Background paper 007

Title: Flood risk, SuDS and drainage

This paper addresses flood risk and new development including SuDS and drainage
Relevant Local Plan Objective(s): • Be resilient and adaptable to climate change and resistant to flood risk and its impacts on people and property. • The city's water resources are utilised efficiently with consideration for the future, whilst water quality is protected and enhanced for the benefit of the wider environment
SA Objective(s): 2. To build resilience to climate change including reducing risks from overheating, flooding and the resulting detriment to well-being, the economy and the environment.
SEA theme(s): Water, climatic factors, human health

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1. Introduction

1.1 Oxford is located at the confluence of two rivers, the Thames and the Cherwell, as well as numerous watercourses. The risk from river flooding is one source of flooding that has the potential to impact development in Oxford, with other sources including groundwater, surface water and sewer flooding. The ongoing impact of climate change, including projected wetter winters and increased incidences of intense rainfall events, is likely to exacerbate these risks in the future, with a variety of negative consequences for property, economy and ecosystems as well as human health.

1.2 Oxford has a history of flood events with several occurring during 2024, where a number of flood warnings were issued, temporary defences deployed, several roads closed and footpaths along the city's waterways completely obscured. Other recent flood events were at the start of 2021, with more historic flooding events occurring in January 2014, November 2012 and July 2007, each of which resulted in significant disruption to the city. This series of flood events resulted in a programme of short-, medium- and long-term measures including the development of the Oxford Flood Alleviation Scheme (OFAS) - the primary purpose of which is to reduce the risk of flooding for properties and infrastructure.

1.3 This background paper provides a brief overview of some of the flooding issues in the city, including SuDS and drainage. It begins by taking a look at flooding from a policy perspective, reviewing relevant policies, plans and programmes at the national, regional and local level. It then goes on to set out the current situation for flooding in Oxford, looking at each source of flooding in turn and how they present a different set of issues. Then the paper moves on to look at what would happen if we didn't produce a plan before setting out what potential

topics could be included in the new plan. Finally, it draws out some of the key issues relating to flooding.

2. Policy Framework/ Plans, Policies, Programmes (supporting Task A1 of Sustainability Appraisal)

The Flood and Water Management Act, 2010

2.1 This piece of legislation requires better management of flood risk, creates safeguards against rises in surface water drainage discharges and protects water supplies for consumers. It gave a new responsibility to the Environment Agency for developing a National Flood and Coastal Risk Management Strategy, and established upper tier local authorities (in our case Oxfordshire County Council) as Lead Local Flood Authorities and provided them with a range of duties.

National Planning Policy Framework (NPPF)

2.2 Paragraphs 170-182 of the NPPF set out the policy for planning for development in flood risk areas. It requires a sequential approach to development: sites should not be allocated, or permitted, if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. It also requires an exception test for proposed development in areas of flood risk: this requires proposed development to show that it will provide wider sustainability benefits to the community that outweigh flood risk, and that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall. Paragraphs 180-181 focus primarily on planning applications and paragraph 182 states that applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. It is expected that these sustainable drainage systems will provide multifunctional benefits wherever possible, through facilitating improvements in water quality and biodiversity, as well as benefits for amenity. Local Planning Authorities need to have appropriate policies in place on sustainable drainage systems.

2.3 Paragraph 125 (b) of the NPPF recognises that some undeveloped land can perform many functions, including flood risk mitigation. The NPPF also requires that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies. The NPPF states that the SFRA will be the basis for determining the sequential approach to development. This is important as applicants need not apply the sequential test again on sites allocated in the development plan through the sequential test.

2.4 The NPPF was recently updated and published in December 2024, however there were not any significant amendments to the flooding policy. A few minor amendments were made to

the September 2023 version of the Framework, which included specifically referencing that improvements to green infrastructure and other forms of infrastructure can provide opportunities to reduce the causes and impacts of flooding as well as explicitly stating that as well as development being resistant and resilient to flooding, in the event of a flood, buildings should be able to be quickly brought back into use without significant refurbishment. Additionally, a separate Annex 3 was provided which classifies flood risk vulnerability.

National Planning Practice Guidance (PPG)

2.5 The Flood risk and coastal change section of the PPG was last updated in September 2025. Significant amendments were made in 2022 to bring the guidance up to date and in line with the latest policy position on flood risk introduced in the updates to the NPPF in 2018 and 2021. Paragraph 078 refers to a table which sets out the definition of the different flood zones:

- Flood Zone 1 has the **lowest** probability of flooding
- Flood Zone 2 has a **medium** probability of flooding
- Flood Zone 3 has a **high** probability of flooding
- Flood Zone 3b is the **functional flood plain** and this zone comprises land where water has to flow or be stored in times of flood.

2.6 The key difference made in 2022, is that the definition of the functional flood plain (Flood Zone 3b) changed from an annual probability of 1 in 20 (5%) or greater in any year to 1 in 30 (3.3%) or greater in any year.

2.7 The PPG on Flood Risk and Coastal Change provides more detailed guidance as to the application of the sequential and exception tests in the context of plan-making and planning applications. It also provides additional information on the "sequential approach to the location of the development" and provides some over-arching guidance relating to "taking flood risk into account in preparing plans".

New national flood and coastal erosion risk information

2.8 In December 2024, the Environment Agency published a new report summarising the changes to the National assessment of flood and coastal erosion risk in England in 2024. In March 2025, new national flood risk assessment (NaFRA) was also made available. Its intention is to provides a single picture of current and future flood risk from rivers and the sea, and from surface water, using both the existing detailed local information and improved national data. This includes future scenarios accounting for climate change. This new flood zone data is expected to inform any new flood risk assessments, including those undertaken at a strategic level.

