flooded 2000 & 2020

For the past five years, Sam and his partner have run an independent coffee shop in Shrewsbury. The shop had not flooded since the 'great floods of 2000' but has recently been flooded five times in only two and a half years!

In February 2020, they were flooded twice in a matter of only nine days; no sooner had they reopened after the first flood, they were flooded again.

The flood water was about 60cm (2') outside the shop and 30cm (1') inside. On those occasions they had 'makeshift flood barriers and pumps', which did not turn on or off automatically, so the pair did not leave the shop for two nights and three days. One slept on the storeroom floor while the other on some tables.

Sam explained how the business is their livelihood and pays their bills, so it is essential they can reopen as soon as possible.

Coping with the 2020 floods took a toll on their mental health and wellbeing, so it was essential that they improved the situation, long term. Shortly after the 2020 floods, lockdown happened so this was not a good year for them.

Sam and his partner are a young couple and do not have substantial savings, so it is essential that any materials they use on the property are either flood recoverable, or cheap enough to be sacrificial – while at the same time look good to their customers. They do not have flood insurance as it is deemed too expensive, therefore everything they buy for the business has to be purchased on that basis.

The changes they have made following the floods include:

- Acquiring tables and chairs with metal legs.
- The shop counter is made of an inexpensive material and has high stainless-steel legs, which can be easily dismantled and moved if a significant flood is expected.
- Tiled flooring, which can be easily washed down and sanitised.
- After drying the original plaster, OSB boarding has been added, which is an engineered wood which is fairly water resistant. The OSB boarding is pinned to the wall, so it can easily be removed and replaced and allows the walls behind to dry out if needed. It also gives the coffee shop an 'industrial chic' look and looks totally deliberate.
- Using a government grant, the couple now have kitemarked flood barriers to both doors and submersible pumps just inside the doors, which pump away any ground water or any flood water that has got into the shop.

The area flooded once again in February 2022 and Sam reported that the barriers and pumps were a total game changer. They did not let any water into the premises. The only water that did get in was through the joining wall from a next-door shop. They were able to brush that water into the sump pumps using large squeegees.

When the floodwater receded at 4am, they and a team of friends, family and staff were able to clean up, sanitise and open for business at 9am the next morning. They had a queue of loyal customers waiting outside ready to support the business!

Sam and his partner are living proof that being able to recover quickly from a flood does not have to cost a fortune.

Flood barriers to both doors and submersible pumps just inside the doors were a total game changer.



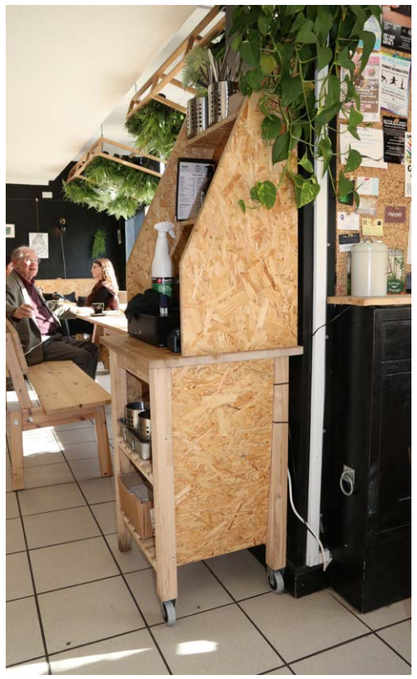
IMAGE: M3 GLOBAL FLOOD TECHNOLOGIES

Top Tip

If money isn't plentiful, whenever buying equipment, think 'flood recoverable' or 'cheap and sacrificial'



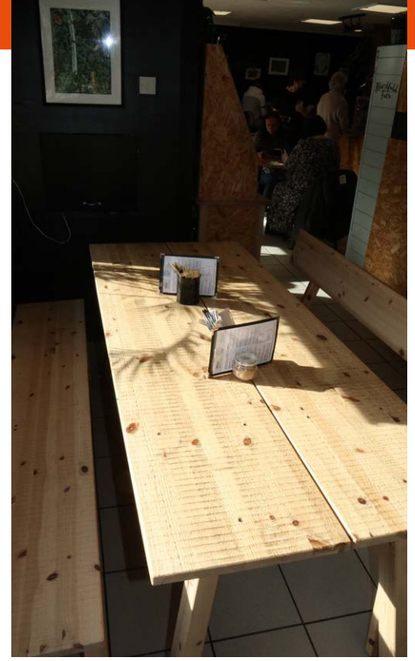
OSB boarding pinned to the wall can easily be removed and replaced to allow the walls behind to dry out.



Some units are on casters so they can be easily moved.



The shop counter is made of an inexpensive material with stainless-steel legs, which can be easily moved.



Materials are either flood recoverable, or cheap enough to be sacrificial but still look good.





Tables and chairs have metal legs and the tiled flooring can be easily and sanitised.

Sarah and Paul in Shropshire

Stone built cottage
Flooded on numerous occasions including 2020

Sarah and Paul moved into their cottage 17 years ago. They estimate that they've been flooded on no less than 12 occasions!

Behind the couples' cottage lies the River Severn whilst in front, a small benign looking brook (usually) ambles along. Over the years they have learnt to listen to the Environment Agency Flood Warnings, watch 'Gauge Map' and keep a close eye on local river gauges. The River Severn can go belting past their home at a huge rate and not flood them, but it is when the brook stops flowing, that they know they will flood. Years of experience have taught them when they need to start emptying the garage, as well as moving possessions in the house to a place of safety. They have a minimal amount of furniture, with tiled floors and rugs. When they know they are going to flood, they put all their furniture and possessions onto builders' trestles.

Thanks to the works undertaken the couple did not make an insurance claim after the 2020 floods.

Recoverable measures include:

- Tiled floors throughout the ground floor.
- Cement boards (instead of plaster board to the kitchen walls), which are painted over to look like real plaster and which have survived many floods.

A sorry sight in February 2020.





Top Tip

If a flood is on its way, they sweep their front garden of any leaves and debris, to stop them from entering their house during the flood event.

- Solid wood kitchen units (both pine and oak).
- Solid Oak varnished skirting boards.
- Electric sockets sited higher up the walls.
- Three pumps; one is placed into a sump and two (only used in bigger floods of over 35cm) are placed on the floor. Sarah and Paul said these are an essential part of their 'flood tool kit' and are cheap to purchase.

The couple plan to use their £5k flood resilience grant to buy kitemarked flood barriers for both doors, to give them more time to move possessions. As they also flood from underneath, they know that barriers alone won't stop the water from entering their home.

They have an Esse boiler which they plan to replace, as it sometimes leaches kerosene if the flood water gets too deep. To combat this, they empty a large amount of washing up liquid into the flood water and agitate it to disperse the paraffin residue. As the water recedes, they continually use a large rubber edged squeegee mop to stop any silt from hardening on the floor. They then sanitise afterwards.



The large rubber edged squeegee mop



Solid wood kitchen units.



Tiled floors throughout the ground floor.



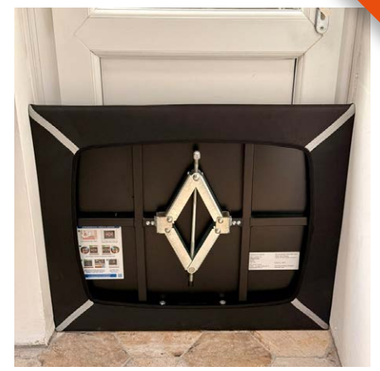
Sarah and Paul have now been flooded on over 20 occasions. This amazing couple say that they continue to learn from each flood and, as such, have recently made some modifications to their home to help speed-up the recovery time from such regular floods.

In the latest round of works, the walls were stripped back to brick and a PermaSEAL waterproof membrane was installed. Moisture resistant plasterboard was fitted to this, then skimmed with plaster. This allows the wall to breathe, as the floodwater would normally be retained in the bricks for some time.

The flooring has been stripped back to the concrete base, then a liquid damp proof membrane applied. Once dry, a further layer of silicone was applied. This was topped with porcelain tiles for ease of cleaning. Previously, they had terracotta tiles, which are prone to holding the water. On top of this the adhesion of the tiles was questionable, as some were hollow sounding and so this needed rectifying.

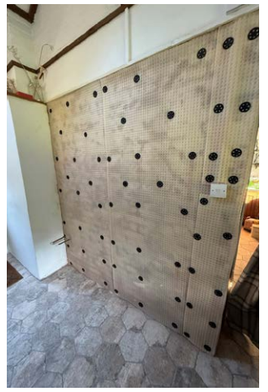
The couple have also made some modifications to the kitchen to help reduce both the preparation and clean up time.

The couple have an electronic cat flap on their back door, so they have an extra Floodgate, which is installed behind the door inside the kitchen. This reduces water ingress through the door seals and cat flap. Whilst they are unable to use the door for access when this is deployed, they are able to access the front door, over another flood barrier they have fitted. They simply remove the batteries from the cat flap before fitting the Floodgate to prevent it from shorting out.



The couple have an cat flap on their back door, so they have an extra Floodgate installed behind the door.

The old Esse boiler has now been upgraded to a modern oil-fired boiler, which is placed at a raised level in their garage, out of harms way. The 'void' left has also been updated with an additional slate slab and bio-ethanol fire, the latter of which can be lifted in the event of flooding.







The walls were stripped back to brick, a waterproof membrane installed, moisture resistant plasterboard fitted and skimmed with plaster, allowing the wall to breathe.





The flooring was stripped back to the concrete base, a liquid damp proof membrane applied, then a further layer of silicone applied and topped with porcelain tiles. They have also made some modifications to the kitchen to help reduce both the preparation and clean up time.

John and Michelle in Shropshire

Sandstone house
Flooded 1998, 2000 & 2020

John and Michelle live in rural Shropshire in a Sandstone house, originally built in the 1700's and that had an extension added to the main building around 20 years ago. They have been flooded four times; in 1998, 2000 and then twice in February 2020.

The depths of the floods ranged from 35cm (14") to 66cm (26"). When they built the extension, they designed it to allow them to continue to function during a flood and to be able to recover more quickly afterwards. As the water enters their home 'from every which way', they don't try to keep it out. They take flooding in their stride and feel that the occasional flood is a small price to pay for living in such beautiful countryside.

John is now the unofficial flood warden for the village. When there is significant rain fall, both he and Michelle monitor all the gauges in their catchment (including those in Wales) and they regularly visit the local embankment to watch the water levels there. Experience and local knowledge have taught them at exactly what levels they will flood so they keep the community informed and advise as to when to move cars and possessions. It takes John and Michelle about six hours to prepare for a flood, but they believe it is time well spent.



Top Tip

If you have an open fireplace, make sure your logs are stored high up, then, as soon as the flood water has gone, you will be able to light a fire immediately to speed up the drying time.

They have taken the following measures:

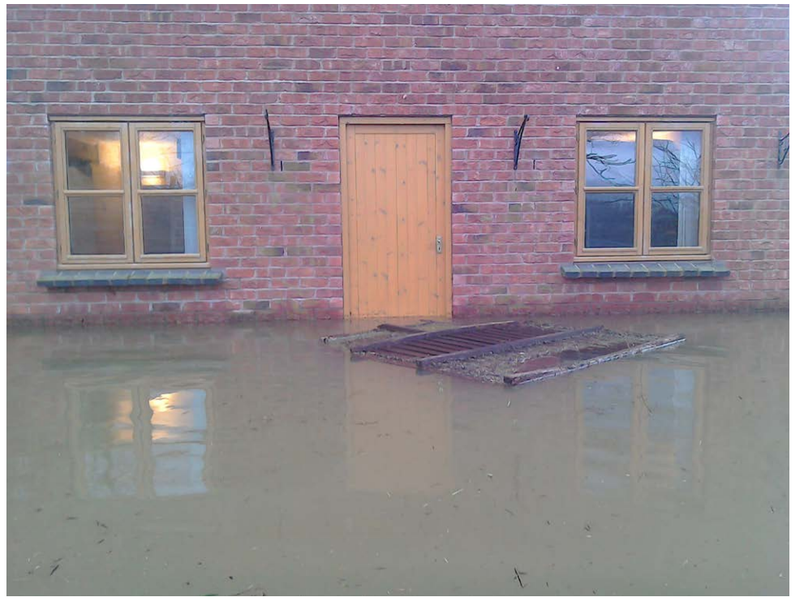
- All their furniture can be moved off the floor, using a combination of tower scaffold, planks of wood, builders' trestles and blocks. They have chosen a minimalist lifestyle and this fits in well with preparing to be flooded. They move most of their belongings themselves with neighbours helping with heavier white goods.
- The lower oven is easily removed with two screws and all the kitchen drawers can be removed and the units lifted out.
- The new extension has cement rendered walls, which were emulsioned using normal paint. After the 2020 flood, the emulsion didn't suffer at all.
- Slate skirting boards (which were glued onto the walls, using waterproof glue before emulsioning.)
- All doors are solid wood and have been treated with three coats of varnish.
- All electric sockets are 1m up the wall.
- Boiler and oil tank are housed above the highest flood level.
- When the flood levels start to drop, they throw a mixture of domestic household products into the flood water and agitate the water regularly, this makes sure that the dirty flood water does not leave any residue.
- As soon as the water is gone, they open all doors and windows, put the heating on and light fires. John said they were back to normal within only 24 hours of the flood water subsiding and that they did not need to make an insurance claim after the 2020 floods!



Oil tank housed and secured above highest flood level.



The kitchen during the flood of 2020.





Furniture raised on tower scaffolding.



The kitchen back to normal within 24 hours of the flood.

Antiques Centre and Riverside Tearooms in Ironbridge

Brick built retail building Floods frequently

For 11 years Donna and Nigel Byard have managed the Antiques Centre and Riverside Tearooms, which is part of the Merrythought Teddy Bear site in Ironbridge.

During that time, the centre, which measures over 5,000sq ft, has been flooded ten times. In fact, the business has flooded two or three times a year in the last three years.

The worst flood was prior to the national lockdown of 2020. They were flooded twice in two weeks; the second was worse as the water swelled so quickly.

Donna and Nigel work very closely with the Environment Agency and say it is key to helping manage the floods. They have prior warning of what level their business will flood to, and they both now have an intimate knowledge of what each flood gauge along the river will mean to them.

The couple know exactly what to do and, importantly, in what order when a flood is expected. They say it is like a button is pressed in your head and off they go into 'flood mode.'

Donna and Nigel use a core of staff members who have worked with them for a good while and know what to do. Plus an amazing band of community volunteers will dash to help when they put the call out.

The Antiques Centre is an antiques emporium consisting of many different small stands of antiques, arts, and craft work, so as you can imagine, it takes a lot of preparation to make sure everything is kept safely out of the floodwater.









As many of the goods as possible are placed on pallets.



What do Donna, Nigel and the team do prior to a flood?

- Pallets are stacked – readily supplied from a nearby bespoke kitchen manufacturer – coupled with tables and shelving, and as many of the goods as possible are placed as high as possible.
- Freezers are lifted onto pallets, as the plug sockets are sited 120cm (3'9") up the wall, so they can remain switched on.
- All kitchen units are on casters so they can all be disconnected and wheeled to higher ground.
- The tearoom tables and chairs are collapsed and stored in a mezzanine level above the kitchen.
- The bench seating in the tearoom can be removed and put on pallets.
- Recent additions include slot-in flood barriers, which worked well in the last flood. They are installed to all entrances and between the two buildings, near where the river and brook meet.
- Submersible pumps and puddle pumps are used at low spots and work well to keep water levels down.
- A ton weight is put on the cast iron drain lid to hold down the local sewage pumping system.
- Donna and Nigel have cameras everywhere so they can monitor the situation on a live feed from their nearby home.



Top Tip

When preparing a large business for a flood, make sure the team supporting you are well versed in what to do.

The tearoom tables and chairs are collapsed and stored in a mezzanine level above the kitchen and the bench seating can be removed and put on pallets.

Because the floors in the Antiques showroom are concrete and the walls pared back to bare brickwork, after the flood water has left the building, it can easily be hosed out and allowed to dry. The floors are repainted with concrete paint once they have dried out.

The kitchen and tearoom floors are sealed with bitumen and topped with specialist PVC flooring with a non-slip vinyl coating and survive a flood well.

Donna prides herself in never losing any items entrusted to her care by the traders, many of whom have been with her for years.

Donna and Nigel know that due to climate change, flooding is going to get worse and happen more regularly. They are extraordinary people, with bags of energy; if anyone can cope with it, they can!



Kitchen units are on casters so they can all be disconnected and wheeled to higher ground...



... or raised up on legs beyond the reach of the water.



Submersible pumps used at low spots and work well.

Homes that have been built back better to reduce the impact of the flood and speed up the recovery



This section focuses on the home and shows the variety of different interventions people have made to enable their homes to recover more quickly after a flood.

It also includes some tips given by the homeowners. These may help in both the preparation for and recovery from the floods.

Peter in Somerset

Small 17th Century Cottage (listed building) Flooded twice since 2000

Peter moved into his idyllic, small 17th Century Grade two listed cottage in Somerset in 1988, since then he has been flooded on two occasions.

