

Flooding as an emerging risk

Recent events have driven flooding up the political and risk management agenda. Developers need to understand the now stringent planning restrictions associated with flood risk, to inform site acquisition and improve building designs, warns Dr Justin Butler, Managing Director of Ambiental (www.ambiental.co.uk)

The introduction of Planning Policy Statement 25: Development and Flood Risk (PPS25) in December 2006 made flood risk a material consideration for any planning application. Despite this many property developers, architects and planning consultants are still unclear of the wider implications and practical considerations of PPS25. The requirements of PPS25 mean that flood resilient design will need to be achieved, and certain types of development will not be permitted on high risk sites.

Following the flood events of summer 2007, the Environment Agency (EA) and Local Planning Authorities have become more thorough in their analysis of new developments, often asking for information above and beyond that required by PPS25. Understanding the issues that may affect the progress of your development will reduce any associated financial risk.

Current Legislation

PPS25 falls in line with the Government's planning objectives; to promote sustainable patterns of development, to avoid flood risk and to accommodate the impacts of climate change. Its aim is to ensure that flood risk is taken into account at all stages in the planning process, so as to avoid inappropriate development in areas at risk of flooding and to direct development away from areas at highest risk.

Through the implementation of planning strategies at a variety of scales, sustainable development can be delivered through the successful appraisal, management and reduction of risk. Over wide areas, Regional Flood Risk Appraisals (RFRAs) or Strategic Flood Risk Assessments (SFRAs) define and inform the management of risk through policies that steer developments away from areas at risk of flooding. The reduction of risk is achieved through appropriate location, layout and design specifications, often at the site-specific Flood Risk Assessment (FRA) stage.

Flood Risk Zones

PPS25 sets out a sequential risk-based approach for determining the suitability of land for development in flood risk areas. The Sequential and Exception Tests are used by Local Planning Authorities to demonstrate the suitability of the development at the site.

The EA have defined the following flood zones, based on the modelled extent of different probability flood events:

Flood Zone 1: Low Probability of Flooding
Flood Zone 2: Medium Probability of Flooding
Flood Zone 3a: High Probability of Flooding
Flood Zone 3b: The Functional Floodplain

The Functional Floodplain refers to land where water has to flow or be stored in times of flooding; land in this zone is frequently flooded.

The Sequential Test should be applied to demonstrate that there are no available sites in areas with a lower probability of flooding, appropriate to the type of development proposed. SFRAs refine information on the probability of flooding, taking into account multiple sources of flooding and climate change. As such SFRAs can be used by the Local Planning Authority to apply the Sequential Test. If the Sequential Test shows the development cannot take place within areas outside of Flood Zones 2 and 3, then the exception test should be applied.

The Exception Test provides a method of managing flood risk, while still allowing necessary development to occur. One of the requirements of the Exception Test is that the site lies on developable or previously developed land. This leads to obvious benefits of brownfield over greenfield sites. The other principal requirement of the Exception Test is that the planning application must be accompanied by an FRA that demonstrates that the development will be safe, without increasing flood risk elsewhere and where possible, will reduce flood risk overall.

Site Specific Requirements for Flood Risk Assessments

The exact specification of the assessment will depend on the type of development that is to take place and the flood zone that it is located within.

The EA online Flood Map highlights locations in Flood Zones 2 and 3 where more stringent planning restrictions are in place. This map is produced using a relatively coarse national-scale flood modelling strategy, thus can only be used as a rough guide to show where more detailed flood risk assessments (i.e. site specific FRAs) are essential. Accurate computer modelled flood levels are usually required for the FRA and in many cases this information is available from the Environment Agency.

