Flood Risk Assessment

To accompany a planning application for a replacement dwelling at

12 Inkerman Road, Eton Wick, Berks, SL4 6LE

Prepared by

Dr Robin Saunders CEng

Innervision Design Ltd

Note regarding sub-floor voids added October 2023

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Disclaimer

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1 Executive Summary

A The proposal is for a replacement dwelling and this is minor development;

B The site lies in Flood Zone 2 and is at a Low residual risk from ground water and reservoir flooding;

C The proposed 2 storey dwelling will provide all sleeping accommodation at first floor level;

D The proposed floor level will be raised circa 400mm above the existing dwelling's ground floor levels;

E Flood resilience and mitigation methods will be implemented on site;

F Safe access/egress routes are not affected and immediately available;

G The site will be signed up to flood warning schemes;

H There is no documented evidence of flood risk from any other sources;

I The development does not impact on flood risk elsewhere;

J Assuming the mitigation, warning and evacuation procedures can be maintained over the lifetime of the development, the proposed minor development to replace a bungalow with a two storey dwelling is considered both acceptable and a significant betterment in occupant safety.

Client actions required

I Sign up to flood warning schemes.

II Complete an emergency flood plan.

Designer actions required

1 Ensure plans and specification incorporate flood resilience and resistance measures prior to submission.

2 Confirm the design intention to manage surface water at source in line with current best practice.

2 Introduction

2.1 Site location

The project is at 12 Inkerman Road, Eton Wick, Berks. SL4 6LE (see Figure 1).

Figure 1: Site location plan, as indicated with North topmost. (source: open street map

2.2 Development description

The proposal is for a replacement dwelling not exceeding 250m^2 in footprint. The site is an existing developed site and the proposed work is classed as minor development. All plans as submitted under separate cover.

2.3 Site geology

Geological mapping data from within the vicinity indicate Shepperton Gravel Member - Sand and gravel, however this would require confirmation on site. If available on site, the superficial deposits will offer potentially medium to good permeability. Infiltration SuDS may therefore be viable (subject to site testing).

3 Policies

In preparation for this Flood Risk Assessment (FRA), National Planning Policy Framework[5] and British Standards on Assessing and Managing Flood Risk[2] were reviewed, and their related policies are, where applicable, referred to in this report.

The Environment Agency has been consulted in order to establish the flood zone of the proposed site.

In addition, planning policies from the Local Authority were also reviewed including its Strategic Flood Risk Assessment.

3.1 Sequential test

Given the application is for a replacement dwelling the sequential test does not apply.

3.2 Vulnerability

The vulnerability class remains “More Vulnerable”.

4 Flood risk analysis

4.1 Sources of potential flooding

Flood risk from various sources at the site is analysed in this section.

4.1.1 Flood risk from sea and rivers

Flooding can occur from the sea due to a particularly high tide or surge, or combination of both.

The site is not at risk from tidal flooding.

Flooding can also take place from flows that are not contained within a river channel due to high levels of rainfall in the catchment.

With reference to the Environment Agency Flood Map, Figure 2, the site lies in Flood Zone 2. This means that the site has a Medium probability of fluvial flooding (between a 1 in 100yr and 1 in 1000yr annual probability of fluvial flooding).

Figure 2: Flood mapping from the EA online data. The site falls within Flood Zone 2

Historic flooding

The site is shown to lie in an area of historic flooding as indicated in Figure 3.

Figure 3: Historic flood mapping from the EA online data. The site falls within an area of historic flooding

4.1.2 Flood risk from groundwater

Groundwater flooding occurs when water levels in the ground rise above surface levels. It is most common in low-lying areas underlain by permeable rock (aquifers), usually due to extended periods of wet weather. The site's geology is classified as having a very High (>75%) susceptibility to groundwater flooding.