Peter was away from his home working during the first flood and, alerted by neighbours, returned home after 5 days. Driving through the village, he looked in neighbouring gardens which looked like a bomb site, with all the contents of the flooded properties discarded outside.
So at least he was prepared for what he'd find inside his own home. As he wasn't at home during the flood everything including photo albums, sentimental items, TV. all the electric goods and everything else were written off.
Fortunately, he says, he had to go away to work abroad for 5 months which allowed his cottage to dry out naturally. On his return, in agreement with his insurance company Peter undertook the renovations himself.
He used this opportunity to make significant adaptations to his cottage, so if he did flood, the damage wouldn't be as extensive.



Peter said he had always wanted a waterfront property, but certainly not like this!

The changes included:

- He took out the bottom step of his two staircases and made stone bases for each.
- Installed solid floors throughout the ground floor, he uses rugs on his lounge floor, that can be easily rolled up.
- Raised his fireplace up to save his main source of heating from being flooded again.
- His kitchen is the lowest point in his cottage, so it acts as a sump. He installed two robust pumps. With internal float switches under the floor
- Raised his plug sockets a metre up the wall.
- Back in 2000 Peter couldn't find a suitable doorway flood barrier, so he made his own. Basically, he got 18mm hardwood plywood sheets cut to size and lined with old neoprene diving suits cut up to form sealing strips that he could then bolt through the frames of the three doors that were then external to the property.
- He also minimized what he has downstairs; it is not a big cottage and he said one of the benefits of being flooded is that he threw away a lot of stuff he'd been hoarding over the years. He said being flooded has changed his attitude to materialistic things and what he does have, has to have a reason for being there.



Peter took out the bottom step of his two staircases and made stone bases for each.



The electric cooker is on a raised plinth and kitchen units on legs to allow water to run underneath.



The units on legs allow water to run to a sump pump installed at the lowest point of the kitchen.





Peter didn't have another flood until 2009; his homemade barriers and pumps worked well with only 1-2mm of water ingressing into the kitchen from the external doorway which has now been infilled. Like many people who regularly flood, Peter has refined and upgraded his adaptations along the way.

He now has: :

- Solid wood furniture, that can survive being flooded and he has also had little wooden cups made for the legs to sit in, or little matching blocks for the furniture to stand on.
- He has now bought 2 commercially made flood barriers, that work on similar lines to his home-made barriers. (Being a listed building, he cannot have any visible fixtures and fittings.)
- He has installed a sump pump in his front door porch, which is located between the two flood barriers.
- He has removed and filled in his back door, as it was low lying next to the road and the main point of water ingress.
- The kitchen units are on high legs to allow water to run underneath them to a sump pump installed at the lowest point.
- The electric cooker is on a raised plinth



Wooden cups made for the chair legs to sit in, and little matching blocks for furniture to stand on.

All this has worked really well, apart from the flood in 2023, when Peter and his partner had been away. His partner had just arrived back when a flash flood occurred, and she was unable to install the barriers in time. Extensive flooding happened throughout the village on that occasion as it was the worst flood on record.

- He has now made a new stable type of front door in keeping with a listed property, so he can fit his flood barriers when they go away and they will remain unseen from the road.





Back door removed and filled in as it was a main point of water ingress.







Peter has installed a sump pump in his front door porch, which is located between the two commercially made flood barriers.

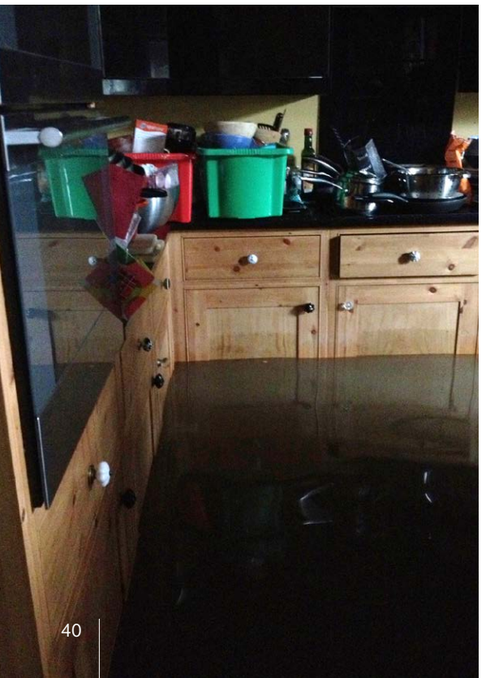
Sue in York

Victorian terraced house
Flooded 2000, 2012 & 2015

This property is one of a small terraced row built in 1895. The homeowner has lived here for 26 years and had their first flood (from the local river) in 2000. The family lost a lot of their possessions as they hadn't been raised up above flood level. They were out of their home for 9 months and the insurance claim came to £80k.

A period of 'peace' followed the 2000 flood, but then in 2012 another flood occurred, with water reaching halfway up the kitchen units. This time, the homeowner decided to take advice from a specialist surveyor (who was recommended by their Loss Adjuster) and set about making their home flood resilient. The reason was simple: if ever it became impossible to obtain flood insurance, then 'turning the house around' after flooding now needed to be easily affordable on a modest income. The surveyor was also interested in making the house more environmentally friendly, whilst working with different types of materials to improve its flood resilience.

Concrete floors were installed throughout, replacing the suspended wooden floorboards that had been in all but the kitchen previously. Underfloor heating was also installed below the new surfaces, and then they were finished with limestone slabs.





Top Tip

Getting the drying process under way as soon as possible is key to getting back to normality quickly.

Top Tip

Water proof and breathable plaster is easy to apply, no specialist training is needed and helps to keep the cost down.

As you can see, this solid wood kitchen fitted in 2012 survived the 2015 flood.

Some items have survived one or more floods:

- Painted pine skirting-boards and varnished solid pine doors.
- Walls are finished with waterproof and breathable plaster.

Other resilient measures include:

- Solid pine kitchen cabinets, with removable kickboards and wider-than-normal gaps behind the floor level cabinets – this allows de-humidifiers and/or blowers to circulate air throughout.
- For post-flood cleaning, the homeowner uses Teatree Oil to disinfect/kill fungal spores*.
- French doors are 'Alu-clad' type (aluminium external face) which are resilient, wipe clean and low maintenance.
- Sacrificial chain-store bookcases with sturdy frames are turned on their sides to support other (more valuable) furniture above flood level (then shelves replaced); this method worked well for 2 weeks during a previous flood.
- Items on lowest shelves kept in boxes/ baskets, so easily carried upstairs.
- Non-return-valve (NRV) fitted to outlet from ground floor toilet (previously used a 'toilet bung' but it was forced out by the water pressure).
- Used the government £5k grant to purchase industrial standard dehumidifiers, and also a wet-and-dry vacuum (when floods occur, these can be in short supply, so having your own ready to use is a good idea).

All this proved to be very worthwhile – when the third flood occurred (2015) the cost of all the (minor) repairs/replacements needed came to less than £5k!

Future improvements planned:

- If any wooden elements (e.g. skirtings) need to be replaced after a future flood, PVC will be used.
- Boxed-in pipework, due to concrete floors, was made with (sacrificial) plasterboard. Next flood, intends to replace with wooden tongue-and-groove boarding, with hinges to allow it to 'flip up' and allow cavity to dry out. Could also form another surface for supporting items above (low level) floods.



All the items shown here have survived one or more floods.

- To ensure internal doors can be retained (saving money), 'rising butt' hinges will be installed so that they can be removed and stored safely.
- A fully flood resilient front door is also on the list, should the current one need replacing at any point.

* Scientific research here: J. May, C. H. Chan, A. King, L. Williams, G. L. French, Time–kill studies of tea tree oils on clinical isolates, Journal of Antimicrobial Chemotherapy, Volume 45, Issue 5, May 2000, Pages 639–643, https://doi.org/10.1093/jac/45.5.639



Sacrificial chain-store bookcases with sturdy frames are turned on their sides to support other furniture above flood level.

Claire in York

Victorian terraced house. Flooded 2000, 2012 & 2015

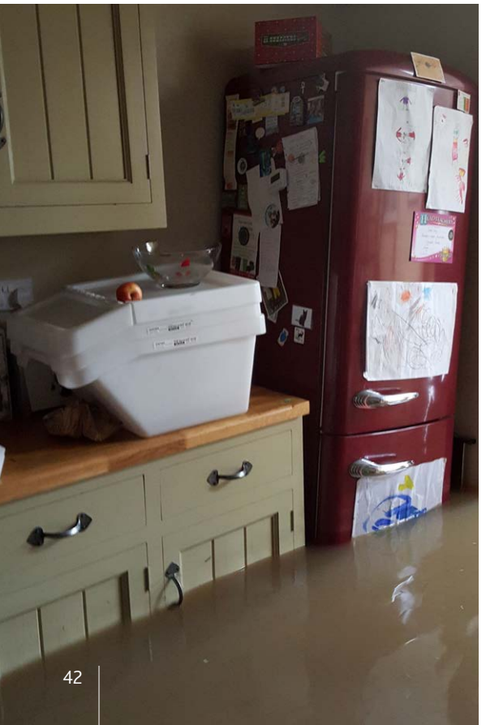
This property is one of a small terraced row built in 1895. The homeowners bought it in 2011 and it hadn't been touched for 30 years, so a lot of work was needed to upgrade it. As they were aware it had flooded in 2000, they employed both an engineering surveyor and a specialist flood surveyor to advise what could be done to make their home flood resilient as part of the overall refurbishment. This proved to be worthwhile, as the river flooded the house just a year later in 2012.

Although the water level was initially predicted to be just 7-10cm (3-4"), it eventually reached 60cm (2') deep in some rooms. A similar depth of flooding followed in 2015, and a 'near-miss' has already occurred in 2019.

Measures taken:

- Solid wood kitchen, easily washed down, and all parts are free-standing so moveable (though very heavy). No carpets are used on ground floor, and the floors are finished either in stone, or solid wood (70 year old pitch pine, as shown in kitchen) with closed cell insulation beneath.

Solid wood kitchen survived the floods.



- All service points (electric, water etc.) are raised above flood level. All walls are finished in lime-plaster (which has already survived the 2015 flood, and just needed washing down).
- A flood wall (which reduces the risk to neighbouring homes as well) has a flood-proof gate for access to the patio area.
- Sump pumps installed in both rooms. Claire prefers pumps with circular floats rather than square floats which tend to jam.
- Additional free-standing pumps also purchased as back-up – these can be dropped into the existing sump cavities via an access hatch.
- Bricks painted externally with flood-resistant coating.
- Non-return valves (NRVs) installed to all ground-floor plumbing connections.
- Door barriers are also used to increase the time available for raising/moving possessions.

If the solid wood floorboards ever need replacing, the homeowner will change all the flooring to concrete.

- Claire also keeps 'A-frames' and trestle tables in the garage, which can be used to raise items above water level when floods are expected, as well as stackable plastic crates and extra large strong carrier bags to carry items upstairs.



Top Tip

All the work involved took a lot of time to organise and install – so do not underestimate this!



Solid wood kitchen, easily washed down, and all parts are free-standing so moveable.



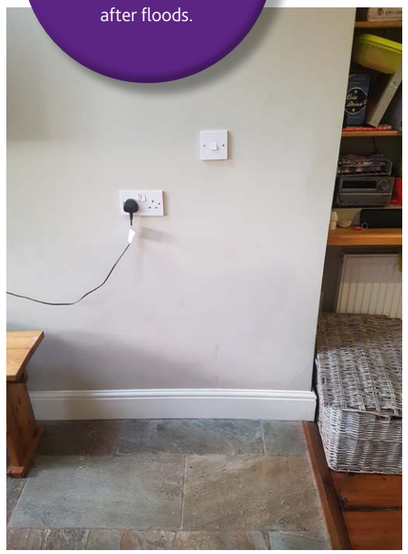


A flood wall has a flood-proof gate for access to the patio area.



Top Tip

Always buy solid wood furniture if you can, as there is no need to replace this after floods.



All electric service points are raised above flood level.



Door barriers are also used to increase the time available for raising/moving possessions.

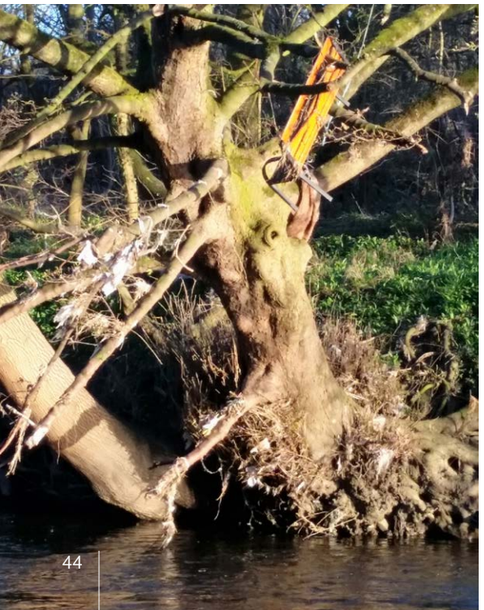
Martin in Leeds

Stone built detached house
Flooded 2006 & 2015

Record breaking floods seem to be happening more frequently in recent years, and the River Aire (Leeds) exceeded its previous recorded maximum by around 73cm (29") on Boxing Day 2015.
As the house had flooded in the past, the homeowners in this case had already received a flood warning and so had put their flood plan into action (deploying barriers, packing overnight bags, collecting up pets and turning off the electricity before evacuating to a friend's home) – but the exceptionally high water level meant that their barriers were over-topped.

As the owners knew the importance of initiating the drying process as quickly as possible, as soon as they were able to get back into the house they used social media to make a plea for help with stripping out the skirtings, lower sections of plasterboard and the flooring. All low-level electrical elements were removed at very early stage resulting in their re-use, following drying out, in the refurbishment. 25 people responded and by the time the loss adjuster arrived next day, all the damaged material had already been successfully removed from the building and the drying process could begin. Extensive "proof" photos were taken for any queries from the loss adjuster.

Garden bench later found stranded high up in a tree.





Top Tip

Intense and immediate drying out really does pay dividends.

To guard against such severe flooding in the future (which they accept is more likely due to climate change) the owners chose a combination of resistant and resilient measures. The house came under threat again in February 2020 (three weeks of constant flood warnings) and the measures worked to keep water out of the main part of the house. That which got in under the suspended floors was automatically pumped out efficiently.

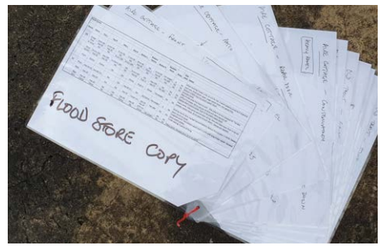
The combined works came to approximately £15,000.

Resistance measures included:

- Increased height of the flood barriers from 40cm (16') to 80cm (32").
- Self-closing flood air bricks.
- Repointing all walls with waterproof mortar up to a height of 1m.
- Where solid floors exist, inclusion of edge channels, with rodding and wash-out points, leading to low level sumps. This is work must be carried out by specialist companies, typically those involved with basement conversions.
- All solid floor sections sit on studded membrane allowing water to move beneath the floor and flow to the sumps – known as a "cavity drainage system".
- Sub-floor automatic high-performance skimmer pumps located at low points, with battery back-up system capable of running the pumps for up to 10 hours in the event of a power failure.
- Toilet bung for use in the ground floor toilet as a back up to a non-return valve already fitted in the soil pipe run.

Recoverable measures included:

- Plastic flooring and skirtings throughout. Pieces are individually numbered so they can be removed, washed down, and reused.
- Solid floor upper surfaces are coated with a liquid applied damp proof membrane, with upstands of the same behind skirtings. These form basic bunds confining water in areas which can then be easily swept out or wet-vacuumed.
- Carpeted areas replaced in some utility areas with lino, which can be lifted washed, dried and reused.



Concise written laminated instructions for the installation of flood barriers and other items of resistance.





Toilet bung for use in the ground floor toilet and a key safe so neighbours can install barriers if owner is away.

Lessons learned and useful tips:

- Act quickly to remove wet items post-flooding. Photograph everything for insurance claim purposes and start drying out as soon as possible.
- Make sure your neighbours know where your keys may be obtained if you are absent. Martin has trained his neighbours how to install his barriers if he is away.
- Have concise written laminated instructions (several copies) for the installation of flood barriers and other items of resistance. Hold one copy in the house and one in the flood equipment store.
- Have a dedicated flood installation tool kit, which is never raided of its contents for use elsewhere!
- For each flood barrier, gather the fittings for that barrier together in a single marked container.
- Write on the flood barriers, where and how they are fitted (indelible marker).
- Keep a wet-vac ready.
- Service all resistance equipment once a year and trial fit all equipment once a year.
- Carefully store all resistance equipment in a protected area out of reach of vermin (they strip off any foam seals for nest material and gnaw on plastics!)
- Hard woods, like oak and ash, are very resilient to getting wet, provided they are quickly removed from damp conditions and dried out. Components comprising skirting boards and window boards in a conservatory were stripped out quickly, dried flat, and all were reused in the refurbishment.



Although barriers were in place in 2015, the river had an unpleasant surprise in store.



Fitting new taller but lightweight barriers.



Sub-floor automatic high-performance skimmer pump.







Channels and membranes with sumps and pumps to remove water, then closed cell insulation and finished with removable plastic flooring.

Katie near Hebden Bridge

Detached 3 storey townhouse Flooded 2015

Katie and her family moved into their detached three storey town house, which has a garage underneath the living area, in August 2015.

