Staffordshire County Council

STAFFORDSHIRE LOCAL FLOOD RISK MANAGEMENT STRATEGY

2024 Update

Overview of Flood Risk in Staffordshire

1. Flood Risk in Staffordshire

Floods that affect Staffordshire come from different and often multiple sources including main rivers (including the Rivers Severn and Trent), ordinary watercourses, surface water runoff, groundwater, sewers, and reservoirs. Ordinary Watercourses tend to be smaller tributaries of the larger river systems that are not legally designated as Main Rivers.

The various sources of flooding are outlined in **Table 1-1**.

Climate change and continued urbanisation can increase flood risk in the future unless action is taken to mitigate or adapt to this risk.

Major towns, such as Burton-upon-Trent and Stafford, suffer from well documented fluvial flooding from the River Sow and River Trent, respectively. However, other parts of the county are elevated with steep catchments and surface water flooding is often the major concern in these areas. Staffordshire also benefits from large areas of agricultural land (a key land use in the study area) and green open space with the potential, where appropriate, to offer opportunities for flood storage and the delivery of wider environmental benefits.

Fluvial flood risk from larger rivers is well understood and has been managed at a national scale for many years by the Environment Agency. However, flood risk from local sources, including surface water runoff, groundwater and ordinary watercourses is less well informed, being very localised, often difficult to predict and with sparse historical records available to provide supporting evidence. **Table 1-2** shows some of the types of flooding that have been experienced historically within Staffordshire.

Table 1-1: Selected Historical Flooding Events

Selected Historical Flooding Events in Staffordshire

- Oct/Nov 2000 – Central North West and South East band of county (combination of flood sources),
- August 2004 – Central North West and South East band of county (combination of flood sources),
- June/July 2007 – Whole county (interaction of all forms due to excess rainfall).
- October 2010 – Centred on North West corner of county (combination of heavy rainfall and trash screen blockage)
- June to November 2012 – Prolonged period of wet weather resulting in numerous local flooding issues across Staffordshire.
- June 2016 – Warm Humid conditions with sporadic thunderstorms and intense rainfall. The worst affected areas of Staffordshire were the areas south and west of Leek in the North, Cannock area, and areas adjoining the Black Country in the south.
- March 2018 – The “Beast from the East” brought with it sustained low temperatures and significant snowfall, snowmelt, wet weather and saturated ground which led to flooding notably in the east of the county.
- October 2019 – Cool, damp conditions with incessant rainfall. The whole county was affected with Stafford and adjacent areas mostly affected.
- February 2020 – Storm Dennis was a long duration, low to moderate intensity event causing flooding countywide and especially in central and east parts of Staffordshire.
- June 2020 – Typical summer storms with short intense highly localised rainfall affecting areas across the county.
- August 2020 - Typical summer storms with short intense highly localised rainfall affecting areas across the county.
- October 2023 – Persistent heavy rain from the East because of Storm Babet affecting the whole county especially around Stafford and East Staffordshire areas.
- January 2024 – Following sustained wet weather over winter 2023 heavy rain due to Storm Henk led to widespread flooding across the county

Flooding, as a natural process, has a major influence in shaping the environment and has been a major challenge to mankind by affecting changes in land use. Based upon our experience to date, evidence shows that the culverting and diversion of watercourses as well as changes in land use, particularly as part of historic urban development practices, have in many cases resulted in increased flood risk.

Typical issues include:

- flooding due to inappropriately sized culverts;
- the inability to carry out maintenance due to access restrictions;
- increased likelihood of blockage due to poor design (e.g. blockage of trash screens, build-up of silt);
- a lack of understanding of riparian landownership responsibilities;
- a lack of records leading to accidental damage by third parties, particularly relating to the location or design of designated heritage assets;
- a lack of inspection and monitoring of condition; or,
- increased runoff from agricultural land due to changes in crop selection, removal of hedges and ditches and soil compaction from grazing and machinery.

1.1. What do we mean by Flood Risk?

Flood Risk is the combination of the probability of flooding occurring (which is often expressed as a return period or Annual Exceedance Probability) and the potential consequences should that flooding occur (for example on people, homes, business, critical infrastructure and services and the environment).