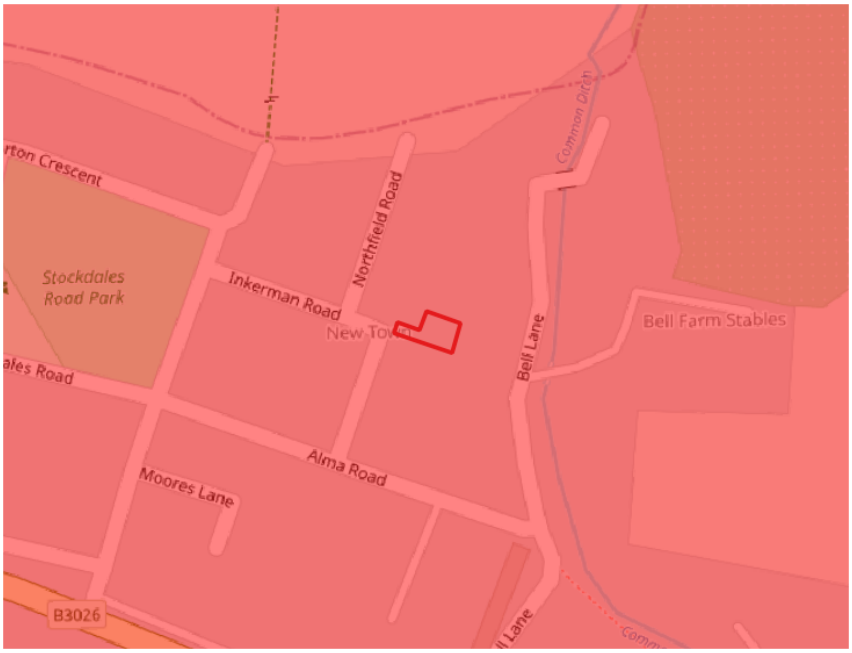

Figure 4: Susceptibility to ground water flooding. The site falls within an area at high risk

Since the proposed development does not involve any basement elements, the impact of groundwater flooding on the proposed site will be minimal. Hence, the risk of groundwater flooding on the proposed site can be considered to be Low.

4.1.3 Flood risk from sewer and highway drains

Flooding occurs when combined, foul or surface water sewers and highway drains are temporarily over-loaded due to excessive rainfall or due to blockage.

There are no indicators to Sewer flooding at the site.

Hence, the risk of sewer and highway flooding to the proposed site can be considered to be Low.

4.1.4 Flooding risk from surface water

Flooding occurs when rainfall fall on a surface (on or off the site) which acts as run-off which has not infiltrated into the ground or entered into a drainage system.

With reference to the E.A online mapping, RoFSW, Figure 5, the site is not at risk from surface water flooding.

Figure 5: SW flood extent mapping.

4.1.5 Flood risk from infrastructure failure

Flooding occurs because of canals, reservoirs, industrial processes, burst water mains or failed pumping stations.

The site is shown to be at flood risk due to reservoir failure in the event that it was to coincide with a fluvial flood event, as indicated by the hatched areas in Figure 6.