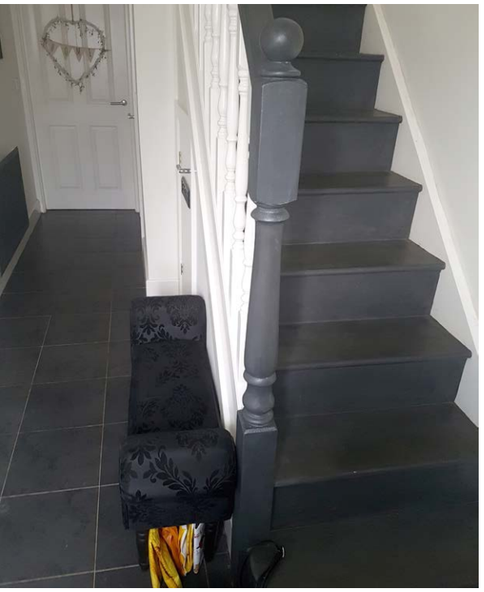
The house is situated between a river and a canal. Katie was aware of the flood risk and signed up to the Environment Agency Flood Alerts service, but she honestly thought that they would never flood. Katie said November and December has been very wet months, but it didn't worry them. The family were spending Christmas with her Mother when she received a flood alert. Katie and her husband went back home and initially they didn't think things were too bad, but Katie recalled how quickly the water rose up and flooded her ground floor garage where the family had stored lots of belongings, some of which hadn't been unpacked from when they had moved in. Katie said that many memories were lost. The water also went into their hallway.



The water rose far faster than Katie expected and she lost lots of valuable memories that were stored in the garage.



So much lost by the rising water.



Tiling in the hall floor using waterproof adhesive and grout and removed stair carpet.

Katie and her husband took advice from a surveyor and they decided to turn a negative into a in positive. They abandoned the garage and gave themselves an extra living room above the flood level, it was built on a suspended floor.

Using their own money, coupled with the Government 5k grant, the couple:

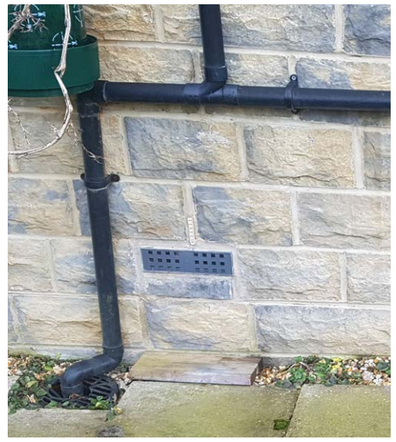
- Bricked where the garage was, leaving a void under the house.
- Put waterproof render onto the bricks.
- Installed self-closing airbricks to the old garage and all around the ground floor.
- Installed non return valves.
- Enlarged the drains to the front of the house.
- Tiled the hall floor using waterproof adhesive and grout.
- Removed the stair carpet and replaced it with a painted staircase to avoid future wet carpet.

Top Tip

Never store items of value in low ground floor cupboards or drawers, including those in the garage.



Katie's new room.



Waterproof render onto the bricks and self-closing airbricks.

Todmorden resident

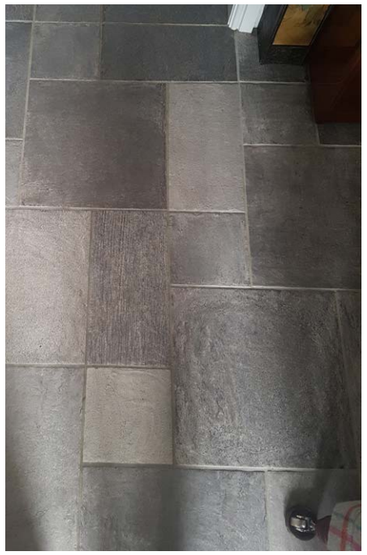
Mid-terraced house Flooded 2015

This mid-terraced house is known to have flooded three times in the last 20 years. On Boxing Day 2015 water entered through the floor so the homemade flood board, which had kept the water out in lesser floods, was ineffective.

It was discovered that the house had no damp-course, and that a disused drain has not been blocked off correctly! The floor was made of chipboard, laid onto a wooden framework – so as the water rose, the floor (plus tiles and carpets etc.) simply floated upwards. The water eventually stopped around ankle depth, and an hour later it had all drained out again. The owners put as much furniture as possible up on blocks and were also able to rescue their piano and store it elsewhere.

Despite the shallow depth and short duration, the dehumidifiers supplied by the insurance company took between 4 and 5 months to dry the house sufficiently for repair work to start. The owners were out of their home for 8 to 9 months as a result. The owners are fortunate enough to have a surveyor and builder in the family, both of whom were able to advise them.

Their reason for making changes was so that, in any future flood, they could "just swill it out!"



Tiling in the ground floor above insulation and underfloor heating.



New wall at front of house with a flood-proof gate

- Solid floor – waterproof membrane, insulation layer, underfloor heating and then concrete. (An extra benefit of this is that the heating bills are now lower).
- Finished floor level is now 15cm (6") higher than previously, and the membrane continues for another 15cm (6") above this. Floor covering is tiles.
- Walls have resilient plaster to same height as the membrane.
- Skirting boards are standard cheap wooden ones that are sacrificial.
- Home-made wooden 'flood board' drop into wooden channels either side of front door.

The government's £5k grant was spent on:

- New wall at front of house made from local stone (direction flood normally approaches) with a flood-proof gate.
- Front garden level raised by 20cm (8"), with paving sloping down to sump.
- Sump created, into which powerful submersible pump can be dropped when flooding commences.
- Front walls of house treated with a waterproofing solution.

Todmorden Resident told me that the flood water in 2020 reached a good 20cm (8") up the purpose-built wall and flood gate and it held fast. No insurance claim because there was no damage. Job done!





Home-made wooden 'flood board' which was effective in lesser floods .



Sump created, into which powerful submersible pump can be dropped when flooding commences.

Clare in Todmorden

Stone built terraced house Flooded 2006 & 2015

Clare's family have been flooded twice, in 2006 and 2015. They live in a terrace of old weavers' cottages, which were built with no foundations and are situated on one of the steep hillsides that are typical of the Todmorden area. They had lived there for several years, and had no idea their home was at risk of flooding - although the local river was close by, it is well below them 'in a deep dip' and had never been known to overtop its banks. In the summer of 2006, however, they were shocked to find 'surface water' pouring into their home after a thunderstorm accompanied by torrential rain.

The flood water entered at both the front and rear of the cottage partly caused by drains blocked with builders waste.

Due to the fact that the water was contaminated, the family had to move in with relatives. The problem was compounded by the way the houses had been built – trapping in contaminated water beneath a suspended floor.

After the first flood, Clare bought a flood barrier for the front door, which was successfully used several times after high rainfall. She took the precaution of installing it each time the family went away but they were flooded again in 2015 when water flowed under the walls and up through the floors.



After experiencing poor workmanship by the insurer's contractors after the first flood, Clare decided to take a cash settlement from the insurers and organise the repairs herself. They were fortunate enough to know a local builder with specialist knowledge of flood resilient repair. She had lots of ideas for reducing the risk of future flood damage, and decided to create a 'model house' to demonstrate just what could be done. All the aspects were discussed and agreed in detail, including finishes and colour schemes. In contrast to the 'strip and skip everything' approach often adopted by some insurers, many items were saved, including much of the kitchen and it's concrete worktop (that the same builder had installed five years earlier), along with other furniture that could safely be cleaned and disinfected.



The kitchen worktop is polished concrete and was saved in the flood

- The rebuild involved excavating and 'tanking' the whole of the ground floor of the cottage. The original stone flags were removed (and sold to a builder's merchant, bringing in additional funds for the refurbishment works).
- A combination of layers of hardcore, a waterproof plastic membrane (which continued up the walls to a metre high) and insulating foam was topped with 10cm (4') of concrete. After being left to 'go off' for a few hours, two different powdered colours were thrown randomly onto the concrete, which was then stamped to give it an antique wood effect pattern. Finally it was sealed to give a gloss finish (and this should last around ten years before needing to be re-sealed).
- The walls were rendered on top of the membrane, using coloured renders which were finally polished to produce a finish resembling marble. Above this, the original stonework of the cottage walls has been left exposed.
- The family's cats were also catered for, with a new cat-flap being created in the window of the utility room, so avoiding any puncturing of the plastic membrane.
- The government £5k grant was used to buy two kitemarked flood doors.

An additional and very welcome benefit of the work, is that the family now finds the house much easier to heat, plus the absence of damp means it is also healthier.



The rebuild involved excavating and 'tanking' the whole of the ground floor



The walls were rendered on top of the membrane, using coloured renders



The walls were rendered using coloured renders.

Top Tip

During the first flood the sofa upholstery remained dry, meaning that the wooden legs could simply be unscrewed and French polished! The same applied to the hardwood surfaces on the stone staircase, as these too made a good recovery after drying.



A new cat-flap was created in the window above the height of any potential flood.

Clare reports "In February 2020 I had water on the outside of my house as high, if not higher than the previous two occasions we've been flooded. This was the first time my hometown had flooded this badly since we had had all the work done, so this was its first proper test. The tanking held, the PVC flood doors held and the concrete floor held. Instead of standing in half a foot of water inside I just had a dribble coming in where some wires went through the wall to the meter box outside. It was getting through at a speed at which I could mop it up, so in the end I only had a third of a mop bucket of water instead of a £25,000 insurance claim. I couldn't be happier"!



The floor is concrete, with an antique wood effect pattern, and sealed to give a gloss finish.

Nikki in Todmorden

Victorian terraced house
Flood on numerous occasions

Nikki has lived in her tiny Victorian terraced house for 34 years. During that time, her ground floor has flooded five times and on 'numerous' occasions in her cellar.

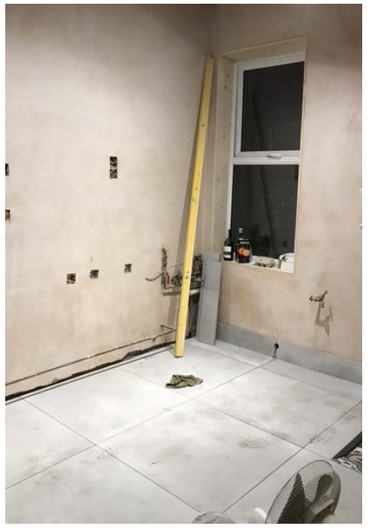
Nikki's house is located in a very low spot and surface water flooding presents a real problem for her, as water flows rapidly down the hill while her cellar floods with ground water.

Registered as disabled, Nikki has mobility issues and uses a mobility scooter when out of her house. Due to her disabilities, she lives on benefits, but she says that Todmorden is a wonderful close-knit community and people rally round to help her.

During the floods of 2000 Nikki lost many sentimental belongings, which seriously impacted on her mental health. She feels strongly that the impacts of flooding and its effect on people's mental health is sorely overlooked. Possessions that matter to her are now stored upstairs.

The Christmas floods of 2015, which was Nikki's worst flood, saw the combined depth of water from her cellar and ground floor reach over 2.5m (8'6")!

At this time, Nikki was away from her home and she had terrible trouble getting back as



Raised concrete floor with underfloor heating, covered in porcelain tiles on floor and skirting.

all the nearby roads were flooded. She had two cats, who were stuck in the flood water and were terribly traumatized as a result – we often forget that animals suffer too.

Nikki lived upstairs whilst her house was being repaired and she readily admits that the recoverable improvements have been made as and when she can afford them. She is lucky to have a son who is an electrician and also good at DIY.

Nikki was not covered by insurance for the 2015 floods but is now insured by the Flood Re scheme.

Nikki was inspired to make her home flood recoverable after visiting Flood Expo at the NEC. Using a combination of her own money and a government grant of £5,000, Nikki has made the following changes to enable her home to recover more quickly after a flood.



Top Tip

Being flooded is a stressful experience. As a healthy minds champion, I encourage anyone suffering with their mental health to get help as soon as they can.

Cellar:

- Nikki has been advised not to try to keep the water out of her cellar, as this would compromise the structural integrity of her house. She therefore uses the cellar as her sump to hold flood water.
- The consumer unit fuse box is still in the cellar but is 1.5m (almost 5') above the floor level and is located in a waterproof housing unit made by her son – Nikki was quoted around £1,000 by each power provider to move it elsewhere.
- Walls have been repointed and lime washed.
- Flooring replaced with concrete.
- Nikki hopes to fit a non-return valve in a drain in the near future as the ball valve that is in the cellar drain is inadequate.

Ground Floor:

- The floor has been raised by 10cm (4") with concrete and underfloor heating covered in porcelain tiles, which have waterproof grout and adhesive. The adhesive was put over the entire tile for additional waterproofing.
- Skirting boards replaced with porcelain tiles.
- Waterproof plaster to walls.
- Plug sockets raised up the walls, with a separate fuse box in place for three lower down plugs that operate Nikki's white goods, meaning they can be turned off and easily replaced.
- Stainless steel kitchen installed.
- Aluminium slot-in flood barrier for both front and back doors. This was made by a local company and is not ideal for Nikki to fit, due to her disability. Nikki therefore hopes to replace them with a modular system.
- Nikki has applied 'tung oil' to wooden furnishings, including sofa and chair legs, a large oak storage unit and a wooden table. This stops the furniture absorbing flood water, and her table has since survived three floods.
- A generator is available, should the electricity go off meaning she can run her lights, central heating and some sockets.



Aluminium slot-in flood barrier.



Stainless steel kitchen.



The consumer unit fuse box is still in the cellar but is 1.5m (almost 5') above the floor level.





'Tung oil' applied to wooden furnishings to stop the furniture absorbing flood water.

Mike in Warwickshire

Detached two-storey house Flooded 2007 & 2015

Mike bought his detached two-storey house in 2003, and it is built right on the banks of the River Stour in Warwickshire, with the river effectively forming part of his garden!

The worst flooding occurred in the summer of 2007, but there have also been less worse floods due to the location. The house already had concrete floors, but the 2007 event saw 1.5m of flood water rising up in the ground-floor rooms. This was later found to be due to a collapsed culvert running underneath the house, which Mike tackled by inserting two non-return valves at the river end of the pipe. This prevents water flowing back through it when the river is in flood, but still allows drainage water to pass through into the river in normal circumstances.

Other measures to keep water out:

- Walls on river-facing side of house have multi-layered waterproofing (brickwork/ aluminium and bitumen).
- Glass barrier with floodgate for access on river-facing side.
- Additional floodgates at side and front of house.



Mike's detached two-storey house is built right on the banks of the River Stour.





Mike has also made his home resilient to flooding in ways he describes as 'quick, effective and simple'. These interventions buy him time to do other work:

- Two sump-pumps in lounge, which operate automatically via float switches.
- Upstairs wiring is on a separate circuit from ground floor, and the board is also sited upstairs.
- A 'flood cupboard' contains all the items essential for raising furniture 30cm (12") off the floor (wooden blocks and crates) plus plastic boxes for storing other contents, and string (to hold the curtains up above flood level).
- Solid oak doors have survived five or six floods already, typically 3 hours on each occasion, and there have been no problems with them.

Future plans:

- Fitted carpets will be replaced if the resistance measures don't work as planned and another flood occurs.
- Electric sockets to be raised (insurers refused to do this after 2007 flood, citing the 'like-for-like' principle of reinstatement).
- Standard plaster (same insurer's insistence) may also need to be replaced.



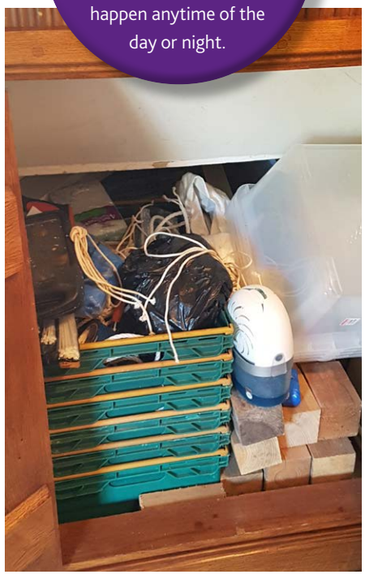
Walls on river-facing side of house have multi-layered waterproofing.

Top Tip

Keep all the essential flood preparation items you'll need in a hurry in a 'flood cupboard', as a flood could happen anytime of the day or night.



The glass barrier with floodgate for access on river-facing side.



A 'flood cupboard' contains all the items essential for raising furniture 30cm (12") off the floor.



Solid oak doors have survived five or six floods already.



Two sump-pumps in lounge.



The culvert running underneath the house now has two non-return valves.

Karen in Appleby

17th century, sandstone terraced town house Flooded 2015 & 2020

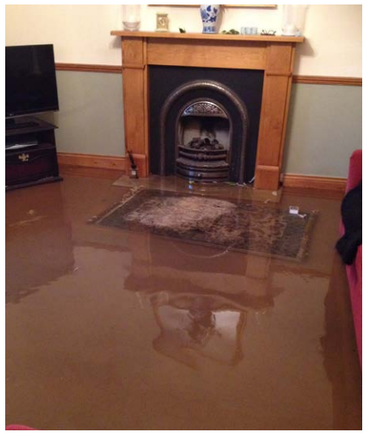
Karen and her family have lived in their 17th century, sandstone terraced town house in Appleby for 15 years. They were flooded for the first time during Storm Desmond on December 5th, 2015, when the river Eden reached unprecedented levels.