Flood and Coastal Erosion Risk Management Strategy Roadmap to 2026

2.9 The Flood and Coastal Erosion Risk Management (FCERM) Strategy for England was published in 2020, with an initial 1-year action plan showing the actions needed, published

in May 2021. The Environment Agency has recognised that a longer-term view is now needed to implement the strategy and to address this, they have worked with partners to develop a roadmap. The roadmap contains practical actions out to 2026, which once completed will help to implement the strategy's 2100 vision. These include actions such as taking forward projects and programmes that will pioneer innovative ways of boosting flood and coastal resilience and make a difference to their local communities, as well as identifying practical ways in which flood and coastal investments can contribute to wider priorities, including local nature recovery, carbon reductions and more integrated water solutions that help with both flood and drought resilience.

Catchment Strategic Plan, Part of our Drainage and Wastewater Management Plan (DWMP) for Oxfordshire, Swindon, Wiltshire, Gloucestershire and Warwickshire, Thames Water, 2023

2.10 Thames Water produced a strategic plan which develops a strategy for the next 25 years to meet future challenges such as climate change and population growth which could impact the sewerage and drainage systems in the region. The document also illustrates the range of investment that is required for each of the catchments across the region (including Oxford) and identifies sewage treatment works that will need to be upgraded within the next 25 years to ensure treatment capacity keeps pace with growth.

Our Catchment Plan, Thames Water, 2018

2.11 Thames Water produced a plan which includes an analysis of the causes of sewer flooding and pollution in the Oxford catchment. These include heavier and more intense rainfall events happening more often; deterioration within the sewerage network and blockages caused by fat, oil and grease deposits, resulting in flooding and operational issues; loss of local river flood plains; and increasing river flooding. The report notes that the foul sewers were not designed to cope with surface water. For example, in the Grandpont area, the deterioration of some of the sewers within their network has allowed groundwater into the foul sewers. At Abingdon Road, flooding from surface water sewers has also occurred as a result of high river levels and / or restriction of the outfalls due to vegetation growth.

2.12 The Our Oxford catchment plan is currently at the Options Appraisal stage. Thames Water are recommending an intervention comprising short-, medium- and long-term measures. Short-term activities will include their ongoing work to improve the operation of their network and their response to problems as they occur. Medium term activities will include the refurbishment of their local sewerage network to reduce pollution and foul sewer flooding. Long term activities include the review and refinement of their catchment approach based on the experience gained, and outcomes achieved from the short- and medium-term interventions.

Oxford City Council "Our Strategy" 2024-28

2.13 The City Council's "Our Strategy" document sets out the importance of working with partners to deliver improved flood defences and managing the increased risks of flooding in order to help the city become more resilient to climate change.

Oxford Local Plan 2036 Policies on Flood Risk

2.14 The Oxford Local Plan 2036 is the current development plan for the city and it contains a number of policies that relate to flood risk. In particular, Policies RE3 and RE4 set out the City Council's approach to flood risk, sustainable drainage, and also provide the policy approach in relation to water management at some of Oxford's important nature conservation sites. Policy RE3 includes strict provisions as to what development will be granted planning permission in Flood Zone 3b. Any proposal must meet all of the criteria in this policy and must be for water-compatible uses or essential infrastructure; or, where it is on previously developed land, it must represent an improvement of the existing situation in terms of flood risk.

2.15 Policy RE3 was informed by the Flood Risk and Sequential Test of Sites Background Paper. In line with the associated guidance in the PPG, when developing site allocation policies, the sequential test was applied if any of the potential sites were outside of Flood Zone 1. Before allocating sites in higher risk flood zones, it was demonstrated that there were no reasonable alternative sites available in areas with a lower probability of flooding that would have been appropriate to the type of development or land use proposed. Any proposals for the development of sites in Flood Zone 3a that incorporated 'more vulnerable' uses such as housing also required the exception test. In the case of Oxford, where previously developed sites in Flood Zone 3b were proposed, an exception test was also required. Paragraphs 1.21 to 1.59 of our Statement of Common Ground with the Environment Agency provide more detail as to how the sequential and exception tests are applied in Oxford.

2.16 The Flood Risk and Sequential Test of Sites Background Paper set out the individual capacities of sites within each Flood Zone and demonstrated that Oxford had insufficient capacity to accommodate its housing need within lower risk flood zones. Consequently, development sites were allocated within higher risk flood zones applying the sequential test. These sites must be accompanied by a site-specific flood risk assessment when planning permission is sought.

Oxford City Sustainable Drainage Design and Evaluation Guide

2.17 In 2010 the Flood and Water Management Act proposed that sustainable drainage systems (SuDS) should be used on most development and this was confirmed in a ministerial statement in 2015 introducing the 'non statutory technical standards' for SuDS. The evaluation guide to sustainable drainage was published in 2018 and provides a link between the design of SuDS with the evaluation requirements. The design and evaluation guide promotes the idea of integrating SuDS into the fabric of development using the available landscape spaces as well as the construction profile of buildings. This approach provides

more interesting surroundings, cost benefits, and simplified future maintenance. This guide provides a background context for SuDS designs, taking into account the landscape character and local geology and provides advice on what type of SuDS is most suitable in Lye Valley; a Site of Special Scientific Interest (SSSI) with a unique nature, where special consideration to the type of SuDS must be given.

3. Current Situation (supporting Task A2 and A3 of Sustainability Appraisal)

3.1 In Oxford there are major technical obstacles which mean any solutions to flooding will be expensive, provide different levels of protection and not benefit everyone in the affected communities. Proposals can be brought forward that will reduce the risk to many people, but major flood defences are not a realistic option in the foreseeable future. The most sustainable way of managing flood risk in Oxford will be through a Flood Risk Management Strategy. As set out in the introduction, flooding occurs from a number of sources including groundwater, surface water, river, and sewage flooding. Each will be looked at in turn to present a current picture of what is happening in the city.