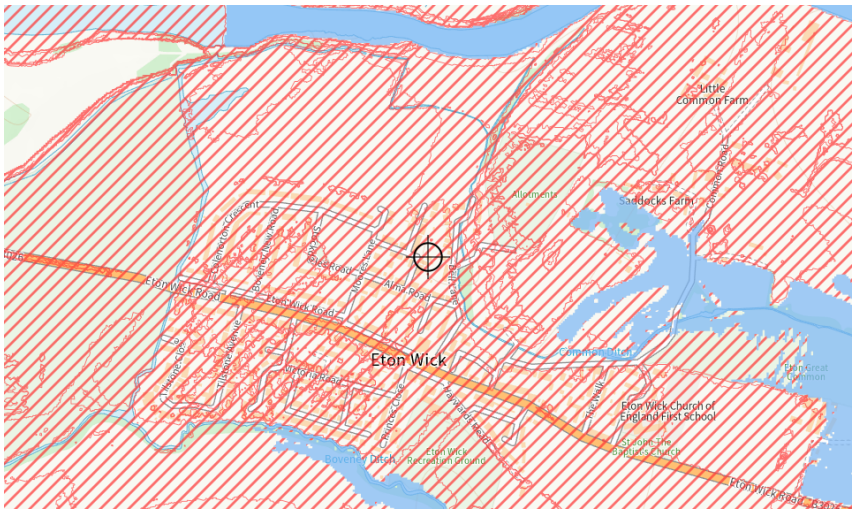

Figure 6: Flood risk from reservoir flooding. The site is shown to be at risk in the event that reservoir failure coincides with a fluvial flood event. (Source: EA flood mapping)

However the EA have previously stated that:

> "Reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers. As the enforcement authority for the Reservoirs Act 1975 in England, we ensure that reservoirs are inspected regularly and essential safety work is carried out."

Hence the flood risk to the site from reservoir failure is considered to be Low.

4.1.6 Urban flash flooding

With reference to the UFF dataset there are no referenced flash flood incidents at this location.

4.2 On-site surface water analysis and management

4.2.1 Generation of Run-off

The post-development surface water run-off volume will increase when compared to the pre-development level because there is an overall reduction in permeable areas.

Hence all additional surface water arising will require management on site in line with current best practice.

4.2.2 SuDS Statement:

Surface water will be managed in full alignment with the SuDS hierarchy as required under provisions made under the Town and Country Planning Act 1990.

While not required for Planning permission consent it can be confirmed that all SW on site will be also be designed, installed and tested in full accordance with Part H of the Building Regulations 2010 (as amended 2013), Requirement H3, as made under the Building Act 1984.

Shallow soakaways may be viable given the expected ground conditions associated with the local geology hence the recommendation of this report would be to adopt the use of soakaways and water butts as a viable and proportionate SuDS solution on site.

4.3 Impact on flood risk elsewhere

4.3.1 SW arising

Since the proposal is intending to manage any additional surface water at source the impact on flood risk elsewhere is Low.

4.3.2 Volumetric displacement

The site is in future Flood Zone 3 once climate change allowances have been applied hence flood compensation storage volume is required. Section 5.6 provides details of the provision.

5 Levels

5.1 Climate change allowances

With reference to Figure 7, the revised climate change allowance for this site is +35%.