After an insurance claim of over £48,000, which they used to restore their home and possessions and live for eight months in temporary accommodation, the family returned home in August 2016.

Rather than replace like for like, they used the Government grant (provided through Eden District Council), flood grants from Cumbria Community Foundation and Appleby Town Council and plus their own savings, to try and make their home flood resilient. This required a shift in mind set; They gave up trying to keep the flood out of the building and instead worked on managing the flood water inside their home. They could not stop the flooding, but they believed they could manage the situation to make it quicker, cheaper, and easier to get back to normal.







Storms Ciara and Dennis were the first tests of their resilience plans - more than 15cm (6in) of rain fell in the county in 24 hours, with water levels in Appleby within 60cms (2ft) of those seen during Storm Desmond in 2015. For three weeks the family lived with Flood Alerts and Flood Warnings arriving regularly.

What did they do?

- They purchased a modular style steel flood barrier which held back the water for longer to give them more time to get their furniture upstairs or on the dining room table.



The solid wood dining table can be dried out and polished, if flooded, and is useful to stand other furniture on.

- Replaced the wooden floors and carpet with concrete floors and tiles.
- Tanked the walls and floors
- All electrics downstairs were replaced, with new wiring coming downwards, and sockets fitted at a higher level.



The main living room is flood recoverable but still looks beautiful and homely.

- They bought a solid wood dining table which could be dried out and polished, if flooded
- Replaced the gas fire with a log burner so they could get heat to dry out the house quicker
- Had the fuse box lifted above flood level
- They replaced their traditional piano (destroyed in 2015) with a lighter electric version that they could lift onto a table
- Replacement BT line installed on the first floor
- Bought a wired telephone which does not rely on the mains electrics
- Reduced the amount of furniture and items stored downstairs
- More kitchen cupboards on the wall with items of lesser value stored in lower cupboards.
- Made a flood plan of what they would do when they receive a flood alert, flood warning, and sounding of the flood siren.



Tiled floors throughout with a larger number of kitchen cupboards on the walls.

Karen and her family are very grateful to the flood volunteers in Appleby who give up their time to ensure the Community is safe. They knock on every door in the flood zone when they have a warning, to ask if they need any help.

What difference did the measures make?

STORM DESMOND 2015

River level 4.75m

Flood level in their home 1.5m

Cost of the resilience work was approx. £15,000

Cost of items lost and damage to property £48,000

STORM CIARA 2020

River level 4.15m

Flood level in their home 5cms

Time to return home 24 hours, after sweeping the water out and sanitising.

Cost of items lost and damage to property £0.00

David and Tina in Cumbria

Grade 2 listed converted cottage Flooded 2005 & 2015

The cottage is very near to Scandal Beck, which flows into the river Eden. The cottage has now been flooded on three occasions, in 2005 and from both Storms 'Desmond' and 'Eva' in 2015.

The flood water comes up very quickly and then recedes quickly also (just a matter of a few hours). The couple feel very fortunate that so far the water has been quite clean. I was struck by their keenness not to throw out anything unnecessarily and subsequently, both their fridge and freezer worked after the flood and once they were cleaned out were used again. Their kitchen is made of elm from a tree on their farm, which had been seasoned for around 10 years before being crafted into a kitchen and shelves. This survived the floods; the kickboards were removed to enable drying out, then washed and refitted. The plaster also survived the flood.

They decided to try to keep the water out of the cottage as best as they can. After taking advice, they built a wall alongside the cottage and up the lane. They dug deep foundations, the wall was built of concrete blocks and finished with stone to make it blend in with the cottage.



Top Tip

If you are unable to lift furniture upstairs, always lift out the bottom drawers and put them on a higher surface.



Scandal Beck, which flows into the river Eden, can rise dramatically.



Marine ply slot-in barriers put behind the gates in the wall.

In addition, they:

- Underpinned and repointed the gable end of the property.
- Installed two sumps outside, into which they put a pump if needed. (These were tested successfully recently when they were threatened with a flood from overland run off from a hill behind the house).
- Flood barriers are fitted behind the gate.
- Made a small bund to slow down the overland run off water.
- Installed a non-return valve on the septic tank.

Internally they have:

- Removed the carpets and have replaced them with tiles, this will enable them to just sweep the flood water out of the doors.
- Put the boiler and freezer on a plinth.



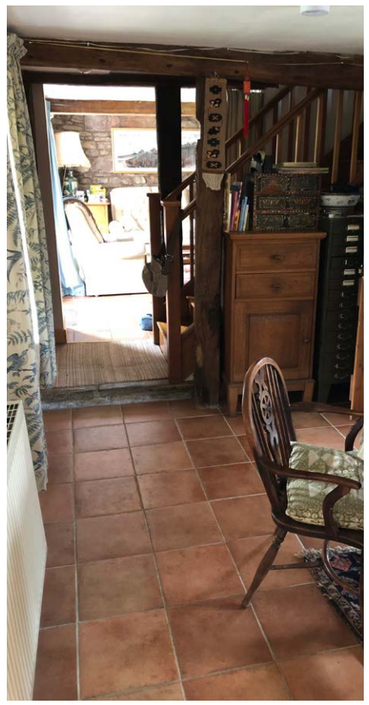




Their kitchen is made of Elm, which came from a tree on their farm, and survived the floods.

David and Tina reported that during the flood in February 2020, their wall and the barriers on the gates were very efficient in keeping the water from the beck out. However, they were also very efficient in keeping the water that was coming off the fields (and into their garden) in! The pumps at the front and back of the house easily dealt with the water in the garden, so that it never actually threatened the house, however, the pumps had to be watched carefully because they tend to cut out when the float gets caught on the wall of the sump. Also, the hoses from the pumps tend to crease on the edge of the sumps and in the high winds of Ciara they were blowing back off the walls.

David and Tina have learned that (i) the defences work well provided they are there to keep an eye on them and (ii) it would be helpful if future storms could be kind enough to avoid arriving in the middle of the night!



Floor is tiled, enabling them to just sweep the flood water out of the doors.



The boiler and freezer raised on a plinth.

Retired couple in York

Georgian cottage (listed building)
Flooded multiple times

The interior of this home in York appears unremarkable at first glance – but a multitude of flood resilient measures are actually present.

The owners were well aware of the flood risk when they bought the cottage – not only is it on the bank of the River Ouse, but the estate agent made the flood liability quite clear (the vendor had experienced five floods in 25 years). Having fallen in love with the house they decided to go ahead anyway – and the first flood happened a month after they moved in (2006) with eleven more floods following since then. The first ten of these were relatively shallow (several inches only) and of clean water and the owners were back to normal within an hour. However, the Boxing Day 2015 floods resulted in three feet of murky water inside the house, and some parts remained submerged for ten days. The owners themselves were trapped inside for four days, with provisions being delivered by a family member through an upstairs window.



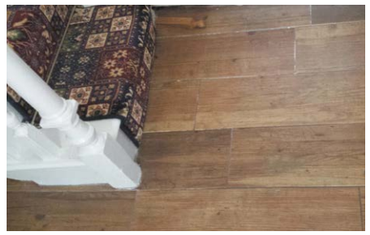
Pumping water out through the window.





Original Georgian window now reinforced with concrete, and has bespoke barriers.

Some recoverable measures had been installed by a previous owner (raised electrics, 6" square quarry tiles with waterproof adhesive on the floors and tiling on the lower part of the walls) but there were no flood barriers or pumps. However, the 2015 flood caused the quarry tiles to pop up from the floor, having become detached due to the high water pressure exerted. As part of the repair process the owners decided to have the house tanked up to dado rail height and much larger tiles laid on the floor, with full tile adhesive, not the 'dot and dab' method as used with the previous tiles. In keeping with the age of the house, the owners chose parquet-effect ceramic tiles for the lounge, and wooden floor-board effect ceramic tiles for the hallway. A solution for the original Georgian bow windows (with the approval of the local Conservation Officer) has been to reinforce the surrounds with concrete, and then have window barriers tailor-made to protect them in future extreme floods. Cleaning products are kept on high shelving, rather than below the kitchen sink - this means fewer items to lift when a flood warning is received.



Wooden-floorboard-effect ceramic tiles in hallway and easily removable stair carpeting.



Removable kitchen – baskets for storage and eye level oven with separate hob

Other measures include:

- Main sump pump in kitchen, smaller one in lounge, and a third pump kept as a reserve, in case one of the others fails.
- Both electric fire and entire fireplace are removable.
- Quick release hinges fitted to internal doors.
- The kitchen units are free standing so can be moved, just the granite worktops stay in place supported on metal legs.
- Water resilient paint in utility room.
- Large furniture items raised on steel trestles.



Dedicated storage box for barriers, trestles etc. in the garden where they are accessible when needed.

Sue in Cumbria

Mid-terraced house
Flooded multiple times

When Sue's home in Cockermouth was flooded to a depth of 1.2m (4') in 2005, she thought it was going to be a 'one off', as there hadn't been a serious flood in the area for 40 years prior to that.

Then came a flood in 2008 which was 45cm (18") deep and Sue began campaigning for flood defences in the hope these would solve the problem. However, the major flood of November 2009 resulted in seven feet of water invading her home. Sue said that being flooded was the easy bit, the hard bit was the months it took to recover. So she resolved to make some changes which would reduce the amount of time it took to recover in the future. Following the 2009 event, Sue could no longer get flood insurance. Sadly, her house flooded again in 2015 and she made use of the government's £5,000 grant to make some additional modifications. The gas central heating boiler was moved upstairs, so that there is now no loss of hot water or heating in the aftermath of a flood and Sue had a wood-burning stove fitted downstairs. both being essential for the drying and cleaning process.

When Flood Re was launched in 2016, Sue was very pleased to be their first customer!



The fireplace surround is also made from hardwood.

Top Tip

Move your boiler upstairs, so if you do flood again, you still have heating and hot water.



Free-standing stainless steel kitchen with free-standing appliances.

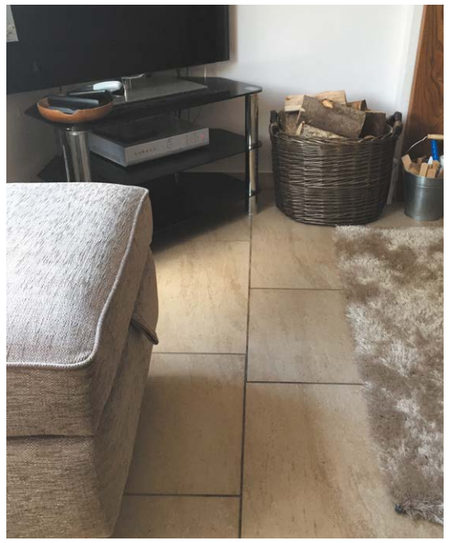


The window sills are made of hardwood.

Recoverable measures included:

- Free-standing stainless steel kitchen with free-standing appliances, which can be moved to safety. The walls are tiled from floor to ceiling, using water-resistant cement and grout; internal door re-hung with hinges allowing it to be lifted off and moved upstairs.
- The ground floor is tiled throughout, using water resistant cement and grout – it can be hosed down and disinfected after a flood.
- The window sills are made of hardwood instead of the usual easily-damaged softwood.
- The fireplace surround is also made from hardwood, and has successfully survived a flood.
- A flood-resistant door has been installed, which allows additional time for moving items before the water has to be let in.





The ground floor is tiled throughout, using water resistant cement and grout

The Gallery in Yalding

3 storey detached house with an Art Gallery on ground floor Flooded 2013

Prior to the Christmas day floods of 2013, Riverside was a 2-storey family home. The house had regularly flooded, but the building skirt system, a butane rubber membrane attached to the house and fitted by the previous owner in 2002, usually coped quite admirably and no water entered the property.

However, the 2013 flood overtopped the building skirt system and seriously damaged the house.

The family decided they could not go through another major flood and face so much disruption again; they were out of their home for 15 months and had terrible problems finding accommodation that would also take their animals. So, the family decided to add an extra floor to the house and move upstairs. The ground floor is now an art gallery during the 'non-flood months'.

Measures taken:

- They have a small industrial kitchen downstairs which serves the gallery when it is open (this can easily be hosed down and sanitised). It was interesting to note that a hardwood dresser had survived the deep floods and remains in use. (the dresser was repaired by the insurer).
- The newly sited staircase has only minimal carpet, which can easily be replaced. Almost everything on the ground floor can be evacuated upstairs if required.
- To the exterior of the property, the building skirt system can be pulled up to around a metre high round the whole house when needed. (The rest of the time, it remains hidden in a trench under easily removed decking).

Top Tip

Hardwood furniture can survive a flood and just needs cleaning and leaving to dry.

- The walls are reinforced with steel supports which are built into the concrete rendered internal walls (this helps to reinforce the structural integrity of the house, when a large amount of water is being prevented from entering the property).
- The ground floor is also tanked.
- They have two seepage pumps and a 12cm (5") main pump fitted to a sump under the house.
- They also have non-return valves fitted on all wastewater pipes. The building skirt system works well in most floods and requires minimal maintenance.
- Additionally the current owners have fitted a large generator above the garage that can power the entire house during flood events and ordinary power cuts.
- A chemical toilet is available for use should the house be flooded for any time. The owners should be able to remain in the house should the property flood again.



The building skirt system usually coped quite admirably and no water entered the property until it was overtopped in 2013.



The building skirt system can be pulled up to around a metre high round the whole house when needed.



The owners had to use their flood skirt 3 times over the winter of 2019/20; Once just before Christmas, then again in February and March. Each time the water was approximately 60cm (12") deep all around the house. The skirt held well with some minor seepage, but the main sump pumps operated faultlessly and kept the water out, so the family remained dry. It is worth noting that they have their own back up generator, which gives them peace of mind, as the local electricity sub station is at risk of flooding. There are promising plans to move it to higher ground, as many householders in Yalding depend on the availability of electricity to operate their pumps.



The staircase has only minimal carpet, which can easily be replaced.



A hard wood dresser had survived the deep floods.



The small industrial kitchen downstairs which serves the gallery when it is open.

Sue and Rob in Lancashire

Detached two-storey house Flooded in 2015

Sue and Rob bought their 1930's detached house in 1986. The house was first surrounded by floods in 1995 and following that, a further fourteen times, until they flooded internally during Storm Desmond in December 2015. They believe that the void of the house will have flooded on every previous occasion but as the water didn't come above the floor boards, it was not classed as an internal flood.

They said that the repair process was extremely stressful and traumatic, with a lot of the work being of an extremely poor standard and much of which had to be redone. To this day, they feel that they haven't got their home back to the standard it was before the floods, a fact they find extremely upsetting. They said the whole experience has left them depressed and traumatized. Sadly, during the repair process, they were flooded again and because of this, they didn't get back into their home again until the end of April 2017!

They decided to make their home resilient, as it felt like common sense and they didn't want anyone else who lived in the house after them, to suffer as they had.

The cause of the flood now has a bund along it's sides.





Top Tip

Use waders, waterproofs and walking poles if you have to walk in flood water, as pavements lose definition during a flood.

Top Tip

Keep an emergency kit filled with everything you may need for loss of power, such as torch, matches, camping stove, soup, hand sanitiser etc.

Sue and Rob's detached house was first surrounded by floods in 1995 and following that, a further 14 times.

Changes the couple made included:

- A pump is under the floor to pump any flood water outside.
- Closed cell insulation under the floor.
- A waterproof sub floor membrane (which can cope with being under water for 30 days) and then an engineered oak floor finish on top.
- Cavity wall insulation replaced with water proof insulation.
- Cement render to the walls.
- Electric sockets further up the walls, wires now come down the walls.
- Waterproof rendering was applied underground to the foundations and 30cm (12') above ground.
- Water resistant spray to walls above the render.
- Self-closing air bricks.
- Barriers to all external doors.
- French Windows have flood guards fitted.
- Exit points for waste pipes have all been sealed.
- Rooms without floor voids have been raised, concreted and have been tiled with ceramic tiles.
- The kitchen is on legs with removable kick boards.
- They have 2 puddle sucker pumps (which can pump down to 2mm of water), a spare pump and a generator.
- Rob has built a wall with substantial foundations in the garden.
- They have non-return valves fitted to the sewers.
- White goods are raised up on plinths.
- Shower, sink and washing machine have separate non-return valves.

The village also now benefits from a flood alleviation scheme.



Self-closing air bricks and waterproof rendering was applied underground to the foundations and 30cm (12") above ground.

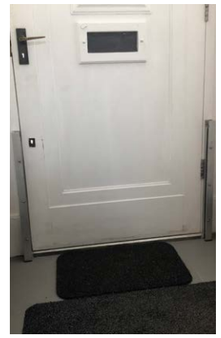


Wall with substantial foundations in the garden.



A waterproof sub floor membrane with an engineered oak floor on top.









Electric sockets further up the walls, barriers to all external doors and non-return valves fitted.



White goods are raised up.



The kitchen is on legs with removable kick boards.

Maya and Kieran in Lancashire

4-storey, stone built 19th century end of terrace house. Flooded 2017

Maya and Kieran had one previous 'near miss' and one flood that only came from under the floor boards.