Fluvial Flooding

3.2 Fluvial (or river) flooding occurs when a river bursts its banks and water spills out onto the surrounding land. This type of flooding is caused by heavy rain. Fluvial flooding is the primary source of flood risk in Oxford in terms of flooding extent, the number of properties at risk and historical flood damages. Oxford is located at the confluence of the River Thames and River Cherwell, and is at risk from both watercourses independently, as well as concurrently in large flood events. As can be seen from Figure 3.1 below, large parts of Oxford are at risk from this type of flooding. Some areas of flood risk in Oxford allow the river to naturally burst its banks onto river floodplain, however other areas have properties in them.

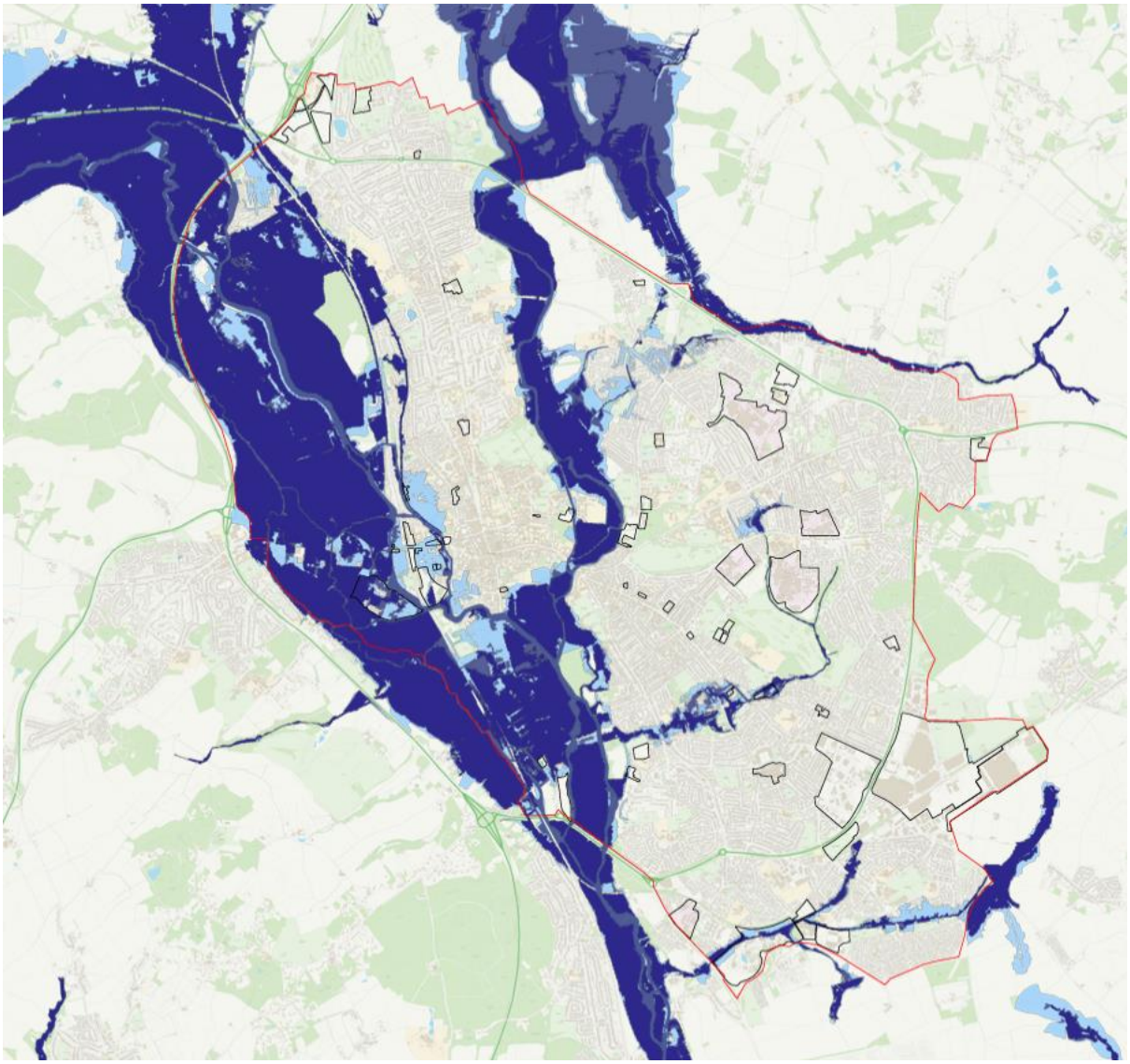


Figure 3.1 - Flood map showing risk of river flooding in Oxford (WHS, 2025)

Groundwater Flooding

3.3 According to the Environment Agency, groundwater flooding:

> *"can happen when the level of water within rock or soil underground – known as the water table – rises. When the water table rises and reaches ground level, water*

starts to seep through the surface and flooding can happen. This means that water may rise up through floors or underground rooms such as cellars or basements."

3.4 The Environment Agency and British Geological Survey have investigated the nature and mechanisms behind groundwater flooding in Oxford. In the majority of cases, it has been found that local ground water is linked to river flows and has an independent response to rainfall. There is a lack of reliable data however, therefore a system of water level measurement points for future monitoring purposes has been established.

3.5 The Environment Agency holds and updates a groundwater flooding register identifying the locations and nature of specific groundwater flooding events. For Oxford, the groundwater register has identified 21 records of suspected ground water flooding. These occurred between 2000 and 2003 and 2007 and 2009. 15 of the incidents occurred within the city, whereas 6 were located just outside the city's boundary. Groundwater flooding tends to occur in low lying areas, with clusters of incidents in New Hinksey, Grandpont and New Botley. These three areas all lie within Flood Zone 3, so the groundwater incidents are likely to be associated with fluvial flooding.

3.6 Four of the incidents reported immediately to the west of the Cherwell-Thames confluence are within Flood Zone 1. The sites are located on gravels like those within the floodplain. Although the incidents took place within Flood Zone 1, the proximity of the Rivers Cherwell and Thames means that groundwater emergence is likely, especially during periods of high-water level in the two rivers.