The likelihood of flooding is often expressed in different ways. For example, a flood with a 1% Annual Exceedance Probability (AEP) has a 1 in 100 chance, or probability, of happening in any one year. This is also often referred to as a flood return period, and, for the same 1 in 100-year example, means it might flood on average once every 100 years. Return periods can be misleading, however, as in this example it can be incorrectly interpreted that such a flood might not happen again for another 100 years.

Flooding can occur from different sources, at different times and for different reasons. Often more than one source will contribute towards it, such as high water levels in a receiving watercourse combined with overland flows. It is also

complicated by preceding weather conditions and can be particularly exacerbated when the ground is waterlogged following earlier rainfall, or in long dry summers when the earth has been ‘baked’ dry and becomes hard and impermeable.

Table 1-2: Sources of Flood Risk

Surface Water Flooding 	Surface water flooding usually occurs when high intensity rainfall results in overland flows on the surface of the ground. This can embankments, and in low lying areas. As experienced in 2012 and in various events since, it can be exacerbated when the soil is saturated and receiving drainage systems have result in ponding against obstructions, such as road and rail insufficient capacity to cope with the additional flow. In addition to the potential for property damage, the impacts of deep and / or fast flowing water can result in hazardous conditions and pose a risk to life. In Staffordshire there are many areas where the steep topography, combined with low permeability soils, can exacerbate surface water flood risk. Changes in agricultural land management practices can also increase rates of surface water runoff. Typical issues that can have a significant impact include crop selection, removal of hedges and ditches

	and soil compaction from grazing and machinery. Surface water flooding is influenced across much of the study area through complex interactions between watercourses, overland flow paths, groundwater springs and piped drainage systems.
Sewer / highway flooding 	During heavy rainfall flooding from sewers or highway drains may occur if the rainfall event exceeds the design capacity of the drainage system, the system becomes blocked and/or the system cannot discharge due to high water levels in receiving watercourses. Sewer and highway flooding typically results in localised short term flooding.
Groundwater Flooding	Groundwater flooding occurs as a result of water rising up from the underlying aquifer or from water flowing from springs. This tends to occur after much longer periods of sustained high rainfall and can be sporadic in both location and time often lasting longer than a fluvial or surface water flood. High groundwater level conditions may not always lead to widespread groundwater flooding; however, they have the potential to exacerbate the risk of surface water and fluvial flooding by reducing the infiltration capacity of the ground, and to increase the risk of sewer flooding through sewer / groundwater interactions.

	Historically, information on the susceptibility to risk of groundwater flooding has been sparse and there is currently no evidence to suggest that this is a major problem within Staffordshire. It is our experience that groundwater flooding issues are likely to be localised in their nature, affecting only a small number of properties.
Artificial Sources	Artificial sources include any water bodies not covered under other categories, such as canals, lakes and reservoirs. The Canal and River Trust (CART) keeps records of flooding incidents associated with the canal network. Particularly vulnerable stretches of canal to breach are closely monitored by the CART, who have plans in place to respond to incidents and minimise water loss from the canal network as soon as possible. The Environment Agency oversees the management of large raised reservoirs. Through this regulatory process, the Environment Agency seeks to ensure that reservoir flooding remains extremely unlikely. In Staffordshire, there are 45 reservoirs which fall under the Reservoirs Act (RA) 1975.

2. Future Changes in Flood Risk

2.1. Climate Change

We can consider climate change in the context of how this will influence future flooding, how we can act to mitigate the effects of climate change, and how we can adapt to changes in flood risk over time.

Climate change can affect local flood risk in several ways and impacts will vary, depending on local conditions and vulnerability. Prolonged periods of rain, resulting in saturated ground, followed by intense storms, such as those experienced in 2007, 2012 and 2020, have been shown to increase the likelihood of flooding. This can occur at any time of the year, with winter months characterised by wet weather, and warmer air in summer months that can lead to heavier rainfall. Storm intensity could therefore increase even in drier summers. More intense rainfall causes more surface runoff, increasing localised flooding and causing erosion. In turn, this may increase pressure on drains, sewers, and water quality. Observations from the Met Office State of the UK Climate report[1] indicate that the UK was 9% wetter in 2011-2020 than in 1961-1990. Six out of the ten wettest years have occurred since 1998 (from observation records that began in 1862) and February 2020 was the UK's wettest February on record. Flooding in February 2020 across Staffordshire resulted in significant property flooding as well as impacts to critical infrastructure and services.