This was because the flooding caused a power cut, consequently cutting the power to their underfloor pump. However, the flood of the 23rd November 2017 was much worse and flooded their downstairs kitchen to a depth of 1.5m (5'). Their boiler was ruined and they lost a lot of possessions that had been stored in the front cellar room. They had to move out, which was a difficult time for them and their young family. Their daughter (now 11) was deeply traumatized and still worries about flooding to this day. As a result, they decided to sacrifice a living room and move the kitchen upstairs. They had a struggle with their insurance company, who wanted to replace 'like for like', so they decided to take a cash settlement and do the work themselves. Due to the budgetary restrictions of a young family, the work to restore the kitchen is an ongoing project, but they plan to end up with a 'hose down and get on with life' finished room.

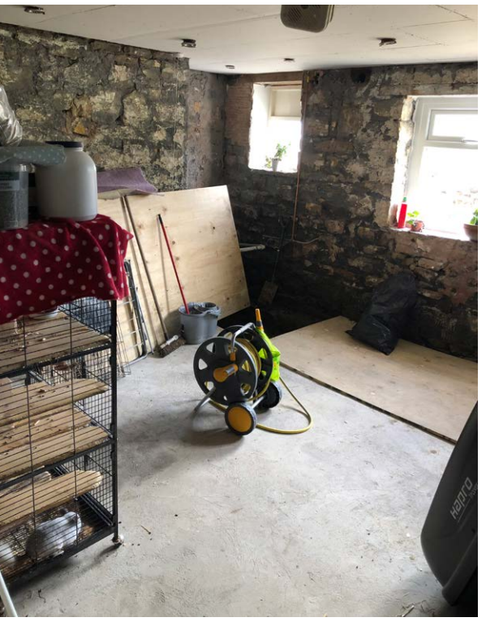


The couple moved their kitchen upstairs.

To date the following actions have been taken:

- Kitchen moved upstairs.
- Replaced original window with a flood proof window.
- Fitted a flood door.
- Moved boiler up the wall.
- Isolate the electrics, so upstairs can continue to function during a flood.

When I asked Maya and Kieran what made them decide to move the kitchen upstairs, their reply was very poignant. "So we never have to disrupt our children's lives again, so we never have to move our children out again and never again spend Christmas in a hotel room." They want their home to be able to continue functioning during a flood and let downstairs flood, safe in the knowledge they can hose it down afterwards.



The basement room previously housed the kitchen and was extensively flooded to a depth of 5 feet.



Original window replaced with a flood proof window.



Flood door fitted.



White goods in the basement room are now raised up.

Cottage in Oxfordshire

Detached house. Flooded 2017

This detached property suffered surface water flooding in the kitchen area following torrential rain in 2017, because the adjacent roadway is 30cm (1') higher than the kitchen floor.

It was obvious that this problem would reoccur (likely with increasing frequency due to climate change), so a specialist survey was undertaken with an ensuing recommendation that a cavity drain waterproofing system be installed, along with a small packaged pumping station. The work was carried out by a specialist membrane provider and is a typical structural waterproofing solution, where external ground levels are high and surface water is on the road outside.*

The existing fitted kitchen and floor finishes, were removed and then re-installed following completion of the work, adding to the cost-effectiveness of the chosen solution.

Since the work was completed, the area has already experienced a similar downpour and the owner was delighted to find that the property remained dry.

System components included:

- Cavity drainage membrane system.
- Drainage channel.
- Sump pump (submersible package pump).
- Façade cream (water repellent façade-hydrophobic cream for cementitious-based building materials).

**These systems do not provide a hydrostatic barrier but provide protection by means of water management.*



Existing kitchen and floor finishes were removed, and then re-installed following completion of the work.



The 3mm floor membrane is also designed as an underlay for protecting oak floors.



Cavity drainage membrane system and sump pump during installation.

Susan in Berkshire

A ground floor flat. Flooded 2014

Susan deals with risk management in her working life, so when she fell in love with this ground floor flat in late 2013, the fact that the local authority search process indicated a risk of flooding, it did not deter her. The River Thames had not flooded the area since 1947 and the house itself had never been flooded at all, so there was no problem obtaining insurance quotations. Nonetheless, to manage the risk, she planned to make her new home as resilient as possible just as soon as she was able to move in.

Contracts were exchanged one Friday in early February 2014, but that very same evening a flood warning was issued for the local stretch of the River Thames. Two days later this was upgraded to the most serious type, a 'Severe' warning. When Susan arrived on the following Monday morning to measure up for new curtains, she described the scene as 'almost like Armageddon' - in fact, she had to use a rowing boat to reach the house! At first it appeared that the flood water had spared the house itself, but it was a different story at the rear of the property, where flood water had come in via the back door and also up through the shower outlet. Thankfully, the water depth was only just above the skirting boards, so Susan's first action was to deploy two submersible pumps, which successfully prevented it getting any deeper. Most of the water was groundwater and so was relatively clean, but in the shower room there was wastewater.

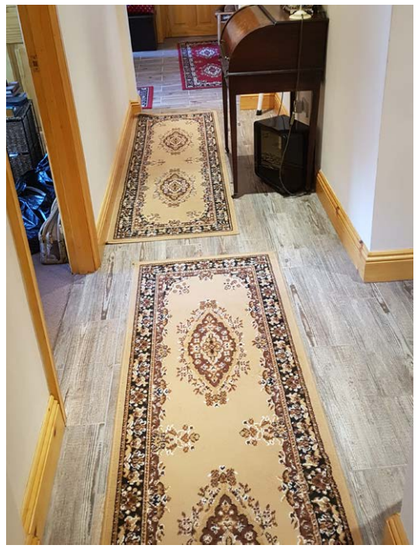
Susan has no complaints about her insurers; a loss adjuster was quickly sent out and within a week, driers had been brought in and damaged components were stripped out. Because of these quick actions, the house only took a matter of a few weeks to dry out. But then Susan ran into the problem experienced by so many flooded homeowners – the insurance policy can only indemnify, i.e. 'put you back to where you were' so the planned resilience measures could not be installed as part of any repair work.

Top Tip

Have pumps tested each year, and take out a maintenance contract for flood doors and flood barriers, so that the gaskets get checked annually.



Susan had to use a rowing boat to reach the house!



Ceramic tiled hall with rugs.



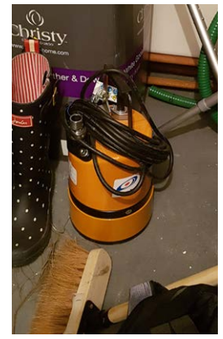
Temporary flood barrier for cellar.



Flood barrier on the back door.



Solid wood kitchen with sacrificial kickboards.





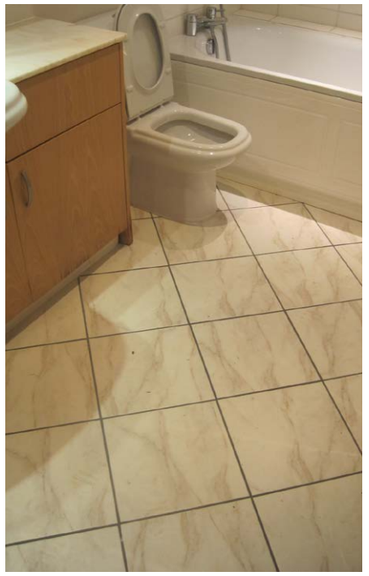




Puddle sucker, non return valves added to all the pipe work and sump pumps in the outhouse.

The changes Susan made included:

- Susan made use of the government £5k grant to pay for two 'sump pumps' in the outhouse, which is where the water first entered. One is the main pump, the second is the back-up, and the electrical supply for both is well above flood height.
- The back door is protected by a flood barrier (which is left permanently in place).



Ceramic tiled bathroom floor.

- A flood resilient front door has been installed.
- Carpets and laminate flooring replaced with ceramic tiles, bonded to the concrete floor with waterproof adhesive. The only exception was the three bedrooms, where cheap 'sacrificial' carpet was chosen.
- All replacement woodwork including skirting boards, internal doors and built-in wardrobes are made from solid wood, which has been varnished.
- Solid wood kitchen.
- NRVs have been added to all the pipe work.
- Toilet bungs for each of the bathrooms.

Other essential items are kept close at hand:

- A portable pump.
- Gel-filled absorbent pads.
- A second barrier for an internal door.



A flood resilient door to the front of the property.

Toilet bungs for each of the bathrooms.



A Lancashire couple

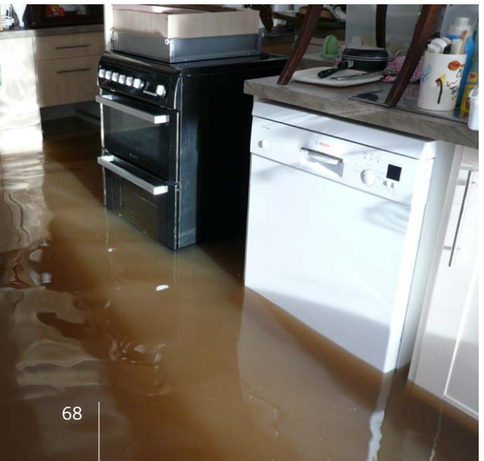
Detached house. Flooded 2015

This Lancashire couple's home had previously flooded once, before they lived there. It flooded again during storm Desmond, this time from a different direction. They moved as much as they could before they and the wife's elderly mother - who lived with them - were evacuated in a boat by the fire service.

The house took a long time to dry out because initially, the contractors carrying out the repairs had failed to remove the insulation, which inhibited the drying process. The whole of the ground floor had to be totally gutted, including the ceiling.

The couple realised that unless they did something to stop the flood water from entering their home, they would be unable to sell it in the future (if they chose to), but also that they could not continue to live there with any confidence of another flood not occurring. They did a lot of research and decided to improve the internal resilience but also to invest heavily in trying to keep the water out of the garden and home. They did the following:







Top Tip

This couple have invested in a generator, to enable the pumps to keep running if the electricity fails.

At the perimeter of the garden one-metre-deep holes were filled with concrete, into which posts and reinforced 'Task Green' waterproof fence panels were fitted.



The front entrance gate is the same material as the fence panels and is fitted tightly to prevent ingress of water.

- Filled in the suspended floor with concrete and installed under floor heating. (They used a plastic floor covering, as they were mindful that the elderly mother might fall and injure herself on a ceramic floor).
- Plaster was replaced with a lime-based mix.
- Plug sockets were raised up the wall.
- At the perimeter of the garden their contractor dug one-metre-deep holes, which were filled with concrete, into which 'Task Green'* waterproof posts and fence panels were then fitted, with the lowest panel sunk into a 60cm (2') trench, also filled with concrete. The contractors also reinforced the fence panels with steel bars, to enable them to withhold the weight of deep water.
- All rainwater drains are now independent of those outside of the property and run through a series of French drains into a large sump (formally a septic tank) into which a strong pump is fitted which pumps the water through an existing pipe into a ditch outside the garden boundaries.
- They have another pump and generator as a backup.
- The front entrance gate is made of the same material as the fence panels and is fitted into a frame which has been made to fit the contours of the drive. The gate has a thick black sponge seal that can be tightened manually to prevent ingress of flood water.

**NB Task Green has since gone out of business, but a quick internet search found another similar brand.*





Rainwater runs through a series of French drains into a large sump into which a strong pump is fitted which pumps the water outside the garden boundaries.



They have another pump and generator as a backup.

Wendy and Ben in Lancashire

Detached old cottage
Flooded 2015

Wendy and Ben live in an old cottage in Lancashire. In the past, they had almost flooded, but water had never got into their home.

Sadly, in December 2015, during Strom Desmond, Wendy noticed her carpets were wet and very quickly the entire ground floor was flooded, to a depth of about 1.2m (4'). Wendy noticed that the water was entering her home via the doors and not from underneath as her floor was concrete. The couple turned off the electricity and spent the night upstairs. Wendy recalls having to wade through the water in the dark to get some insulin for her diabetic dog. She was upset at the sight of her Christmas tree floating in the flood water. However, her Grandfather clock that was built in 1740 was still ticking away and continued to do so. Wendy sadly recalls that she often looks for things and remembers that, 'they went in the flood'.

As the flood occurred over the Christmas period, the couple decided to hire their own dehumidifiers and remove wet carpets. They say their prompt action aided the drying time. The couple were out of their home for 6 months, whilst the cottage was repaired. They had already decided that things had to change and took advice from family who were in the building trade. She also praised her insurance company, as they rang every week to see how the repair works were progressing.



Wendy's Grandfather clock that was built in 1740 was still ticking away even in 1.2m (4') of water.



The couple were out of their home for 6 months, whilst the cottage was repaired.

Top Tip

If you are patient and allow the solid wood furniture to dry out, drawers will open and behave as they should again.

The following changes were made:

- Electricity wires now come from upstairs.
- Sockets placed up the walls.
- Tiled floors to much of the ground floor (she decided on a sacrificial carpet for her living room but hopes to roll it up, if ever she was flooded again).
- White goods in the utility room are now on a plinth.
- Waterproof cement render plaster.
- Flood barriers to all external doors and one internal door, and there is a step down into the kitchen.
- Prior to new local flood defences being installed, the couple would lift all their belongings out of harm's way before they went away.
- The couple now keep all important documents upstairs.

Much of their Oak and Mahogany furniture survived the flood. Ben said, if you are patient and allow the wood to dry out, drawers will open and behave as they should again.





White goods in the utility room are now on a plinth and even the wood burning stove in the lounge is raised up.



Flood barriers to all external doors and tiled floors.

Christine in Lancashire

Mid-terraced house
Flooded 2015

This bungalow had never before been flooded in the 60 years since it was built, but that all changed in December 2015.

Storm Desmond caused unprecedented flooding in many areas of north-west England and here it was the River Wyre that invaded the home of a retired couple, who also ran a guinea pig rescue centre. To make things worse, not only was the flood completely unexpected, but it happened at night and the power failed immediately. The water was rapidly increasing in depth so, having no upper storey, the only solution was for the owners to evacuate. This involved the elderly couple, 3 dogs and 36 guinea pigs leaving through a window in the pitch dark. Once outside, the rushing water was already over wellington height and was enough to knock you off your feet. The owners needed help in struggling up the driveway to escape and they describe the experience as 'very frightening'.

The aftermath was heart-breaking, as everyone in the local area was in the same position, and the couple were unable to begin emptying their home. Everything was left 'wet and rotting, including all the clothes in the wardrobes' recalled Christine.



Flood resilient front door has been installed.



A 'concrete type' fence has been erected to hopefully slow the flow of water, providing extra time to evacuate.

The flood water had eventually reached a height of 1.5m so everything was completely ruined. Consequently, the loss adjuster advised that not just their possessions, but also the floors, plasterwork, and nearly all the furniture would have to be discarded. The only exception was a grandfather clock, whose mechanism was right at the top of the case and was still chiming away, despite its ordeal!

The owners were out of their home for 7 months but were fortunate in being able to stay with relatives who could also accommodate the animals. Then, unbelievably, just six weeks after moving back in, another flood occurred. Although this time the water only came 'just over the skirting board' it was still enough to ruin all but the tallest items. Not wanting to go through such devastation a third time, they decided to include some resilient features in the repair process.

- A non-return valve in pipework, to prevent backflow.
- The sewer pipe also now has an NRV, as a dead rat was found in the kitchen following the first flood!
- The external brickwork has been sprayed with a waterproofing agent.
- Flood resilient doors have been installed throughout.
- In conjunction with a neighbour, a 'concrete type' fence has also been erected. Although they don't expect this to stop the water, the couple are hoping it will at least slow the flow down, providing extra time to get out if necessary.



Flood resilient patio doors have been installed.



Mark in Corbridge

A solid stone terraced house. Flooded 2005 and 2015

A solid stone terraced property in Corbridge, situated about ¼ of a mile from the River Tyne. The home-owner's family bought the property in 1996, which unfortunately suffered flooding to 1m depth in 2005. After recovery, the house was rented out for a few years only to suffer flooding again in 2015, this time to a depth of 1.5m (4'10").

The owners, a young couple with small children, readily admit to not having much disposable income. They would have liked to have done more to improve the flood resilience of the house and now have a 'flood fund'. They are saving for flood barriers, a non-return valve and a sump pump. They praised their Local Authority officer for the support he gave.

They decided to give preference to reducing the impact any future flood could have and took the following actions, using a combination of the £5,000 grant and some savings.

- Filled in a suspended timber floor with concrete.
- Installed hardwood flooring with rugs (They said the wet carpets were a nightmare to lift out and slow the drying process).
- Installed solid oak doors.
- Rendered walls with waterproof cement.
- Kitchen doors have easy release hinges, so the doors can be removed quickly.
- The household electrics have been separated onto two different circuits, so if they do flood again, they will still have electricity upstairs.

Top Tip

If you live in a terraced property, try to work with your neighbours, to enable a cohesive approach to any resilient repair.





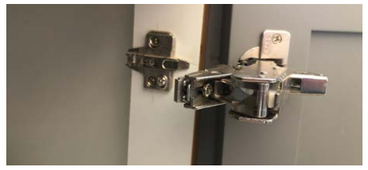
The Belfast sink is easily cleaned.





Solid oak doors.





Kitchen doors have easy release hinges, so the doors can be removed quickly.



Tiled floors in the kitchen and utility areas.



Hard wood flooring with rugs replace the carpets which were a nightmare to lift out and dry following the flood.