Surface Water Flooding

3.7 Surface water (or pluvial) flooding happens when heavy rainfall overwhelms local drainage capacity. It is a significant risk affecting 3.2 million properties in England. Surface water flooding is **more** difficult to forecast than flooding from rivers as it is often caused by periods of intense rainfall. This is because "current meteorological methods are not able to pinpoint where or when potential intense rain will arrive, nor can they know or predict the capacity of local systems to manage the level of rainfall." There are several high-risk areas near the city centre where surface water pools, including large parts of St Aldates and Speedwell Street to the south of the city, and George Street to the west. The Oxford City Level 1 Strategic Flood Risk Assessment (WHS, 2023) indicated that ground levels to the west and south of the city are lower than those in the city centre, which may explain why water is shown to pool in these locations. The greatest risk of surface water flooding is around certain roads pertaining to the areas of Jericho, Headington, Summertown, Woodstock Road and the city centre. Recent surface water flood incidents have been reported at the following locations:

Table 3.1 - Recently recorded surface water flood incidents

Area	Road	Year
Headington	Old Road	2020

Summertown	Summerhill Road	2020
Summertown	Water Eaton Road	2023
Woodstock Road	Blandon Close	2020

3.8 Most of the areas identified above tend to be located outside of the floodplains of the River Thames and River Cherwell, meaning that the main source of flooding shown in these areas is likely to originate from surface water flooding rather than from fluvial flooding.

Sewer Flooding

3.9 Sewer flooding is when sewage or foul water leaks from the sewerage system (through pipes, drains or manholes) or floods up through toilets, sinks or showers inside a building. The responsible authority for sewer flooding across in Oxford is Thames Water, the sewerage undertaker, who have confirmed that a total of 155 historic records of sewer flooding have been recorded within the Oxford City administrative area since records began. The most incidents have occurred in the built-up areas of New Hinksey, Grandpont, Botley, Osney and Marston.

Strategic Flood Risk Assessment (SFRA)

3.10 The NPPF requires local plans to be supported by an SFRA and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities (in this case, Oxfordshire County Council). The EA provides guidance on how to undertake an SFRA. The most recent SFRA was undertaken in 2023 to support the emerging Oxford Local Plan 2040 (now withdrawn). A Level 1 SFRA was initially undertaken which identified all flood risk areas, based on all sources of flooding and taking account of the latest climate change allowances. A Level 2 SFRA was then carried out as it was determined that the City Council could not allocate all land for development outside flood risk areas. The Level 2 SFRA gives more detail on the nature of the flood risks identified and where the sequential and exception tests will need to be applied. Although the Oxford Local Plan 2040 has now been withdrawn, the 2023 SFRA is based on the most up-to-date modelling available at the time, including running the associated central, higher central and upper end climate change allowances, which provided a comprehensive update to the flooding mapping for the city. The Level 1 assessment in particular therefore provides a very useful baseline (regardless of which site allocations are taken forward in the Oxford Local Plan 2045). However, any future SFRA will need to use the new flood zone data that was published by the Environment Agency in March 2025.

Taking account of Climate Change impacts when looking at Flood Risk

3.11 The paragraphs below summarise the approach that was taken in respect of taking account of the climate change allowances in the Local Plan 2040. The new Local Plan will have to determine if this approach is still the preferred one.

3.12 An important part of predicting the likely impact of flooding in the future is looking at the likely impacts of climate change. In flood risk terms, climate change is likely to bring increased wetter weather and more incidences of various types of flooding. The headline findings from the current UK Climate Projections released in 2018 (known as UKCP18) highlighted that in the most recent decade (2009-2018), the UK climate has been on average 1% wetter than 1981- 2010, and 5% wetter than 1961-1990. Looking into the future, UKCP18 reported that rainfall patterns across the UK will vary, but that by 2070, under a scenario of high greenhouse gas emissions, winters will on average grow increasingly wetter and summers drier. However, despite overall summer drying trends in the future, there are likely to be future increases in the intensity of heavy summer rainfall events, particularly for urban areas in the UK, which will have an impact on the frequency and severity of surface water flooding.

3.13 To take climate change into account in planning for flood risk, the 2023 SFRA has been informed by the latest guidance released by the Environment Agency on how local planning authorities, developers and their agents should use climate change allowances. There are allowances for different climate scenarios over different epochs, or periods of time, over the coming century.

3.14 For Oxford City, the peak river flow and peak rainfall intensity allowances are relevant and have been used in any relevant modelling updates. For peak river flow, Oxford falls within two management catchment areas: Gloucestershire and the Vale Management Catchment and Cherwell and Ray Management Catchment. The climate change allowances for the Cherwell and Ray are significantly lower than those for the Gloucestershire and the Vale. The majority of the Oxford administrative area lies within the Gloucestershire and Vale Management Catchment, therefore this in combination with the more precautionary climate change allowances, is why this management catchment has been deemed to be the most appropriate one to use for Oxford. More detail on how the climate change allowances have been applied to the updated hydraulic modelling can be found in the Level 1 SFRA (2023). In the emerging Oxford Local Plan 2040 (now withdrawn), we also looked at the implications of climate change on a site-specific basis as part of gaining a clear understanding about whether development proposed in higher-risk flood zones would be safe, as well as meeting the other tests set out in national policy. Climate change allowances were applied to all site allocations assessed as part of the Level 2 SFRA.

4. Likely trends without a new Local Plan (supporting Task A2 and A3 of Sustainability Appraisal)

4.1 Flood risk from a range of sources will be an ongoing challenge in the city. Climate change is projected to bring about wetter winters and more incidences of high intensity rainfall events, which is likely to increase the risks of flooding, particularly in highly urbanised parts of the city and within the flood risk zones.

4.2 In the absence of a new local plan, local flooding policy would still be in place until 2036, as long as the plan remained "up-to-date". In the absence of an up-to-date local plan, development management decisions would need to be made against the national framework. As the NPPF presently contains a strong policy framework at the national level for flooding, it is unlikely that new or existing development would be adversely impacted by this change.