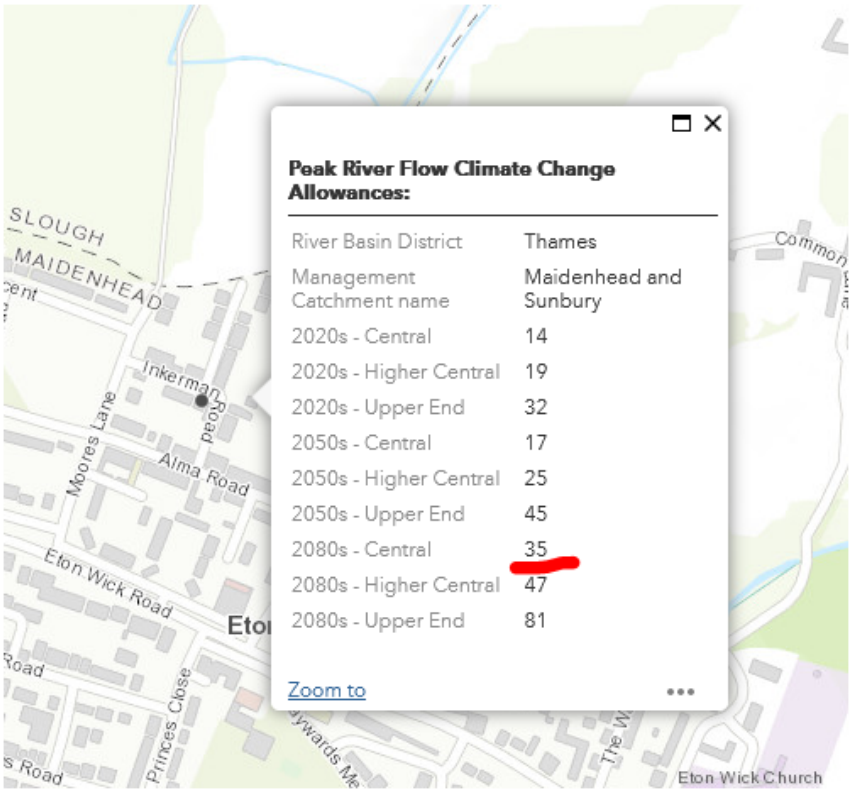

Figure 7: Revised climate change allowances

5.2 Flood level data

The flood data is extracted from the River Thames fluvial data as provided under a "Product 6" FOI request to the EA.

With reference to the nodes as shown in Figures 8 and 9, Table 1 provides the flood level data.

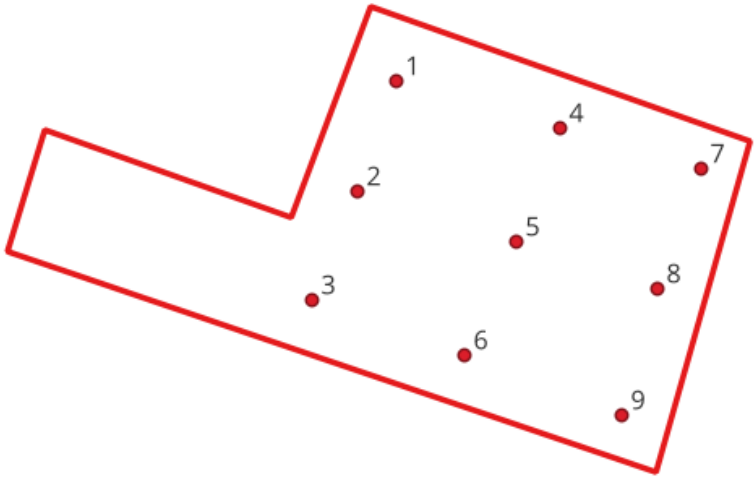

Figure 8: Site nodes

Figure 9: Site nodes relative to the existing

Node	Q 100yr + 35% flood level	Q 100yr + 35% flood depth
1	21.05	0.30
2	21.05	0.30
3	21.05	0.27
4	21.04	0.30
5	21.04	0.34
6	21.04	0.26
7	21.04	0.32
8	21.04	0.23
9	21.03	0.30

Table 1: Undefended flood levels, m AoD, and depths, m, for the design period 1 in 100yr +35% CC flood event.

5.3 Ground level

Ground level at the site is circa 20.8m AOD

5.4 Floor level data

The proposed floor level will be raised circa 400mm above the existing dwelling's ground floor levels.

Ideally the FFL should be 21.35m AOD however site and planning constraints and considerations may not allow this.

5.5 Sleeping accommodation

The existing dwelling is a single storey bungalow with ground floor only sleeping accommodation.

The proposed 2 storey dwelling offers a significant improvement in occupant safety with all proposed sleeping accommodation at first floor level.

5.6 Sub floor void

The proposal is to use a sub-floor void to mitigate against loss of flood plain capacity.

The following now forms part of the design:

1. A secured and open sub-floor void will be provided below the entire building.
2. The openings to the void will extend from the existing ground level of circa 20.8m AOD to full soffit height.
3. The soffit of the void will be set no lower than 21.05m AOD with a floor construction thickness of no less than 300mm.
4. There is a 1m of opening to the void for every 5m linear length of wall.
5. The incorporation of 10mm diameter bars at 100mm spacing will secure the void openings.
6. Access "gates" will also be provided to allow ongoing maintenance to ensure the void remains open of the lifetime of the development.