Rob in Corbridge

1740's solid stone detached house
Flooded 2005 and 2015

The homeowners moved to Corbridge in 2014 and although they knew that the house had been flooded 10 years previous, they had been told that improvements had been made to a local flood bund. Since they had fallen in love with the property and garden, they decided to go ahead with the purchase. All was fine until Storm Desmond in 2015.

When they received the flood alert, they moved as many possessions as they could upstairs. The water slowly but surely encroached upon the property and by the evening they decided to leave with their two dogs and young baby. When they returned the following morning, their home had been flooded to the ceiling of the ground floor! They both admit to being in total shock to see their home like that. After the flood, the family lived in the house for 11 months, but it clearly was not appropriate for their needs, having a young baby and two dogs. The couple agreed that the recovery from the flood was far worse than the flood itself.

During the restoration, they took the opportunity to build an extension to the house and at the same time, incorporate some flood resilience into the repair so that if they do flood again, they can recover quickly and get home sooner.



Top Tip

Photograph absolutely everything that has been flooded, as it's easy to forget and lose out with your insurance claim. Start drying the property as soon as possible to speed up the recovery time.

Flood recoverable work included:

- All external walls have a layer of membrane, a layer of galvanised steel cladding, closed cell insulation and horizontally fixed plasterboard, which can be removed and replaced easily.
- Concrete floors
- Under floor heating
- Porcelain floor tiles in the kitchen
- Engineered oak to the remaining floors, which does not expand when wet
- Oak internal doors
- Free standing, solid wood kitchen

The couple noticed that a lot of their hardwood furniture survived the flood and didn't need replacing. They favoured resilient repair over installing flood barriers, but do plan on buying some in the future.

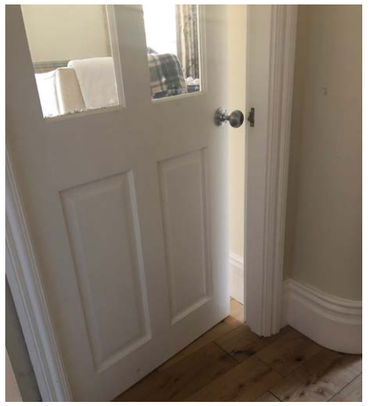
Prior to the work being carried out the couple's Flood Re insurance excess was £15k, this is now reduced to £250!



Permeable patio areas surround most of the house.



Porcelain floor tiles in the kitchen.



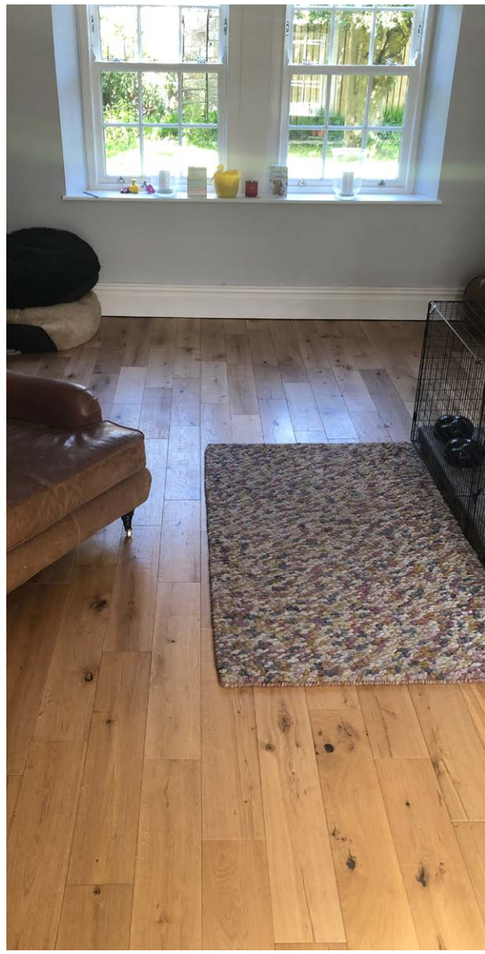
Oak internal doors.



Free standing, solid wood kitchen.



Hard wood furniture survived the flood.



Engineered oak to the remaining floors.

Businesses that have been built back better to reduce the impact of the flood and speed up the recovery



Without exception, the business owners were driven by the need to get up and running as soon as possible after a flood.

Their financial livelihood (and the livelihood of the people they employ) is dependent on being able to do this. They all have plans in place to put into action, as soon as they are aware that a flood is imminent.

The Swan Hotel in Newby Bridge, Windermere

Large brick built hotel Flooded 2009 & 2015

The Swan Hotel is on the banks of the River Leven to the south end of Lake Windermere.

Sarah Gibbs has been the hotel manager for eleven years, during which time the hotel has flooded twice; in November 2009 and December 2015. Following the floods, Sarah commissioned a flood survey and was told that they were '1 in 1,000' year events. Sarah said she must be very unlucky to have had two 1,000-year events in the space of only nine years! The floods caused substantial upheaval, great expense and the hotel had to close for six months. After the second flood, Sarah felt a particular responsibility towards the hotel shareholders and her staff, the latter of which depended on the hotel for their livelihoods. So, Sarah decided that she had to take action to mitigate the most significant risk that the business faced.

Sarah took the time to do some in depth research as to how, why and when the hotel flooded. She now understands the circumstances that lead to a flood and at what level it will flood. Armed with this information and supported by her insurers, Sarah has done the following to reduce the risk of flooding:

- Rigid temporary barriers are installed around the hotel to a height of 1.2m (4') The hotel has 'Flood Marshals' trained to put the barriers in place, which take six people about 1.5 hours.
- Door guards are fitted to external doors as a 'belt a braces' option.
- Non-return valves to all drains.
- Sump and pump fitted to the lift shaft (which flooded in the last flood).
- Smart airbricks to prevent water getting under the floors, as happened before.
- Several puddle pumps.
- Generators to power pumps and emergency lighting.
- The hotel has an extensive emergency plan, which all staff are trained in. It is regularly reviewed and refined. They have a 'dry run' every September to practice putting up all barriers.
- The floors all have a resin damp proof membrane beneath them, to prevent the water rising from underneath.
- The bar is solid oak and survived the 2015 flood. It has stainless steel fittings and easily removable equipment.
- The hotel kitchen is in the lowest part of the building. It has resin flooring (that survived the 2015 flood), which has now been extended up the wall to a height of 1 metre. There is washable plaster elsewhere and the kitchen equipment can be moved to a higher level if absolutely necessary.

As a result of all this work, Sarah was pleased to be able to report that they have maintained their insurance cover.

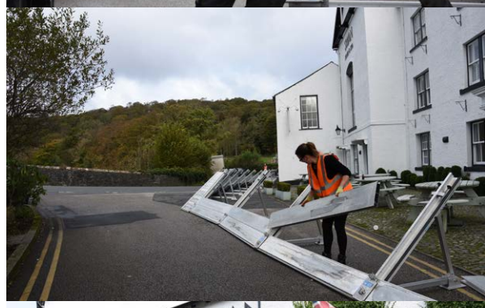


IMAGES PROVIDED BY AQUOBEX

Top Tip

Have an emergency plan, which all staff are trained in and is regularly reviewed and refined.







Rigid temporary barriers are installed around the hotel to a height of 1.2m (4'). The hotel has 'Flood Marshals' trained to put the barriers in place, which take 6 people about 1.5 hours.





The bar is solid oak with stainless steel fittings and easily removable equipment.





Door guards are fitted to external doors as a 'belt a braces' option.



The floors all have a resin damp proof membrane beneath them, to prevent the water rising from underneath.



Glenridding Hotel in Cumbria

250 year old stone built hotel Flooded 2015 & 2016

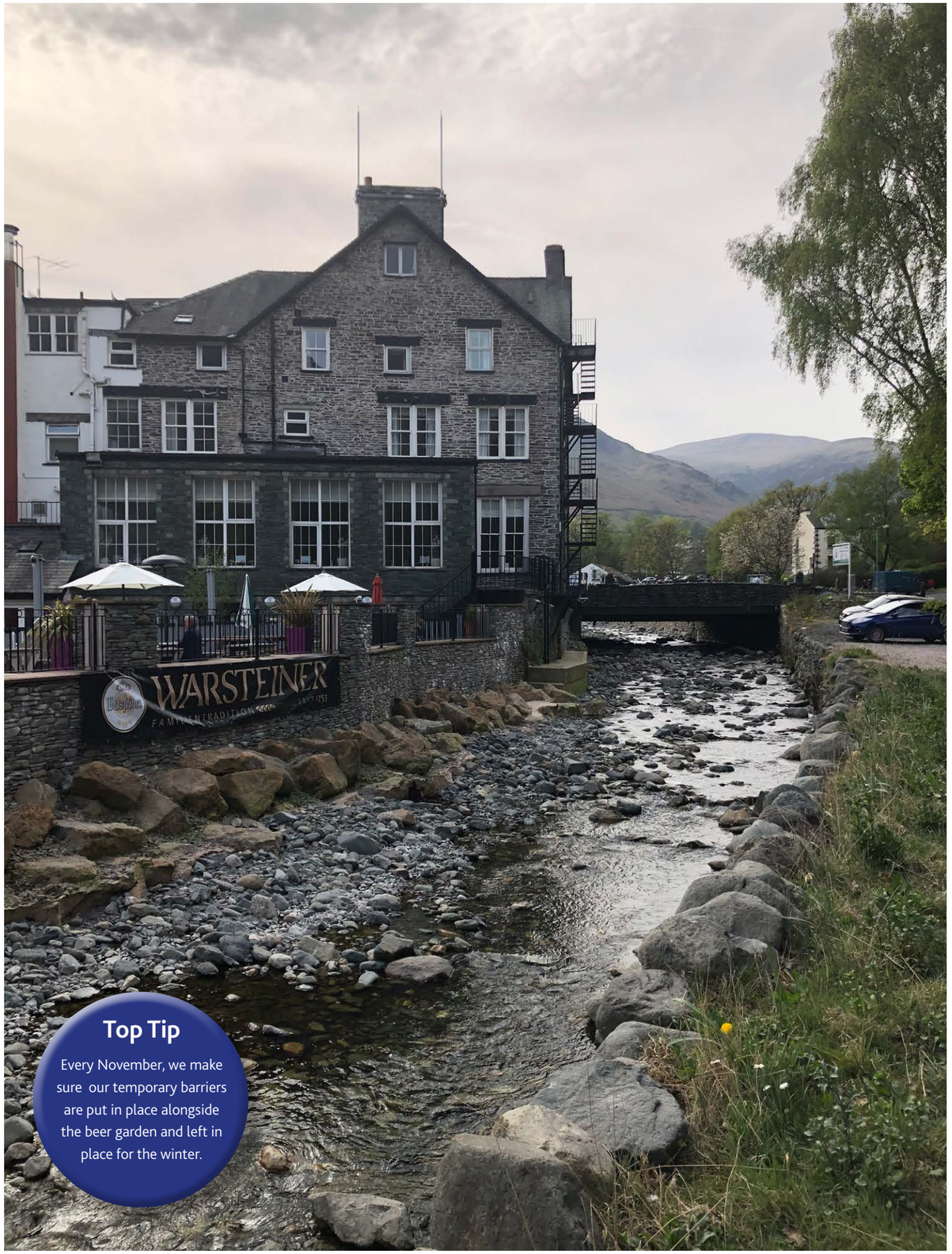
The 250-year-old Glenridding Hotel was flooded on four occasions between December 5th, 2015 and January 12th, 2016. Two of those floods caused complete destruction of the ground floor of the hotel.

The hotel was flooded by Glenridding Beck, which was overwhelmed by the vast amount of water, trees and rocks pouring down from the hills. The adjacent bridge was blocked by the amount of debris and as a result, the water burst through the hotel in huge volumes on it's way to the lake below. Selina Ali, the hotel manager, told me that she was shocked by the sheer amount of water that hit the hotel and how terrifying the whole event was. The damage to the hotel was extensive and enforced complete closure for a year, with some parts remaining closed for 18 months.

The hotel management team took the decision that this type of event should not happen to them again: They not only took extensive advice as to how to prevent any future flooding, but also how to put in resilience measures so that if they did flood, they would be able to clean up quickly afterwards. They also now have a detailed emergency plan, which all staff are familiar with.

Flood barriers go along the river side of the hotel.





Top Tip

Every November, we make sure our temporary barriers are put in place alongside the beer garden and left in place for the winter.

The gable end of the hotel has been strengthened with concrete cladding and large rocks placed in front of it.



IMAGE PROVIDED BY IBS ENGINEERED PRODUCTS LIMITED

The measures taken:

- In addition to newly upgraded Environment Agency defences, if a future flood warning should occur, the hotel has built a robust flood wall around the front and river side of the hotel, into which demountable flood barriers are fitted to protect the entrances.
- The gable end of the hotel (which sits in the river) has been strengthened with concrete cladding.
- Large rocks have been placed in front of it.
- The internal wall side has also been tanked.
- An open walkway from the front to the back of the hotel, now has doors and barriers and the floors are tiled and the walls tanked.
- Every November, the barriers are put in place alongside the beer garden and left in place for the winter.
- Non return valves have been fitted as necessary.
- The bar area is now tiled and tanked and given a contemporary look which disguises the fact that it is 'flood resilient'.
- The bar area is built in slate.



A robust flood wall around the front and river side of the hotel, into which demountable flood barriers are fitted.



Newly upgraded Environment Agency defences.



The tiled and tanked walkway through the hotel.



The bar area is built in slate.

Wateredge Inn in Cumbria

Large brick built hotel Flooded 2009 & 2015

The Wateredge Inn is situated in a beautiful location, on the banks of lake Windermere in Ambleside. It has flooded twice, once in 2009 and again in 2015. They didn't expect to flood again, as they had been told that the 2009 flood was a one in a hundred year event.

One of the things that impressed me hugely was that the hotel now has a detailed emergency flood plan in place, which all staff are trained on and know what to do should flooding occur. All available staff will help to action the plan as soon as a flood warning is received. All roads around the area become impassable during a flood, so all bookings are cancelled and ground floor furniture is moved into first floor guest bedrooms.

Plans include:

- Installing 3 pumps into the lower bar area, which will be used as a 'sump' and water pumped out of the window from there.
- A petrol generator will be placed on the flat roof to power the pumps.
- All stock behind the bar is in trays and can easily be removed.
- The motor can be removed from the stainless-steel kitchen 'Chave block' (cooking area) and hydro-snakes will then be used to deflect the water.
- As much equipment as possible will be moved from the kitchen to an upper kitchen area.



The Wateredge Inn is situated in a beautiful location, on the banks of lake Windermere in Ambleside.

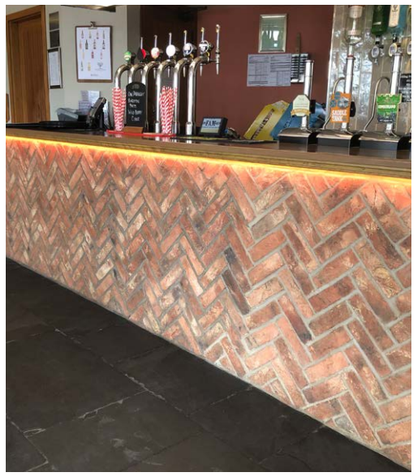
- Serving area can be lifted onto crates.
- Cold stores have rubber seals fitted but in addition, marine ply is temporarily sealed to the fronts.
- Flood barriers are fixed to all the doors.

Recoverable work includes

- Windows have been raised a couple of feet higher up (Jackie, the duty manager recalled looking through the window and seeing the flood water up against it).
- The bar is now brick and has been treated with a waterproof spay.
- Sealed slate flooring throughout.
- The fixed seating is easily removed and the frames are now made of marine ply, which will recover if flooded.

Top Tip

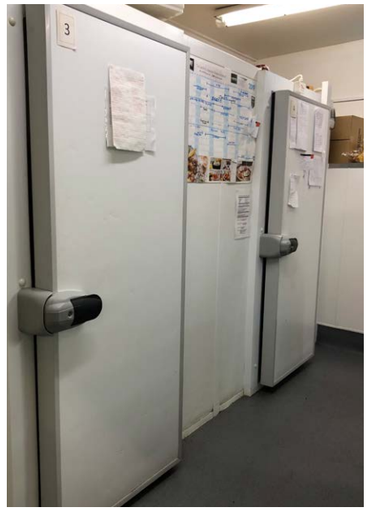
We make sure all new staff are fully aware of our emergency plan and know how to put it into action if necessary



The bar is now brick and has been treated with a waterproof spay. The floor is tiled.



The fixed seating is easily removed and the frames are now made of marine ply.



Cold stores have fitted rubber seals but in addition marine ply is sealed to the fronts.



The motor can be removed from the stainless-steel kitchen 'Chave block' (cooking area).



All stock behind the bar is in trays and can easily be removed.



Windows have been raised a couple of feet.



Vital kitchen equipment is raised above the flood water level.



Jim, Farmer in Lancashire

Working livestock farm and farmhouse. Flooded 2015 & 2017

Jim has been flooded twice, once during Storm Desmond in December 2015 and then again in August 2017. During Storm Desmond, the floods water was 60cm (2') deep in the farm house they lived in and 1m (3') deep outside.