According to the Sixth Assessment Report for the Intergovernmental Panel on Climate Change[2] (IPCC) average global surface temperature was 1.1°C higher in 2011-2020 than 1850-1900, with larger increases over land than oceans. Across the UK, the average temperature has increased by 0.8°C since 1961-1990[3]. This temperature is expected to rise further, with potential UK summer temperatures up to 7.4°C hotter and winter temperatures up to 4.4°C hotter by 2050.

These changes are expected to change the climate across Staffordshire in several ways. In addition to increasing average temperatures, overall, the UK is expected to experience wetter winters and drier summers with changes to seasonal patterns. There could be up to 59% more precipitation in winters by 2050. Rainfall in summer is also likely to be more intense than what is currently experienced and will impact the frequency and severity of surface water flooding, particularly in urban areas[4]. The UK is therefore likely to experience more extreme weather events than at present, with a higher risk of flash flooding and storms all year round expected to double the number of people living in flood risk areas in the UK[5].

Staffordshire County Council has produced a Climate Change Adaptation Action Plan. This is to ensure that the councils are prepared to manage climate change risks to service delivery, local communities, and the natural environment.

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[1] State of the UK Climate Annual Reports. UK Met Office.
[2] Climate Change Climate Change 2023 Synthesis: Summary for Policy Makers. 2023. IPCC.
[3] National Flood and Coastal Erosion Risk Management Strategy for England. 2020. Environment Agency.
[4] UK and Global extreme events – Heavy rainfall and floods. 2021. UK Met Office.
[5] UK Climate Change Risk Assessment (CCRA3) Evidence Report. 2021. Climate Change Committee.

When considering the impacts of flood risk, allowances for the changing climate will be made such that assets perform adequately throughout their design life. For example, in the design of surface water drainage systems serving residential areas, rainfall is typically increased by 30% to represent the increased surface water runoff anticipated during the expected life of the development.

2.2. New Development

New development has the potential to increase flood risk by increasing the amount of hard surfacing and causing rainwater to runoff faster and at increased quantities towards local sewers and watercourses. It can also affect where floodwaters flow to if new buildings or earth works affect existing watercourse floodplains or surface water flow paths.

The Environment Agency and Lead Local Flood Authorities are Statutory Consultees to the planning process. They work closely with Local Planning Authorities to ensure that the users of new development are safe from flooding and that new development does not increase flood risk elsewhere, in line with the 2012 National Planning Policy Framework. This should help to ensure that there is no increase in flood risk from new development.

2.3. Changes in Land Management

Changes in the way that land is managed have the potential to affect flood risk. These are largely affected by the economy, availability of and access to regional, national, or international subsidies and payments and environmental initiatives. For example, changes to the payments farmers receive could encourage more intensive agriculture or conversely less intensive production and more environmental stewardship. Mining and quarrying can have a key impact on flood risk. Mines that are being reclaimed and restored have the potential to reduce flood risk in the surrounding areas. Quarries in the River Trent floodplain are known to be beneficial for storing excess floodwaters and releasing these slowly over time. Such changes are inherently difficult to forecast but will be monitored over time and taken into account when developing flood risk management actions.

Changes in agricultural land management practices can increase rates of surface water runoff. Typical issues that can have a significant impact include crop selection, removal of hedges and ditches (the removal of ditches requires consent) and soil compaction from grazing. Agriculture is a major industry throughout Staffordshire, so in view of this we will work with landowners, Parish Councils, the National Farmers Union (NFU), Country Land and Business Association (CLA) and other similar organisations to promote changes in

agricultural land management practices which can reduce the impact of flooding and provide opportunities to incorporate ecological benefits.

3. Flood Risk Studies and Reports

A number of studies have been undertaken to inform and improve the understanding of flood risk in Staffordshire. These have identified and quantified risk across the area from different sources of flooding using the best available information at the time.

However, evidence and assessment methods are constantly evolving to enable improved assessment of the risk facing communities in Staffordshire and we will continue to collate and use this information as appropriate to build a better understanding of flood risk.

A list of key studies and reports can be found on the last page of the Local Flood Risk Management Strategy Update Summary.