# Flood risks for small users of radioactive substances

This basic guidance is about flood risk management and its role in keeping and using safely radioactive substances. It outlines the need to consider changing flood risks; the principles of Flood Risk Assessment (FRA); and measures to minimise the consequences of flooding. The Radioactive Substances Regulation (RSR) regulatory officer for your premises will be able to arrange for you to speak with other, specialist Environment Agency officers should you need more detailed advice.

## For further information

Please contact your local Radioactive Substances Regulation officer or phone the RSR Permit Support Team on 01142 800 678 or 01142 800 682 who will be able to confirm that officer's contact details.

Where necessary, the RSR officer will arrange for you to speak with other Environment Agency officers specialising in flood risk management.

## Climate change and changing risks

The future climate will be challenging. We are highly confident that mean and extreme temperatures will increase; winter rainfall will intensify and winter mean rainfall increase significantly (up to 40%). Many of these changes will be long lived if not irreversible — mean sea level may rise by 1m by the end of the century with the rise continuing for centuries. These changes will impact many operators that we regulate and in some cases may increase the pollution risks.

We believe that the pollution risk that is most likely to increase because of climate change is the risk of flooding. In many instances, this is unlikely to be a significant problem because the premises are not at risk of flooding or the impact of flooding will be very small (perhaps because only very small amounts of radioactivity are kept on site).

We suggest that operators should consider their own climate change-driven flood risks. In some cases, it may be appropriate to carry out a formal Flood Risk Assessment (FRA) and produce a flood plan. These need not be complicated. We have provided some simple guidance and tools to help with these.

## Flood Risk Assessment (FRA)

The level of a FRA should be proportionate to the scale, nature and location of the operation. In assessing flood risk, operators should consider all possible forms of flooding. These can be summarised as follows:

### River flooding

This occurs when heavy rainfall fills rivers above their normal capacity. The excess water cannot be restrained by normal boundaries (such as river embankments) and follows the path of least resistance.

Operators can use our website to check the risk of flooding. They can also sign up to Floodline Warnings Direct or call our Floodline (0845 988 1188).

Note that Floodline Warning Direct is based on the numbers of people likely to be affected by flooding and how frequently this may happen, so it is not tailored to the risks faced by specific operators.

### Sea flooding

This is caused by storm surges and high coastal tides. As with river flooding, operators can use our website, Floodline Warnings Direct and Floodline.

### Flooding from land

This is caused by intense, short duration rainfall, either from slow moving weather systems or a succession of storms affecting the same area (for example as at Boscastle in 2004). These are most common in summer, when heating of the land encourages high intensity storms. The impact will be also determined by local topography (valley slope and length) and geology (rock and soil types).

Further distinction can be made between:

- 'Severe flash flooding' where heavy rainfall runs off into rivers, especially in short steep-sided valleys that funnel rainwater. The problem can be exacerbated by dams of debris behind bridges. Operators in such areas should be alert to the possibility of flash flooding. They should keep an eye on the weather and familiarise themselves with how the river reacts to it (typical signs of imminent flooding are rapid rises in water level, brown / black colour and high turbulence).
- 'Localised flooding' in urban areas, or on roads, where heavy rainfall exceeds the capacity of drainage systems. Rainwater is unable to drain away and runs down impermeable surfaces causing flooding in unexpected places.

It is very difficult to provide advance warnings for exactly where heavy storm rain will fall. In the absence of other data, operators may wish to consider the impact of a high intensity rainfall event across the site (for example, 50mm rainfall in one hour).

### Groundwater flooding

This occurs where groundwater levels rise above the surface elevation. This normally occurs in low-lying areas underlain by permeable strata (for example chalk, sandstone, river gravel) and is more common in winter.

### Sewer flooding

This occurs because many sewers accept both surface water and waste water. Heavy rain can exceed the hydraulic capacity of the sewer or lead to blockages. Excess flows exit the sewerage system by designated overflows, or up welling via manhole covers etc.

### Flooding from reservoirs, canals and other artificial sources

These all pose flooding risks because they retain water above natural ground level. Whilst the generic risk may be low, individual operators may have heightened local risks, particularly since failure may be acute.

In all cases, our local offices may have more detailed local information on the nature of flooding in particular areas. This could help operators learn from past events and plan better for future ones.

## Measures that operators can take

Having assessed the risk of flooding, operators should then consider what measures are needed to reduce the risk of pollution events that are triggered by inundation.

Operators should give sequential consideration to the following measures:

### Flood avoidance

The best way to avoid flood risk is to relocate away from floodplains although, for most existing activities, this is not an option. However, there are avoidance measures that all activities can consider, for example:

- remove radioactive substances from the parts of the site particularly subject to flooding;
- reduce the site inventory of radioactive substances;
- elevate stores of radioactive substances (locate on first floor rather than ground floor);
- locate those activities with the highest environmental risk on parts of the site with the lowest flood risk.

### Flood resistance

Flood resistance is about erecting defences that prevent flood water inundating the site (dry-proofing) and so preventing contact with radioactive substances. These controls may be permanent structures (for example bunds, embankments) or may be provided by temporary, impermeable barriers (flood boards, sandbags).

Where operators create new flood defences or increase the height of existing structures, then there will be a need for our own FCRM staff (Development & Flood Risk Officers) to consider issuing a Flood Defence consent. This is required to assess the wider implications for flooding to third parties in the rest of the floodplain.

### Flood resilience

Flood resilience accepts that flood water will enter the site but, through careful design, allows for a rapid return to beneficial operation after the flood event (wet-proofing). Although undoubtedly of interest to the operator, who will be looking to restart production after a flood, it is of lower value than the above measures in preventing pollution. However, some activities may have specific reasons for considering flood resilience.

Operators with potentially significant issues may wish to formalise their flood preparations in a Flood Plan. Although Flood Plans are geared toward the protection of people and property, they are also relevant to environmental protection. A Flood Plan will be a written document including staff training, evacuation procedures, property preparation and flooding response.

Operators whose planning suggests less significant flooding issues may find the practical ideas on flood resistance and flood resilience in our ‘How to reduce flood damage of use.