4.3 More locally, the Environment Agency is working in partnership on a major new scheme to reduce flood risk in Oxford. The Oxford Flood Alleviation Scheme (OFAS) will cost around £176 million and is one of the biggest flood schemes in the country, with the aim of reducing flood risk to homes, businesses, services and major transport routes into the city. The OFAS will create a new stream with wetland wildlife corridor to the west of Oxford. The intention of the scheme is to reduce flood risk to all properties in Oxford currently at risk of flooding from the River Thames, as well as to the railway, Botley and Abingdon Roads, other local roads, utilities and services such as broadband. The scheme will also bring additional environmental improvements to the area, including creating new wetland which will link up existing wildlife sites. The proposed scheme is approximately 5 km long, starting just north of Botley Road and passing under the A423 Kennington Railway Bridge (Southern by-pass) to the south before re-joining the River Thames.

4.4 In spring 2022, the Environment Agency submitted a new planning application for the scheme to Oxfordshire County Council, who in summer 2024, resolved to grant planning permission for the OFAS. Approval is subject to the application first being referred to the Secretary of State for the Ministry of Housing, Communities and Local Government, due to the scheme's location in the Green Belt. The Secretary of State will decide if they wish to make a determination. The Environment Agency also made a new compulsory purchase order (CPO) for the scheme. There was a public inquiry into the CPO, led by an independent inspector, which ran from 14 November 2023 to 26 January 2024. In May 2025, the Secretary of State confirmed the CPO which means the Environment Agency can progress with purchasing the land and securing the access needed to build the scheme.

4.5 Although a scheme like the scale of OFAS has the potential to significantly reduce flood risk to all properties in Oxford currently at risk of flooding from the River Thames, even with flood defences in place, an element of residual risk will remain in areas that are prone to flooding. Residual risk can arise from the failure of flood management infrastructure such as a breach of a raised flood defence or blockage of a surface water conveyance system.

4.6 In respect of sustainable drainage systems (SuDS), the absence of a local plan would not be so impactful. National policy now requires SuDS on not just major developments (over 10 dwellings), but for minor developments (fewer than 10 dwellings) within an area liable to flood from surface water or groundwater, or that are likely to increase flood risk locally, as well as for developments that need sustainable drainage solutions to be provided. The relevant policy in the current Oxford Local Plan 2036 (Policy RE4) contains a hierarchy of

SuDS approaches to apply and refers applicants to the guidance provided by either the City Council (minor development) or County Council (major development).

5. Key issues addressed through the Local Plan 2045

Introduction

5.1 The Regulation 18 consultation identified that there were a number of topics that the Local Plan could implement policy to address which relate to climate change, resources and flood risk objectives. Under each of these topics, there were various options for policy approaches which could be taken, with differing impacts and these were presented in tables to better facilitate comparison between them. The options considered have been reviewed in light of the Regulation 18 feedback (as summarised in the consultation report) and the updates to the Local Plan period, these are reproduced in Appendix A along with the preferred approach taken forward for the Local Plan.

5.2 This section will now discuss the key issues that are being addressed through the Local Plan and how the Local Plan's policies respond to them.

Impacts of Climate Change on Flood Risk

5.3 Addressing current and future flood risk remains a key priority for the new Local Plan. The ongoing impact of climate change includes projected wetter winters and increased incidences of intense rainfall events and this is likely to exacerbate risk of flooding in the future, with a variety of negative consequences for property, economy and ecosystems as well as human health. Although there is a need to strike a balance to ensure that other objectives such as the correct amount of housing, infrastructure etc. are also achieved, it is imperative that any new development is directed to areas with the lowest risk of flooding first, and that flood risks are well managed in new development so as to not increase flood risk elsewhere and to ensure the safety of occupants.

5.4 Our existing policy is performing fairly well according to feedback from specialists and the EA. Our approach to flooding also benefits from national policy providing a strong framework for addressing flooding, much of which can be applied directly to Oxford. There are however some areas where relying on national policy alone is not appropriate, as it does not take account of the local circumstances of Oxford's flood risk context, particularly in relation to extensions and also brownfield land at high risk of flooding. As the Local Plan 2036 policy has been put into use, some weaknesses and lack of clarity in how to apply the policy have also surfaced, which the Local Plan 2045 could address.

Strategic Flood Risk Assessment

5.5 Our current Strategic Flood Risk Assessment (SFRA) was published in 2017. In order to ensure that the SFRA is still relevant to best practice and the latest available knowledge, there is a need to undertake a new assessment to ensure that it takes account of the latest climate change predictions and modelling published at the time of the study. Climate change predictions are constantly being updated and refined and new predictions can have a notable effect on the picture of risk which we have considered as we have refined our policies (particularly our site allocations).

5.6 To support the Oxford Local Plan 2045 we commissioned an SFRA in order to understand the impacts of the latest modelling, including climate change predictions. The SFRA uses the EA's latest available modelling data, but also considers the detailed and area-specific 2018 model alongside this to maximise the accuracy of defining Flood Zone 3b. The SFRA assesses the risk from all sources of flooding as well as cumulative impact that development or changing land use would have on flooding. It also identifies opportunities to reduce the causes and impacts of flooding and identifies any land likely to be needed for flood risk management features and structures. The SFRA provides an evidence base to allow us to carry out a sequential test for site allocations to locate these in the lowest areas of flood risk wherever possible. It is also necessary for informing a more detailed assessment (SFRA level 2) of any allocations that need to be located in areas of higher flood risk to ensure development can happen in a safe way, historically this has been necessary in the city due to the lack of available sites that can meet our housing needs within areas of lowest flood risk.