6 Management of flood risk

6.1 Flood risk resilience measures

Because the site is located in an at risk area, and if floor levels cannot be raised 300mm above design flood level of 21.05m AOD it is a recommendation of this report that, in line with current best practice[4], flood risk resilience measures should be incorporated into the development's construction, specifically at ground floor and all construction below such that "the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment"[5].

Given the proposal is for a replacement dwelling then for the purpose of the following the estimated flood level of circa 20.6m AOD is used as a reference level.

The Government's guidance states:

The design should be appropriately flood resistant and resilient by:

- using flood resistant materials that have low permeability to at least 600mm above the estimated flood level;
- making sure any doors, windows or other openings are flood resistant to at least 600mm above the estimated flood level;
- using flood resilient materials (for example lime plaster) to at least 600mm above the estimated flood level;
- by raising all sensitive electrical equipment, wiring and sockets to at least 600mm above the estimated flood level;
- making it easy for water to drain away after flooding such as installing a sump and a pump;
- making sure there is access to all spaces to enable drying and cleaning;
- ensuring that soil pipes are protected from back-flow such as by using non-return valves.

In accordance with the document "Improving the Flood Performance of New Buildings - Flood Resilient Construction"[3] a series of design approaches should be planned to mitigate the flood risk based on the flow chart as at Figure 10.

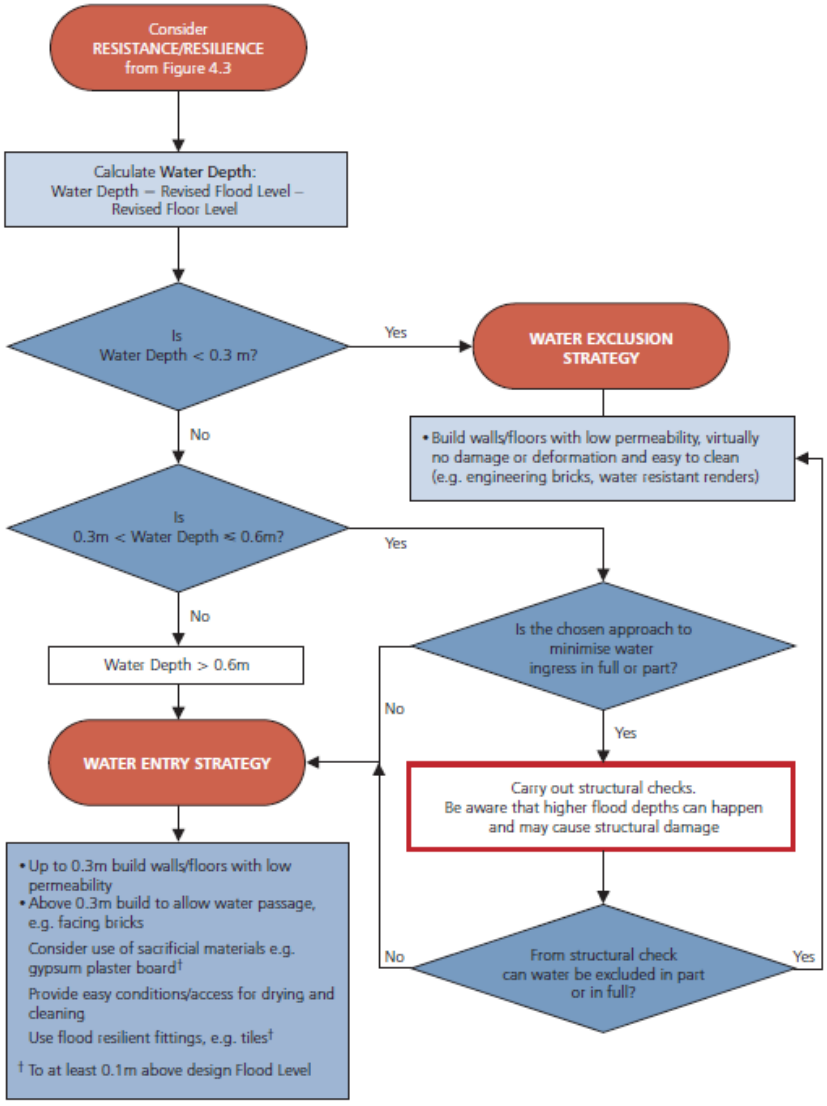

Figure 10: Design strategies for resistance and resilience[3]

Table 2 provides guidance on which materials are most suitable, suitable and unsuitable, when considering construction work involved in this project. This report recommends the use of materials from the "most suitable" column were this is at all possible on site, however they are not mandatory requirements.