Where detailed modelled flood levels are not available, flood risk modelling may be required to determine the path and volume of water which can be expected for a given flood event at a particular location. At Ambiental we have developed proprietary flood modelling and mapping technologies, allowing us to predict the depth, extent and duration of flooding down to the level of individual buildings. On a wider scale, we are then able to provide high detail flood maps of entire UK cities, which can be used, for example by local authorities or developers for strategic flood risk planning. An example of a high detail, 3D flood model for the city of Cambridge can be seen in Figure 1:

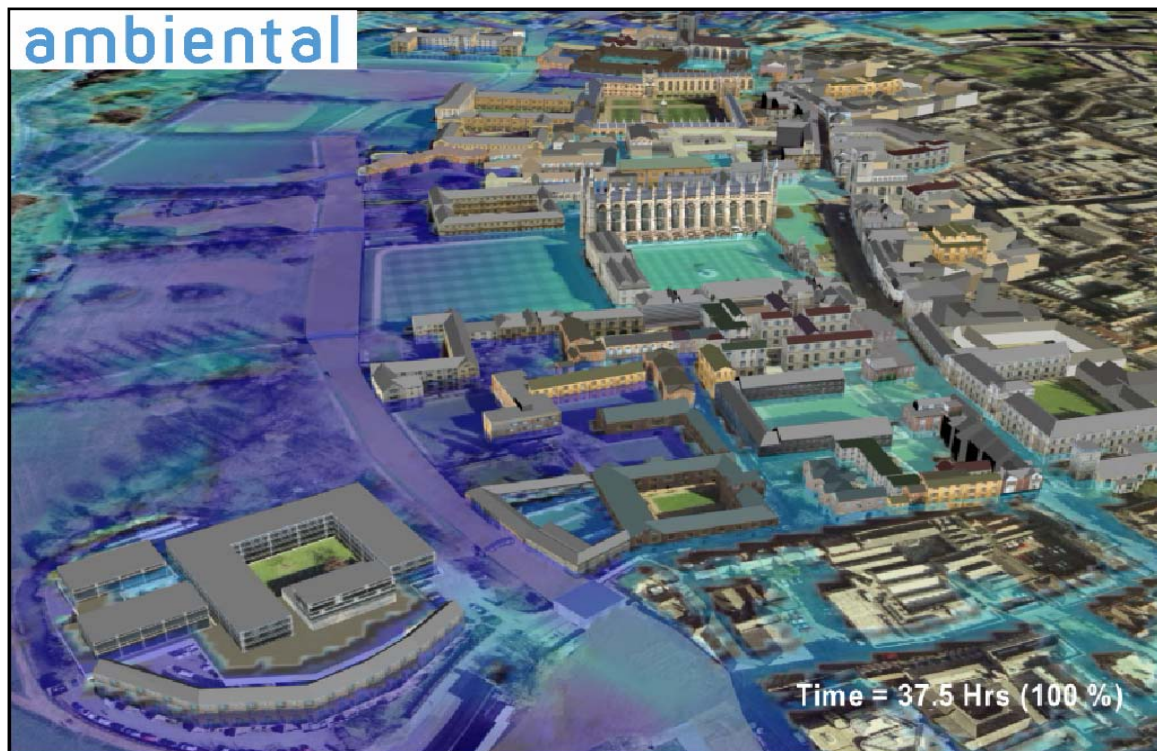


Figure 1: the potential extent of a severe flood in Cambridge (Copyright © Ambiental 2008)

The suitability of the development site partly depends on the type of development. PPS25 implements the following flood risk vulnerability classifications:

- Essential Infrastructure (e.g. electricity generating power stations)
- Highly Vulnerable (e.g. hospitals)
- More Vulnerable (e.g. residential developments)
- Less Vulnerable (e.g. commercial developments such as shops and offices)
- Water compatible (e.g. docks and wharves)

For residential and other vulnerable developments the legislation is stricter and you will likely need clear justification based on detailed data to gain planning approval. Figure 2 gives an indication of the requirements for FRAs as part of the planning process for a variety of development types within the different flood risk zones.