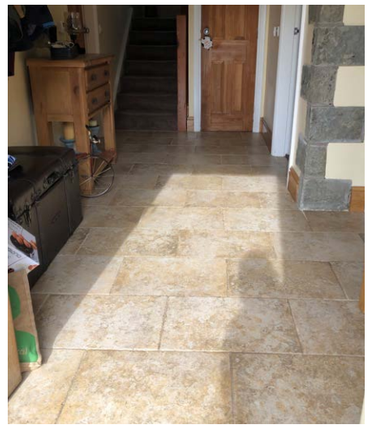
Jim described vividly how he had to carry 30 calves who were housed in pens in the farm yard to save them from drowning, so his home obviously came second.

Jim had a resilience grant but invested heavily from his own money to make sure the farm didn't flood again. When I initially talked to Jim, he said that his home wasn't flood resilient but during our conversation, I discovered that it was!

The resilience measures in the house were:

- Solid floors with under-floor heating
- Ceramic tiles to the floor
- Waterproof plaster
- Oak skirting boards
- Solid wood doors, which survived both floods
- Before the 2nd flood, they moved all belongings up and installed a pump which kept the water to below skirting board level. When the water was gone, they mopped out and didn't move out. The under-floor heating aided the drying out.





Solid floors with under-floor heating and ceramic tiles.



Oak skirting boards



Solid wood doors, which survived both floods



Jim had to carry 30 calves who were housed in pens in the farm yard to save them from drowning.

To the outside of the property:

- Built a robust stone wall around house and farm buildings
- Concrete panels behind farm
- Built a bund in surrounding fields



A robust stone wall around house and farm buildings

- Solid wood gates to be fitted onto metal posts in wall openings with rubber watertight seals to the underneath



Solid wood gates to be fitted to wall openings



Concrete panels behind farm and built a bund in surrounding fields



Dragonfly Boutique in Hebden Bridge

Ladies clothes and accessories
Flooded 2020

Joanne Gas runs an independent boutique selling ladies clothes and accessories in Hebden Bridge.

When Joanne took over the shop three years ago she was aware that it had flooded in the past and decided, in advance of any future floods, to make flood resilient adaptations so that when she did flood, the damage could be limited. Joanne has an incredibly supportive landlord who worked with her on the adaptations.



The flood in February 2020.

Flood recoverable work included:

- A robust slot in steel barrier to the doorway (Joanne acknowledged that this wouldn't keep the water out but would give her time to move her stock to safety).
- The solid floor has porcelain tiles with waterproof grout and adhesive.
- Waterproof plaster to the walls.
- Copper, free standing clothes hanging rails.
- Plug sockets sited higher up walls.
- Solid wood desk and a large table onto which stock can be folded.
- Snake type plastic sacks form a second line of defence to both the stock room and the shop entrance (Joanne said these were useful in helping slow the ingress of water).
- High shelves in the stock room and free-standing solid plastic shelf units. (The bottom shelves can be emptied before a flood.)
- Sealed plastic boxes that contain different clothes sizes, which can be moved but hopefully would withstand the water if she didn't get the time to move them.
- The fridge now stands on a shelf.



Top Tip

Have a plan in place that everyone is aware of, so they know exactly what to do when the flood comes.

The flood in February 2020 came very quickly. Joanne's colleague Bryony, lives in Hebden Bridge and heard the flood siren. She dashed to the shop to put the flood barrier and snake type plastic sacks in place and moved all the stock higher up. Joanne could not get there because the road from her hometown of Todmorden was blocked by flood water. Joanne said Bryony was an 'absolute star' as she knew exactly what to do. Joanne felt extremely lucky compared to others as there was only around 10cm (4") of water in her shop. When the water receded, she, her partner and daughter used a large squeegee to clean the sludge from the floor. **She then steam cleaned the floor and was able to open her shop for business the very next morning!** Joanne strongly believes that more investment should be made into recoverable repair and thinks it is money well spent.



Copper, free standing clothes hanging rails.



Sealed plastic boxes that can be moved or hopefully would withstand the water if she didn't get the time to move them.





Raised fridge in the stock room and free-standing solid plastic shelf units.



A robust 'slot in steel barrier' is fitted before a flood.



Snake type plastic sacks.



Solid floor has porcelain tiles with waterproof grout and adhesive.

Heart Gallery in Hebden Bridge

Brick and stone former chapel Flooded 2009, 2015 & 2020

This business occupies part of a former chapel, built in 1777, so it has probably seen quite a few floods in its time. The last two have occurred during Alison Bartram's occupancy and, given the building's location, more floods are very likely in the future.

Alison's business had only started out in 2006 and she was determined to continue with 'her baby', which had represented both financial and emotional investments. Although the business still had flood insurance, at the time of the flood event of Boxing Day 2015 they discovered that they were under-insured by 12%, which meant that Alison had to fund a shortfall of £20k. In the end this money was well spent, because it meant that all repair works could be designed to make the shop flood resilient. Everything that could be, was salvaged and repaired following the 2015 devastation, including the original solid wood floorboards, some of which were 'upcycled' to make the new counter tops, with the rest being given to a local carpenter for use in other projects. The original hardwood display cabinets also survived and were cleaned and re-coated . Alison stressed that the local community feeling is very strong, with an 'all hands on deck' approach, even from people that were not directly affected but who helped with the cleaning process.





Top Tip

As part of the process of 'stitching themselves back together' the business insisted on supporting local businesses by employing them for the repair work, rather than those suggested by their insurers.

Floor surface is finished with porcelain tiles patterned to mimic floorboards.

The measures taken:

- Floor is now concrete with steel supports and insulation below. The surface is now porcelain tiled, patterned to mimic floorboards.
- All plaster was removed from the walls, which were taken back to bare stone or brick, and then treated with a sealant, followed by a resilient concrete render.
- Counter base and new shelves are made from marine ply and coated with sealant.
- Electrics have been raised.
- Non-return valves (NRVs) were added to all outgoing pipework, including handbasins.
- A 1.2m (4') flood barrier fits into doorway, to deal with low level floods, or buy time for moving contents in more severe events.

An unusual benefit of the refurbishment process was the discovery of additional space, formerly concealed by a false ceiling. This has now become the 'Save Our Stock' (SOS) area, accessed by big ladders and containing lots of boxes, and bubble wrap, ready to accommodate stock in future floods.

The Heart Gallery was flooded again on February 9th 2020 to a depth of 25cm (10'); the water came up through the floor and not through the metal flood door. Thanks to their robust emergency plans, they were able to put all their stock high up onto their 'Save Our Stock Shelves.' The resilient adaptations the Gallery had made enabled them to open again within only 5 days, after thorough cleaning. They reported that they had only minimal redecorating to do; once the salt had come out of the render, they sanded it, used a damp block paint, and then redecorated. Considering their original flood resilient adaptation cost £30k (the original insurance claim for contents alone was £50k), the adaptations have more than paid for themselves in just one flood.





Additional space formerly concealed by a false ceiling has now become the 'Save Our Stock' (SOS) area.



The walls were taken back to bare stone or brick and sealed, followed by a resilient concrete render.



Counter base and new shelving is made from marine ply and coated with sealant.

Element (jewellery) in Hebden Bridge

Brick built terrace of shops
Flooded 2012, 2015 & 2020

Top Tip

The business has a flood plan, which is regularly practised.

Severe flooding affected Hebden Bridge in December 2015, but this business is situated in a dip and so was hit even harder than most – 1.7m (5'6") of water came into the premises.

The destruction far exceeded anything that previous smaller floods had inflicted, although the concrete floor laid down after the 2012 event survived well. The polished surface allowed the proprietor to simply 'sweep out, bleach' and get on with everything else. The aim this time was to create a contemporary retail space with pretty, industrial, flood resilient materials, which has been successfully achieved.

The measures taken:

- Walls were stripped back to the stone or brick and then sealed. Some walls have been left bare and others are rendered with a smooth resilient product, then finished with smooth masonry paint. A feature wall is covered in exterior grade tiles.
- Interior doors are now 'Rainscreen' panels, mounted on stainless steel supports.
- Display cabinets now made from powder coated acrylic, which is washable (formerly MDF).
- Where wood was still needed, marine ply has been used.
- All the electrics have been raised up.
- 'All-in-one' style computers, easily moved, have replaced those that had base units on floor.
- Desks in the office area can be 'cranked up' to standing height.
- Stow away trestles are used to raise soft furnishings, including the sofas that come apart for storage.
- Sump with pump, sited by front door, to remove any water as it arrives.
- Diesel generator, activated by a float switch now sits in its own housing at the rear (this provides power for the pump, heat, light, phones and cleaning equipment needed post-flood until mains supply reconnected).
- The large display windows (3m²) have bracing that can be lowered when needed, to protect the glass from water pressure.
- A dedicated storage area has been created on a mezzanine floor, for flood-related equipment and also to house easily damaged items, such as packaging, during floods.

All the above measures are not only practical, but also mean that the team feels more resilient and able to cope with the emotional strain that comes with a flood.

The company's insurers are so impressed with what has been done that they have still retained flood cover (unlike many businesses in that area), albeit with a considerable excess.

Element Jewellery was flooded again on Sunday February 9th, 2020. The water was just over one foot in depth. Due to their emergency plans and all the resilient adaptations they had made, they lost nothing but a small amount of packaging material! Once they had cleaned up, they were able to open for business just 3 days later.

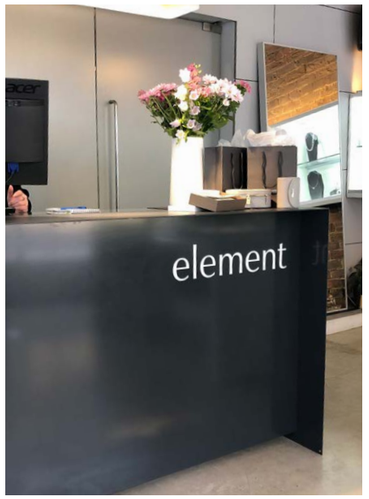




All electric service points are raised above flood level.



Brick wall cleaning.



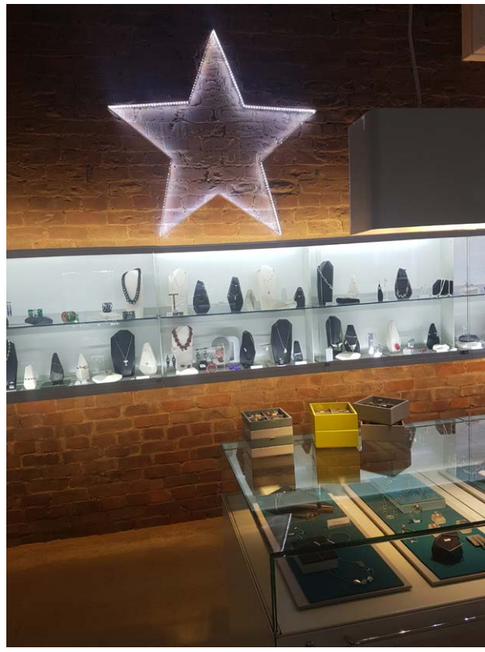
Flood recoverable counter and in the background the interior doors are now 'Rainscreen' panels.



A dedicated storage area has been created for flood-related equipment and easily damaged items.



The display windows have bracing that can be lowered when needed, to protect the glass from water pressure.



Some walls were taken back to bare brick, and sealed.



Stow away trestles are used to raise soft furnishings, including the sofas that come apart for storage.



Display cabinets now made from powder coated acrylic.



Watergate Tea Rooms in Hebden Bridge

17th Century stone building
Flooded 2015 & 2020

The present owner took over this team room business in 2014. To the best of their knowledge, the ground floor of the 17th century building had not previously been flooded, although it was know that the cellar had.

On Boxing Day 2015, the whole of the ground floor was waist deep in flood water and sewage. The power of the water meant that the fridges and freezers had floated in to the central workstation area and electricity feed, knocking it over and bringing down part of the ceiling. When the flood receded, it left around 15cm (6') of silt.

The tea rooms were shut for 4 months whilst drying out and repair work was undertaken. The owner's insurers insisted that repairs were flood resilient and supported them during the process.



Ground floor was concreted and tiled with wood effect ceramic tiles.



Flood barriers to all doors.



Flood recoverable repairs entailed:

- Filling in the cellar with expanding concrete, to give the property a foundation, which it hadn't had before.
- Rewired, so that cables came down the walls, with all sockets raised to high level.
- Ground floor was concreted and tiled with wood effect ceramic tiles, waterproof grout and adhesive.
- Waterproof plaster.
- Window frames replaced with marine ply.
- All kitchen equipment is stainless steel.
- Easy clean white plastic walls, where appropriate.

Resistance measures included:

- Flood barriers to all doors.
- Self-closing airbricks.
- Non return valves as necessary.
- Walls were repointed where necessary and coated with a water proof spray.



Non return valve.

Watergate Tea Rooms was flooded again in February 2020. Thanks to the resilience works, the flood water was only 12cm (4½") deep throughout and covered some lower shelves of storage units, resulting in loss of food/paper goods (it was waist deep in 2015). After thorough cleaning and disinfecting, they were able to open for business again after only 3 days, with little financial loss to goods. No insurance claim was made.



All kitchen equipment is stainless steel.



Walls were repointed and coated with a water proof spray and self-closing airbricks fitted.

Little H café and bar in Hebden Bridge

Old stone built shop
Flooded 2012, 2015 & 2020

Charlotte is the owner of Little H café bar in Hebden bridge, which was flooded in February 2020.

The previous owners had installed a kitemarked flood door, which held back the water and gave them time to move stock to safety, but Charlotte reported that this time, the flood water came in from underneath the vinyl flooring. The previous owners had also installed a stainless-steel kitchen, which survived the floods and only needed a deep clean and disinfection.

Using limited funds and the Government grant, Charlotte made the following changes:

- Laid a stone floor using waterproof grout and adhesive.
- Installed thick wooden skirting boards and gave them several coats of varnish.
- Fitted a new main counter, which is made of varnished scaffolding planks.
- Some walls are stone and can be washed down after any future flood.





Stainless steel kitchen



Main counter made of varnished scaffolding planks.



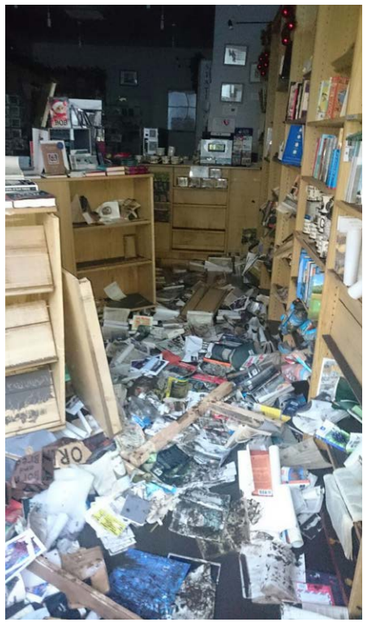
Kitemarked flood door and stone flagged floor.

Book Case book shop in Hebden Bridge

In terrace of shops Flooded 2011/12, 2015 & 2020

The business owner has been flooded twice, with the owner ruefully admitting that they thought the 2011/2012 event, when 1.2m (4') of water entered the shop, was the worst that could happen.

Sadly, 2015 saw around 2m (6') of water engulf stock on tables, the sales counter and all but the highest shelves. Their insurance paid for the repairs after the first flood but the business was unable to obtain any flood insurance afterwards, so the 2015 event saw them retain everything that could be salvaged, which was extremely hard work but worth the effort. They were then determined to do everything possible to avoid or reduce damage as far as possible in any future floods, so they took advice from a knowledgeable local builder, who happened to be a friend of the family.



The 2015 flood saw around 2m (6') of water engulf stock.

Resistance measures to keep the water out:

- External flood barrier which couples up as the shop signage and can be lowered down.
- Powerful sump pump with automatic float switch to remove water as soon as it enters.
- Flood resilient front door.

Flood recoverable methods, in case the water still manages to get in:

- Concrete flooring, finished with composite tiles.
- Walls have been taken back to the bare brick, sealed, then finished with painted marine ply which looks like ordinary wood, but can be removed, washed and disinfected and then put back.
- Plastic door architraves.
- Raised electrics.
- A diesel generator is kept on higher ground at the rear of the property, which will supply power for lighting and cleaning when the flood water has receded and the mains power is still off.
- Wall shelves fold up, and legs are inserted to create tables for storing stock from lower levels.
- NRV on sewage system.
- Business flood plan.







Book shelves fold up, and legs are inserted to create tables for storing stock from lower levels.

The Bookcase was flooded again to a depth of 20cm (8") in February 2020. The owners described this as being 'much better' than the last flood, which was 2m (6') deep. Unfortunately though, their pump stopped working and they believe they would not have lost any stock had this not happened. The shop now has a maintenance plan in place to check that the pump will work properly next time. They lost some lower level stock and a computer (total cost estimate approx. £2,500). After intensive cleaning, they were able to re-open the shop within a week but kept the dehumidifiers running for a month.





Concrete flooring, finished with composite tiles.



Plastic door architraves.

Sue, Hairdresser in Mytholmroyd

Old stone built shop Flooded 2012, 2015 & 2020

Sue owns a hairdressing business and has rented her salon for 38 years. During this time, she has suffered from three significant floods: June 2012, December 2015, and February 2020.