Approach to flood zone 3b (functional flood plain)

5.7 The city is highly constrained by areas of flood risk, with a significant area comprising flood zone 3 – this is the area at highest risk of flooding. Flood zone 3 includes an area that is functional flood plain, referred to as flood zone 3b. National guidance is that we should not usually accept development within this area due to the high risk of flooding along with the loss of flood storage that this would incur, and our proposed approach is to continue to follow national policy and set out that development of greenfield sites within 3b would not be permitted. However, historic development has happened within the flood plain and has led to a number of areas of brownfield land existing within 3b.

5.8 Current policy in the Local Plan 2036 was formulated recognising that these brownfield sites can provide more sustainable locations for development than greenfield sites and that refusing further development could allow these areas to deteriorate whilst ignoring the opportunities for thoughtful redevelopment that can actually reduce flood risk in future. Many developments in these flood zones in the past have not compensated for lost flood storage or ensured suitable drainage systems, whereas new development on these same sites can make sure this does happen. The Policy in the Local Plan 2036 takes a pragmatic approach that recognises that Oxford already has significant development in areas at high risk of flooding, but that preventing redevelopment of these sites would also be preventing

opportunities to be taken for improvements to the flood risk situation, as well as sterilising sites in highly accessible locations.

5.9 Policy G7 in the Local Plan 2045 would broadly continue the approach of the existing plan, but would also deliver a clearer and more comprehensive approach to a range of development types including explicit reference to minor and householder development, and basement development. The policy allows some limited development within Flood Zone 3b, for water-compatible uses or essential infrastructure, as allowed for in national policy, but also on previously developed land in circumstances where the flood risk is demonstrably decreased through careful design and where all of the set of six criteria can be met, which are designed to ensure safety and improvements to flood risk management. These criteria include that the built footprint of the site is not increased and that the development does not result in an increase in flood risk vulnerability classification (so for example and office in flood zone 3b could not change to residential).

5.10 The approach for greenfield sites in Flood Zone 3b follows national policy, setting out that new development would not be permitted there except for water compatible uses and essential infrastructure. It is not seeking to be any more restrictive that this.

Sustainable Drainage Systems (SuDS)

5.11 National Policy includes some references to SuDS; however, we feel that more detail can be added in the new Local Plan, especially in regard to the design of SuDS which are specific to Oxford and have developed Policy G8 to capture this. In Oxford, a significant amount of development comes from minor planning applications, and we recognise that there is an opportunity to further help mitigate for flood risk by requiring SuDS on all new developments, including minor schemes. This would have a significant positive impact, especially considering the potential cumulative effect that numerous small developments could have on increasing overall flood risk in Oxford.

5.12 In addition to having SuDS on all new developments, Policy G8 is also explicit about encouraging green SuDS, that incorporate natural features, rather than grey (e.g. tanks underground). SuDS that incorporate natural green features have the benefit of bringing a wider range of additional benefits to place-making, such as making spaces for biodiversity and making spaces that are more pleasant for people. The policy therefore includes a hierarchical style approach to SuDS design, prioritising green SuDS and maximising multi-functionality. More details on this can be found in the background paper for Green Infrastructure which illustrates the benefits of multi-functionality, which although a priority, are far wider than just reducing flood risk.

6. Appendix A - Policy options and preferred approaches

The analysis set out in the previous sections of this background paper indicates that flood risk is a key issue that new development will need to consider and respond to depending on where it comes forward in the city. The process by which drainage is managed on sites is also a related consideration.

The Local Plan 2042 therefore includes proposed policies in response to the following topics:

- Addressing flood risk and requirements for flood risk assessments
- Sustainable Drainage Systems (SuDs)

For each topic, options for the approach that could be taken for the Local Plan 2042 policy have been considered, and these 'options sets' are set out in tables on the following pages. The tables identify potential positives of the approach, as well as the potential negative or neutral impacts that could arise depending on the approach taken and that have helped inform the preferred position set out for the Regulation 18 consultation.

Additionally, the options sets have been considered in light of their specific sustainability impacts through a high-level screening against the 12 sustainability criteria forming the assessment process for the separate Local Plan Sustainability Appraisal (explained in greater detail in the main Sustainability Appraisal report). Where there is potential for a significant sustainability impact to arise from an option, or where there are significant differences in impacts between potential options, the Council has screened the options set in for a detailed appraisal in the main Sustainability Appraisal report. A summary of this screening process is included at the end of each options set table.

Policy options set 007a (draft policy G7): Flood Risk and Flood Risk Assessments

Table 1 - Policy options set 007a: Flood Risk and Flood Risk Assessments

Option for policy approach	Potential positive consequences of the approach	Potential negative/neutral consequences of the approach
Option a Reiterate national policy and set out requirements for when an FRA will be required, particularly where there is less certainty within national policy (e.g. extensions). Include expectations for how flood risk ought to be assessed, avoided, managed and mitigated. This will include where flood risk could be impacted off-site.	Applications for extensions are a regular occurrence across the city, including within Flood Zone 3b. Owing to the constraints within the city we are seeking to allow some householder extensions if it can be demonstrated that it will not result in a significant increase in flood risk. This option would set out greater certainty as to what is expected.	Whilst the Local Plan can set out some basic principles that should be applicable to most situations, there is likely to always be an element of site-specific context which will need to be considered and may require deviation from these principles. With more extensions permitted within Flood Zone 3b, there is a risk of cumulative impacts from increased developed footprint over time.
Option b For extensions proposed within Flood Zone 3b – set out some key principles/ requirements that will need to be met to address flood risk before these will be permitted.	This option would make explicit the City Council's expectations for when FRAs are to be submitted, and how flood risk is to be addressed in Oxford. It would ensure that where flood risk is present on a site, this is effectively assessed and then addressed in the most appropriate way through the design of the development. Despite strength of national policy regarding flood risk, it does have some weaknesses/ ambivalence towards certain	National policy is generally strong regarding when FRAs are to be expected and how they ought to be completed. Policy is also strong regarding how flood risk ought to be addressed by new development. This could result in some repetition.