Component	Most suitable	Suitable	Unsuitable
Flooring	Concrete, pre-cast or in situ	Timber floor, fully sealed, use of marine plywood.	Untreated timber, Chipboard
Floor Covering	Clay tiles, Rubber sheet floors, Vinyl sheet floors	Vinyl tiles, Ceramic tiles	
External Walls - to max flood level	Engineering brick, Reinforced concrete	Low water absorption brick	Large window openings
Doors	Solid panels with waterproof adhesives, Aluminium, plastic or steel	Epoxy sealed doors	Hollow core plywood doors
Internal Partitions	Brick with waterproof mortar, Lime based plasters	Common bricks	Chipboard, Fibreboard panels, Plasterboard, Gypsum plaster
Insulation	Foam or closed cell types	Reflective insulation	Open cell fibres
Windows	Plastic, metal	Epoxy sealed timber with waterproof glues and steel or brass fittings.	Timber with PVA glues and mild steel fittings

Table 2: Summary of Material Suitability for Building Components[1]

6.2 Flood mitigation measures

The designer is also recommended to consider the provision of a combination of the following flood mitigation measures, to be installed if at all practicable, for use within and around the extension for use in any flooding event:

- Flood resilient doors: Specifically designed to prevent ingress of flood water - passive system (see also Figure 11).
- Door defence: Bespoke barriers fitted externally across doors and low windows and/or the provision of filled sandbags (see also Figures 12 & 13).

- Anti flood air bricks: Where these are unavoidable, these offer replacements for standard air bricks these prevent water entering the sub floor void - passive system i.e. fully automatic (see also Figure 14).
- Air brick and flue covers (see also Figure 15).
- No service penetrations or other openings (cat flaps and letter boxes included) below 1m above FFL.

Figure 11: UPVC doors under flood conditions. These appear to offer reasonable flood resilience

Figure 12: Flood gate example.

Figure 13: Sand bag defence.

Figure 14: Anti flood air brick. Example from CSI products

Figure 15: Air brick covers. Example from Buffalo products

7 Management of residual risk

Any residual risk can be safely managed by not impairing access and evacuation routes, signing residents up to flood warning schemes and preparation of domestic flood plans.

7.1 Safe access and egress routes

The NPPF stipulates that, where required, safe access and escape routes should be available to/from new developments in flood risk areas. Access routes should be such that occupants can safely access and exit buildings in design flood conditions. The replacement dwelling does not impact on existing access and egress routes which are immediately available (ref Figure 16).

Figure 16: Access and Egress routes are existing and not impacted by the proposal.

7.2 Flood warning schemes

Since it has been established that the site is sited in an area with a possibility of flooding the owners of the dwelling should (if they have not done so already) sign up to the E.A. "Flood Warnings Direct" which is a free service providing flood warnings by phone, text or email. See `https://www.fws.environment-agency.gov.uk/app/olr/register`, or call the E.A. on 0345 988 1188 for full information.

7.3 Flood Plan

The project team will also provide the owners of the dwelling with a proforma Flood Plan (See Appendix A for an example). The plan will provide guidance on emergency

response procedures in the event of flooding to the site. This will:

- Provide details of who to contact and how;
- Provide details of how to turn off gas, electricity and water mains supplies;
- Provide details of designated safe egress routes out of the building and out of the local area at risk;
- Provide details of E.A. Flood warning codes;
- Provide details of local radio stations
- Provide a check list of essential items.