After the flood of 2012, which was around 1m (3') deep, Sue noticed that her business recovered quite quickly and believes that this was because she had solid wood cladding on the walls (which were coated in Yacht varnish) and so she was able to wash down and reuse it. After this flood Sue installed flood barriers to the front and back doors.

The flood of December 2015 was over 2m (6') deep and the flood barriers were overtopped. Unfortunately the barriers worked so well in reverse that they kept the water inside the building after the flood had receded outside!



The pressure of the flood water inside caused the windows to blow outwards when the flood receded.





The pressure from this caused the windows to blow outwards. Sue says she was incredibly lucky, as a nearby hairdressers that had not flooded, allowed her to run her business from there. Had she not been able to do that, she would have had no income for the 9 months it took to repair her salon. The insurance bill was about £30,000 and sadly after this flood, Sue was unable to obtain any flood insurance.

After the 2015 flood Sue and her landlord, who was very supportive, decided that the only way forward was to build back better and make the salon resilient for future floods. Her landlord paid for the building works and Sue financed all the internal fittings, which came to approximately £8,000.



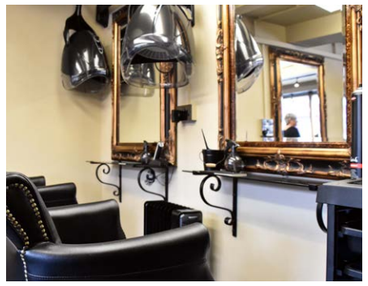
A plastic kitchen was installed.



Stone flagged floor and the walls have a plastic membrane from floor to ceiling, with cement render over the top.

The measures taken were:

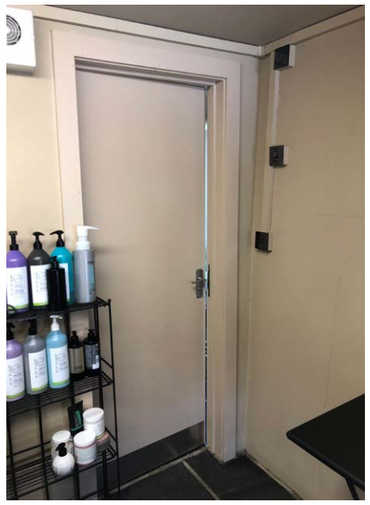
- Stone flagged floor, using waterproof adhesive and grout.
- The walls had plastic membrane from floor to ceiling, with cement render over the top.
- Waterproof paint was used on the walls (the same kind of paint that is normally used externally).
- Non-return valve fitted to the drains.
- A plastic kitchen was installed.
- Plastic door architraves and cheap, sacrificial doors.
- All internal fittings were either reinforced glass (for the shelving), steel or plastic.
- The waiting area chairs are metal garden chairs.
- Sacrificial upcycled furniture.
- Plug sockets sited 1.2m (4') up the walls.
- Hairdryers attached high on the walls.
- Electric meter and fuse box sited high up.
- Plastic mirrors.



Hairdryers high on the walls and plastic mirrors.

The flood of February 2020 happened on a Sunday. Sue was able to power wash everything and put industrial strength dehumidifiers and a powerful gas heater in place, which enabled her to open for business again at 9am on the following Friday. Sue had no insurance - but did have a savings fund to put towards flood damage recovery. Her only losses were lower level stock, (which she was unable to move due to the flood arriving very quickly) the waiting chair cushions and her second-hand reception desk; The total bill for her losses came to under £1,000!

Sue is now a firm believer that adapting a property to enable it to recover quickly from a flood is the 'way to go' and encourages everyone at risk to do the same!



Plastic door architraves and cheap, sacrificial doors.



Electric meter and fuse box sited high up.



Sacrificial upcycled furniture.

Vegan bar in Hebden Bridge

Vegan restaurant
Flooded 2015, 2017 & 2020

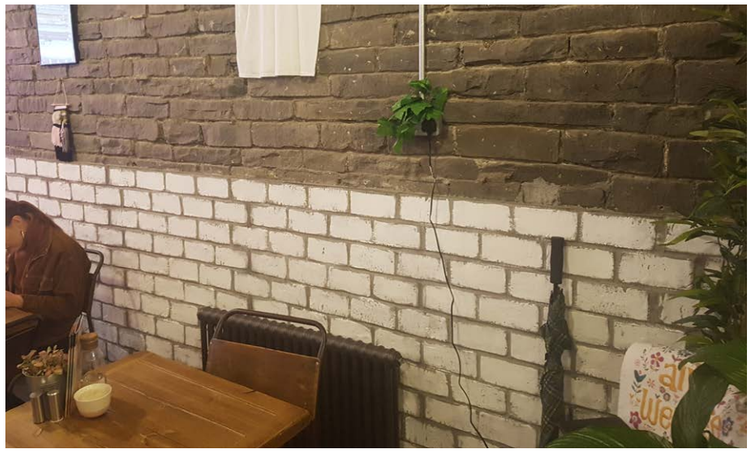
These premises were known to have been previously flooded, as recently as 2015, when the current proprietor took over in 2017.

As part of the works required to make the building suitable for a catering business, flood resilience measures were included. This decision was taken because it would allow the business to recover quickly from a flood, whilst also ensuring that flood insurance was obtainable (quite rare in the area).



Work surfaces, bar and serving counter are concrete.





Walls stencilled and painted to resemble tiling.

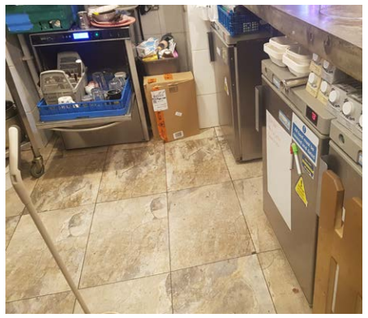
The measures taken:

- All floors are now solid concrete with a membrane underneath, and sealed to allow it to be wiped down.
- Walls - membrane extends from under the floor to one metre up the wall, then concrete coated and painted to resemble tiles.
- All the work surfaces, bar and serving counter are concrete.
- Kitchen is stainless steel and can be hosed down.
- Kitchen floor has tiles, affixed with waterproof adhesive and finished with waterproof grouting.
- Electrical sockets have been raised.
- Window replaced with a new one, with concrete below it.

The business also has flood barriers for the doorways.



Waterproof membrane during installation.



Tiled kitchen floor with waterproof adhesive and grout.

The builder who installed the recoverable repair has confirmed that the bar was open for business in less than a week after being flooded again in February 2020!



Kitchen is stainless steel and can be hosed down.

Boat House in Yalding

Wooden constructed pub
Flooded 2000

The Boat House pub has flooded on quite a few occasions, but it is not possible to adapt the property because it is a listed building.

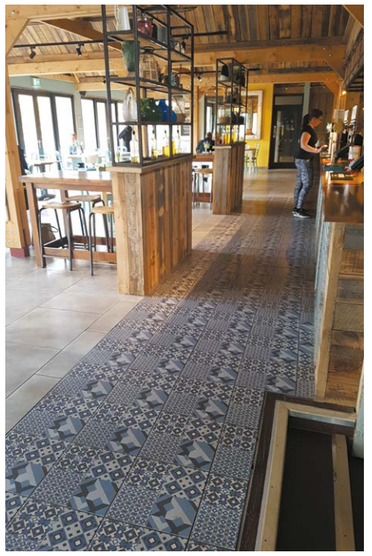
In the face of this restriction, a new extension has been built at a raised level.

Flood recoverable repairs entailed:

- The floors have all been tiled.
- The fixtures are made of old reclaimed wood, which can be washed and salvaged.
- The walls have waterproof plaster.
- Plug sockets are sited higher up the wall.
- Flood barriers to all the doors, which are fitted on receipt of a flood warning.
- Large permeable paved area outside.



The floors have all been tiled.



The floors have all been tiled.





Large permeable paved area outside.



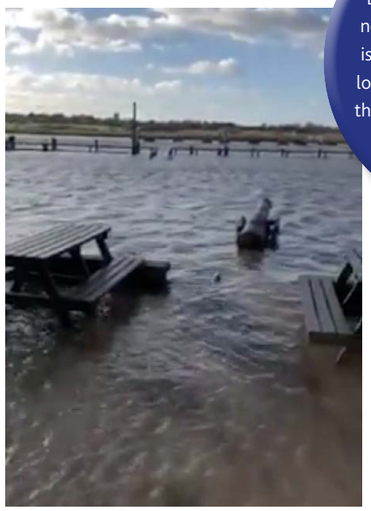
The fixtures are made of old reclaimed wood, which can be washed and salvaged.

The Harbour Inn in Southwold, Suffolk

Old fisherman's pub Flooded 2013 & 2019

The Harbour Inn is below sea level and floods regularly, especially during the months of October- February. Nick Attfield, who is the area manager for the local brewery told me how he manages that risk. The Inn flooded in 2019 and because of the plans he has in place, was able to open the next day.

The tidal surge of 2013 flooded the lower bar quite deeply and even then, they were only shut for 4/5 weeks whilst it dried out. Nick relies heavily on Environment Agency flood warnings and said they were incredibly accurate, especially telling him how deep the water will get. He also finds the app 'the National Tidal & Sea Level Facility' very useful. The kitchen is at the lowest point, so armed with this knowledge and years of experience, Nick can decide whether to move kitchen equipment to a higher part of the inn, or move everything in to his brewery van to take it to a safe place. Then it's all hands on deck to deep clean the inn and get ready to open again.



The Inn flooded in 2019 and because of the plans it has in place, was able to open the next day.

Top Tip

Experience has taught Nick to not try to keep the water out; it is too powerful and can cause a lot of damage. Now, he prepares the inn and lets the water flow in and then out again.





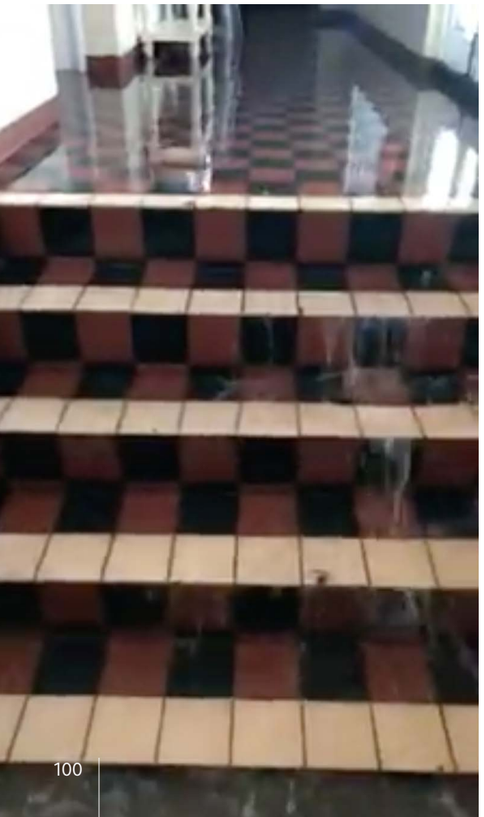
The first few steps can be easily removed to make space for moving kitchen equipment to a higher part of the Inn.

So, what has Nick done?

- The inn has tiled floors that can be washed down. Any tiles that 'pop out' are easily relaid and grouted by a local tradesman.
- The bar is made of marine ply.
- The tables and seating are made of hardwood and can be hosed down.
- All kitchen equipment is on wheels and can be moved easily. Some are also sited on crates so that in a lower flood, they don't need moving.
- The electricity and gas supply are high up and can be easily turned off and back on.
- The toilets are all tiled and can be washed down afterwards.
- They have their own sewage treatment system and are treated as top priority by a local company, who will come and empty it at short notice to prevent it 'backing up'.

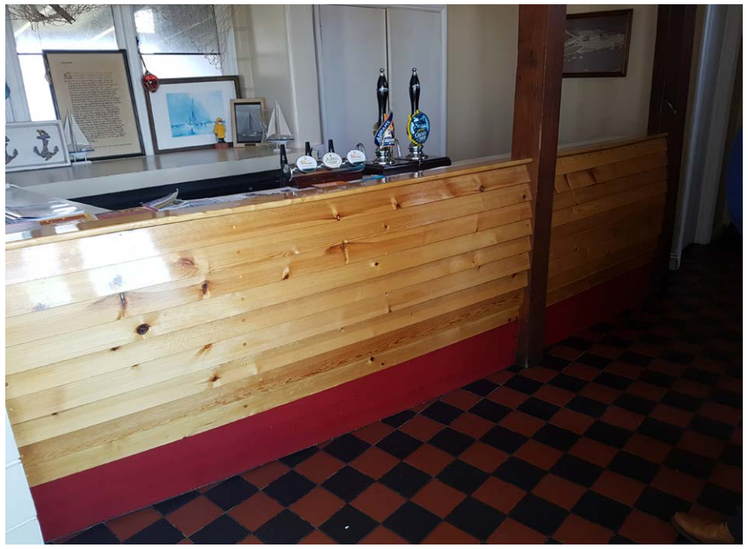
Nick has worked with the Brewery Insurance company and has managed to retain flood insurance. He agreed to pay a percentage of every flood claim, which incentivises him to do everything possible not to make a claim. He hasn't made an insurance claim in over six years!

Nick just prepares the Inn and lets the water in and then he lets it out.

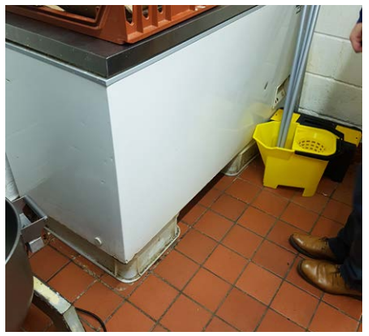




The tables and seating are made of hardwood and can be hosed down, as can the tiled floor.



The bar is made of marine ply.



Some kitchen equipment is sited on crates.



Kitchen equipment is on wheels and can be moved easily.



The electricity and gas supply are high up and can be easily turned off and back on.



The toilets are all tiled and can be washed down.

Shared office block in central York

Modern office building
Flooded 2015

The River Foss is only 10 metres away from this office block complex and underground car park.

It is shared by more than a dozen different companies and was flooded to a depth of 30cm (1') in the internal lobby and lift areas, during Storm Desmond in December 2015. Maclaren Loss Adjusters and Quantum Survey & Project Management oversaw the reinstatement works on the building. Following advice from the Association of British Insurers, they decided to reinstate the building to make it resilient to future flooding. They were able to utilise government grants, that each individual tenant was able to apply for, to help future proof the offices and car park.





Flood barriers to all doors and UPVC door architraves.



Recoverable work included:

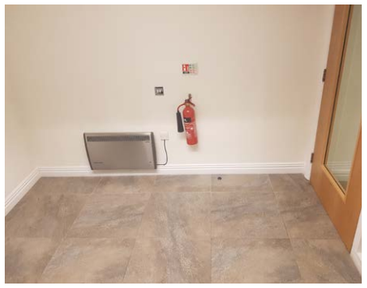
- Replacing entrance lobby floors with non-slip ceramic tiles, adhered with waterproof adhesive and grout.
- UPVC skirting boards.
- UPVC door architraves.
- Raised fused spur for heating systems, with wiring coming down from the floor above.
- The lower section of walls was re-plastered using a breathable renovating plaster instead of standard plasterboard.
- Two puddle pumps to help with the removal of water, if needed in the future.

Resistance measures include

- Flood barriers to all the lift entrances.
- Flood barriers to all the doors.
- Flood barriers fitted around the cooling system plant.
- Non-return valves to drains.



Two puddle pumps to help with the removal of water.



The lower section of the wall was re-plastered using a breathable renovating plaster.



Flood barriers to all the lift entrances.



UPVC skirting boards.

Red Tower Community Centre in York

Part of York City walls
Flooded 2015

The Red Tower is a community centre, part of York's city walls and is grade 1 listed.

It is run by a community interest company, who hold events to provide cooked meals for those that are struggling, with food being donated by local supermarkets. They also run events during the school holidays, to ensure that those children who are entitled to free school dinners, can gain access to a good meal.

As the tower is very old, it has suffered lots of flooding, but Boxing Day 2015 saw flood water rise to a height of 1.5m (5'). As a result, the CIC decided to employ the services of a specialist local architect to make it flood resilient and use it as an example of what can be achieved.

- Walls that have survived previous floods are left bare brick.
- Floors covered with self-levelling screed and coated with floor paint.
- Eco concrete work tops made from recycled material.
- Removable free standing kitchen units on wheels.
- Steel staircase with powder coated finish.
- Glazed sliding door/screen in powder-coated steel.
- Staircase treads in solid oak.
- WC enclosure constructed in metal studwork and clad in fibre cement boarding. Door is fabricated in powder coated steel also.
- Storage cupboard clad in fibre cement boarding.





IMAGE: BARRY BECKWITH

- Sockets, switches and electrical fixtures and fittings moved to high level. All cabling now housed in conduits and feeds down from above, to a minimum height of 1.4m above ground level. Electric sockets, switches and electrical fixtures such as water boilers fitted at that level also.
- Non-return valve fitted to external inspection chamber to prevent the backfilling of waste pipe/wc pan further up the system in the event of a flood.
- New window frames are in oak.



Glazed sliding door/screen in powder-coated steel.



IMAGE: KENNY BROWN

Removable free standing kitchen units on wheels.



Raised electrics with with drops from ceiling level.



IMAGE: KENNY BROWN

Steel staircase and solid oak treads.

floodmary.com



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