DEVELOPMENT CATEGORY	Flood Zone 3 (high risk)	Flood Zone 2 (medium risk)	Flood Zone 1 (low risk)
Minor householder developments (size of building not increased)	Green	Green	Green
Non residential extensions <250m ²	Green	Green	Green
Change of use to commercial	Yellow	Green	Green
Subdivision of houses into flats	Orange	Yellow	Green
Change of use to residential	Orange	Yellow	Green
Re-development <1 Hectare (no change of use)	Yellow	Yellow	Green
New development <1 Hectare	Orange	Yellow	Green
Any development greater >1 Hectare	Orange	Orange	Yellow

May be problematic under current legislation	Orange
Standard FRA Required	Yellow
Development will not require a FRA	Green

Figure 2: FRA requirements and conditions for a variety of development types within the different flood risk zones

Heads-up on Flood Risk

Since the introduction of PPS25, flood risk assessments now require more detailed information on, for example, flood resilient building design and drainage plans. If this is ignored until later on in the planning process it can add significant costs to the project. At Ambiental we provide flood risk scoping reports which highlight, at the earliest possible stage (even pre-acquisition), what form of development is appropriate at a given site and what might be required in terms of mitigation and flood resilient design. Our flood risk scoping reports use the latest data sources and can be easily extended for use as part of the planning application.

The FRA process

The FRA process requires a thorough evaluation of the risk of all potential sources of flooding (e.g. fluvial, tidal, groundwater and sewer) and the developer's clear commitment to design measures that will reduce the risk and impact of flooding. It also prohibits development from increasing flood risk elsewhere, so it is necessary to prove that there will be no decrease in flood storage volume, or increase in surface water runoff following the development.

Ambiental's flood risk assessment reports are tailor-made for the specific development, with the scope of the assessment depending upon the flood zone, potential sources of flooding and the development type.

Brownfield Sites

Brownfield sites offer the advantage of having already been developed. This means that there are likely to be fewer problems associated with the increased generation of surface runoff or, if structures are currently present on site, fewer problems with reductions in flood storage volume. For brownfield sites the legislation prohibits any increase in the risk or impact of flooding on or off site and often the EA require 'betterment' in terms of flood risk. This can mean demonstrating that:

- There will be no increase in vulnerability to flood risk (this includes increasing the number of occupants)
- Ground levels will be raised above extreme flood levels
- Flood proofing and resilient design will be used
- Flood warning and evacuation procedures will be introduced

Issues that we regularly encounter when completing FRAs for developments in brownfield sites include:

- Provision of compensatory flood storage volume
- Determination of a safe dry route of escape
- Control of surface runoff

Flood storage volume is the amount of water that can be held on site during a flood event. Buildings which are not designed to flood limit the amount of floodwater that can be accommodated during a flood event, so any increase in building footprint will reduce the available flood storage volume. This will also increase flood risk downstream, which is prohibited under PPS25. In some cases, decreases in flood storage volume must be countered by the provision of compensatory flood storage.

Compensatory flood storage is a storage volume equivalent to the flood storage which is lost by building in the floodplain. Legislation demands volume-for-volume and level-for-level compensation such that the same volume as that lost due to construction must be created at the appropriate levels elsewhere in the floodplain, to ensure that there is no net loss in storage. However this is not always possible at every site due to topographic conditions and other restrictions.

For residential developments, a safe or 'dry' route of escape needs to be provided to reduce the danger to life. This requires a route away from the building to an area of higher ground that is either dry (i.e. above the water level) or is safe (i.e. has very low water depths and velocities).

Any increase in the impermeable area on site will lead to an increase in surface runoff generation. Under PPS25 this is not allowed. In some cases, a 20 per cent decrease in surface runoff generation is required to help alleviate flooding; this can often be achieved for example through the use of permeable paving, soft landscaping and green roofs. If the requirements for surface runoff generation cannot be achieved through these measures, then a more detailed drainage strategy may be required. This process may take longer as there will be a requirement for negotiation between the Environment Agency and Local Water Authority.

Future Thoughts

Many developers are still acquiring land that, under PPS25, will prove difficult to develop. Even more are designing homes and offices without considering flood resilient design. In our experience, negotiation with the Environment Agency and the Local Planning Authority early on in the planning process increases the chances of success. In this way, expert advice backed up with the latest data from companies such as Ambiental can save developers time and money through more informed site acquisition and improved building design.

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