8 Conclusions

Given that:

- The proposal is for a replacement dwelling and this is minor development;
- The site lies in Flood Zone 2 and is at a Low residual risk from ground water and reservoir flooding;
- The proposed 2 storey dwelling will provide all sleeping accommodation at first floor level;
- The proposed floor level will be raised circa 400mm above the existing dwelling's ground floor levels;
- Flood resilience and mitigation methods will be implemented on site;
- Safe access/egress routes are not affected and immediately available;
- The site will be signed up to flood warning schemes;
- There is no documented evidence of flood risk from any other sources;
- The development does not impact on flood risk elsewhere;

and assuming the mitigation, warning and evacuation procedures can be maintained over the lifetime of the development, the proposed minor development to replace a bungalow with a two storey dwelling is considered both acceptable and a significant betterment in occupant safety.

Signed: 

Dr Robin Saunders CEng, C. Build E, MCABE, BEng(Hons), PhD

Date: 10th October, 2023

References

[1] J Wingfield; M Bell; P Bowker. Improving the flood resilience of buildings through improved material, methods and details. Technical Report WP2c, CIRA, 2005.

[2] BSI. BS 8533:2011. Technical report, 2011.

[3] CIRIA, CLG, EA and DEFRA. Improving the flood performance of new buildings. Flood resilient construction, 2007.

[4] D Kelly, M Barker, J Lamond, S McKeown, E Blundell, and E Suttie. Code of practice for property flood resilience. Technical report, CIRIA, 2020.

[5] Ministry of Housing, Communities and Local Government. National planning policy framework. 2021.

A Emergency flood plan (example)

Personal flood plan

Name

Environment Agency

Are you signed up to receive flood warnings?
If not call Floodline on 0345 988 1188 to see if your area receives free flood warnings.

Let us know when you've completed your flood plan by calling Floodline on **0345 988 1188**.
This will help us learn more about how people are preparing for flooding.

General contact list	Company name	Contact name	Telephone
Floodline	Environment Agency		0345 988 1188
Electricity provider			
Gas provider			
Water company			
Telephone provider			
Insurance company and policy number			
Local council			
Local radio station			
Travel/weather info			

Key locations

Service cut-off	Description of location
Electricity	
Gas	
Water	

Who can help/who can you help?

Relationship	Name	Contact details	How can they/you help?
Relative			
Friend or neighbour			

Be prepared for flooding. Act now

Personal flood plan

What can I do NOW?

Environment Agency

- Put important documents out of flood risk and protect in polythene ☐
- Check your insurance covers you for flooding ☐
- Look at the best way of stopping floodwater entering your property ☐
- Make a flood plan and prepare a flood kit ☐
- Find out where you can get sandbags ☐
- Identify who can help you/ who you can help ☐
- Identify what you would need to take with you if you had to leave your home ☐
- Understand the flood warning codes ☐

What can you do if a flood is expected in your area?

Actions	Location
Home	
• Move furniture and electrical items to safety	
• Put flood boards, polythene and sandbags in place	
• Make a list now of what you can move away from the risk	
• Turn off electricity, water and gas supplies	
• Roll up carpets and rugs	
• Unless you have time to remove them hang curtains over rods	
• Move sentimental items to safety	
• Put important documents in polythene bags and move to safety	
Garden and outside	
• Move your car out of the flood risk area	
• Move any large or loose items or weigh them down	
Business	
• Move important documents, computers and stock	
• Alert staff and request their help	
• Farmers move animals and livestock to safety	
Evacuation - Prepare a flood kit in advance	
• Inform your family or friends that you may need to leave your home	
• Get your flood kit together and include a torch, warm and waterproof clothing, water, food, medication, toys for children and pets, rubber gloves and wellingtons	

There are a range of flood protection products on the market to help you protect your property from flood damage. A directory of these is available from the **National Flood Forum** at **www.bluepages.org.uk**

Be prepared for flooding. Act now

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