	situations, for example how FRA is to be applied to extensions, and local policy can provide greater certainty regarding our expectations.	
Option c Prevent self-contained basement flats in areas at risk from fluvial flooding.	There is a higher level of risk to life in self-contained basement flats than in basement accommodation more widely when in areas of flood risk. This policy approach would make self-contained basement flats unacceptable in such an area.	Could reduce opportunities for development of sites which are otherwise in accordance with national policy and where risks could be largely addressed through specific mitigation measures. Such development is already prevented by national guidance in Flood Zone 3 and subject to an exemption test in Flood Zone 2, so a specific option would not be considered necessary.
Option d Prevent culverting of open watercourses.	Culverting of open watercourses can introduce additional flood risk in the local area due to potentially throttling water flows during heavy rainfall events as well as risks of blockages during storm events that can exacerbate flooding. It can also have detrimental effects for the quality of the watercourse, removing habitat and harming local species.	Could reduce opportunities for development of sites if the open watercourse cannot be incorporated into the scheme.
Option e Allow only water compatible uses and essential infrastructure in undeveloped Flood Zone 3b. However, allow limited development (e.g. redevelopment of existing structures) on brownfield within Flood Zone 3b, with high standard of	Allowing only water-compatible and essential infrastructure in undeveloped flood zone should not increase flood risk elsewhere or result in unnecessary net loss of functional floodplain.	Where development is proposed on brownfield sites in Flood Zone 3b, it will be essential for proposals to have appropriately assessed risks and be able to demonstrate that new development would not: reduce the water storage capacity of the floodplain; impede flows of

mitigation, where built footprint of a site is not increased and where risk is demonstrably decreased. Apply sequential test for development in other flood zones in accordance with national policy. In any circumstance where proposals would conflict with safe access and egress requirements, they would be refused.	In Oxford there is much existing (and historic) development in areas of flood risk; it is important that those existing properties can be improved/ reused/ redeveloped to make efficient use of land. This approach would provide for careful regeneration of existing development sites but limiting further changes in built footprint should help to ensure no increase in flood risk elsewhere (with potential for improvement). Also, encourages use of brownfield land over developing on greenfield sites and can allow development close to where people already live.	water; create or increase any risks for occupants, or of flooding elsewhere. The policy would need to provide clarity on what constitutes the built footprint of a site and what conditions are acceptable under the policy – e.g. if the footprint remains the same, is it acceptable to be relocated within a site?
Option f Allow only water compatible uses and essential infrastructure in undeveloped Flood Zone 3b. However, allow limited development (e.g. redevelopment of existing structures) on brownfield within Flood Zone 3b, no restriction on built footprint change if risk is demonstrably decreased. Apply sequential test for development in other flood zones in accordance with national policy. In any circumstance where proposals would conflict with safe access and egress requirements, they would be refused.	Greenfield sites are likely to have a role as flood storage, and this option would preserve this function and help to ensure no increased flood risk elsewhere. Exemptions could be possible for specific allocated sites where the required evidence has been gathered at the Local Plan stage to support this.	This policy could restrict opportunities for utilising land for other uses, e.g. to meet the city's housing need, which could come forward designed in a way that is safe from flooding, does not shift flood risk elsewhere, and is in accordance with the NPPF.

Option g Prevent development of greenfield sites within Flood Zone 3a, but with specific exemptions (e.g. for allocated sites).	Same positives as above for option b, except this option allows for a greater use (e.g. densification) of site compared with option a - as long as design of development ensures flood risk is ultimately reduced compared to pre-development.	Where development is proposed on brownfield sites in Flood Zone 3b, it will be essential for proposals to have appropriately assessed risks and be able to demonstrate that new development would not: reduce the water storage capacity of the floodplain; impede flows of water; create or increase any risks for occupants, or of flooding elsewhere. A demonstrable reduction in flood risk alongside an increase in built footprint could be very difficult to achieve in practice.
Option h Do not include a policy about flood risk but rely on national policy instead.	Simply relying on national policy could be easier for developers to understand and work with. National policy on flood risk is fairly developed and well tested and may ultimately be transferred into National DM policies.	Oxford has a unique flooding environment and particular constraints on development in the city. There is a risk that a more generalised approach misses opportunities to address this.

Initial sustainability appraisal screening of options sets
Is there only one option or are there various options we could take? Option a, or Option a+ combination of all or some of Option b, Option c and Option d, with either Option e or Option f or Option g. Option h is an alternative option to Option a.

High-level screening conclusion? The options are similar to each other from a sustainability perspective. National policy already provides a strong framework for managing flood risk, however the additional options proposed on top of national policy are seen as necessary due to local context.

Screened in for detailed appraisal? No

Rationale:
Options a and h are alternative options. Option a reiterates national policy and provides more detail where there is less certainty within national policy such as for extensions, whereas Option h does not have a policy and just defaults to national policy. Options b, c and d are all additional options which seek to set out key principles to consider for extensions in Flood Zone 3b; to prevent self-contained basement flats in areas at risk from fluvial flooding; and to prevent culverting of open watercourses respectively. Option e would allow limited development on brownfield land within Flood Zone 3b, where the built footprint of the site is not increased and where flood risk is demonstrably decreased and where safe access and egress requirements are mandatory. Option f is similar to Option e, except it would not restrict the size of the built footprint of the development. Option g goes further than either Options e or f as it prevents development of greenfield sites in Flood Zone 3a, but with specific exemptions (e.g. for allocated sites).

In terms of sustainability impacts, **criterion 2. Climate resilience** is the most relevant. Most of the options would score positively against this criterion as they seek to manage flood risk, albeit in different ways, for example, whether it's addressing extensions in Flood Zone 3b (Option b) or preventing culverting of watercourses (Option d), or providing more detail than what is contained in national policy (Option a). The extent of the positive impact of these options will be dependent on the implementation. The only option that would score neutral is Option h as it would proposes no policy and defers to national policy. Some of the policy options would impact **Criterion 3. Efficient use of land**. Options e or f would have a minor positive impact as they both seek to allow limited development on brownfield land within Flood Zone 3b, which minimises the use of greenfield land. Depending on implementation, Option g would score neutral against this criterion, as although it wouldn't allow development on greenfield Flood Zone 3a, this more restrictive option might limit sites that could be allocated for development, where land is already constrained. Option d might even score positively against **Criterion 10. Biodiversity** as not allowing watercourses to be culverted, not only reduces flood risk (water storage) but keeps the water naturalised, potentially allowing preferable conditions for biodiversity to flourish. Overall, it is considered that the sustainability impacts from the options do not differ enough to warrant them being scoped in for detailed appraisal.

Flood Risk and Flood Risk Assessments - Policy G7

For the Local Plan 2045, the preferred approach is a combination of **Options A, B, C, D and E.** This will allow for a targeted policy that responds to various considerations and potential risks arising from the local context of flood risk in the city.

Option A helps to ensure national flood risk requirements are met but also provides more certainty around expectations for FRAs where national guidance is less clear, or where there are particular local issues that applicants need to consider. **Option B** would help to ensure that extensions in particular flood risk zones are informed by FRAs that meet particular requirements. **Option C** would prevent self-contained basement accommodation in areas of flood risk because of the particular vulnerabilities associated with this type of development and the risks for occupants. Meanwhile, **Option D** would prevent culverting which can incur additional flood risk due to constraining water flows during heavy rainfall events, but also have negative impacts for ecology and wildlife that rely on the watercourses.

Option E is considered to be an important response to Oxford's particular circumstances in relation to pre-existing development in flood risk areas. The option allows only water-compatible and essential infrastructure in the undeveloped flood zone, which should mean flood risk is not increased elsewhere or that loss of functional floodplain does not occur unnecessarily. However, the option also recognises that there is sometimes historic development located in areas of flood risk that could benefit from sensitive redevelopment in order to secure more sustainable futures for these sites, whilst also taking opportunities to address existing flood risk there. However, it will be important to ensure that strict requirements are set out in the policy for when this may be acceptable.

Policy options set 007b (draft policy G8): Sustainable Drainage Systems (SuDs)

Table 2 - Policy options set 007b: Sustainable Drainage Systems (SuDs)

Option for policy approach	Potential positive consequences of the approach	Potential negative/neutral consequences of the approach
Option a Require SuDS on all new developments (including minors), unless this is shown not to be feasible, and include guidance on how they should be implemented.	Greener solutions have multiple benefits – so these can be maximised where green SUDs are prioritised for in the first instance.	Some sites may not be able to accommodate green solutions. Whilst well-designed SuDS can deliver multiple benefits, this should not come at

Incorporate hierarchy style approach to SuDS design, prioritising green SuDS and maximising multi- functionality.	Same benefits as Option b but with more detailed specifications on the type of SuDS to be implemented, with a priority given to green, natural features. Green, multi-functional SuDS can contribute to wider placemaking and have a variety of benefits that extend beyond water management, including improving water quality, reducing urban heat, promoting biodiversity and better placemaking.	the cost of their role as flood risk mitigation where this is required – potentially this could be complicated by seeking to deliver wider multi-functionality particularly where inappropriately designed. Additional management/ maintenance requirements for green SuDS would need to be factored into design and cost of schemes.
Option b Require SuDS on all new developments (including minor household applications), unless this is shown not to be feasible, and include guidance on how they should be implemented.	Some sites might only be able to accommodate limited 'grey' drainage measures (e.g. tanks). This approach would ensure that new development include SuDS wherever possible and set out guidance for how this ought to be designed. SuDS can help to reduce risks of flooding, particularly during times of intense, heavy rainfall by capturing surface water run-off and reducing pressures on sewers. Sets out that SuDS would be required on minor schemes also (which are not addressed in national policy).	Could lead to proliferation of 'grey' SUDs and miss out on benefits that greener solutions for SuDS design – e.g. making use of green infrastructure – can provide. SuDS may be more challenging to deliver on smaller sites where space is limited. Would need to ensure that proposals are accompanied by appropriate infiltration studies.

Option c Do not include a policy about SuDS but rely on national policy instead.	There is a variety of industry guidance about good design for SuDS which could be utilised by developers. Equally the City Council could set out its expectations in the form of supporting guidance/ technical advice note.	Guidance in national policy about SuDS is limited in terms of 'good design' and regarding wider objectives (e.g. water quality), it also only addresses SuDS on major schemes. A local policy could be more explicit in terms of what is expected/ suitable for Oxford, including on minor applications. This option would arguably not address the local context of flood risk in the city and the need for all new development to address it.

Initial sustainability appraisal screening of options sets
Is there only one option or are there various options we could take? Option a, b or c are alternative to each other **High-level screening conclusion?** The options are similar to each other from a sustainability perspective **Screened in for detailed appraisal?** No **Rationale:** Options a, b and c are all alternatives. Option a requires SuDS on all new developments (including minors), prioritising green SuDS and maximising multifunctionality. Option b is similar to Option a except it doesn't prioritise green SuDS or multifunctionality, whilst Option c is not to have a policy and rely on national policy/ guidance instead. In terms of SA impacts the options are most directly relevant to **criterion 2. Climate resilience** and both Options a and b would be a positive impact. Option a will also have minor positive impacts for **criterion 7. Green Infrastructure.** Potentially option b might also positively impact criterion 7 as well but it depends upon implementation, otherwise it would be neutral. Option c is expected to be neutral in impact for these criteria, as there is strengthened national policy guidance however this is lacking the detail that would help to steer the design of these measures to take account of local context. Overall, it is considered that the sustainability impacts from the options do not differ enough to warrant them being scoped in for detailed appraisal.

Sustainable Drainage Systems (SuDs) - Policy G8

For the Local Plan 2045, the preferred approach is **Option A**, which would mean requiring SuDS on new development and also incorporating a hierarchy style SuDS policy that steers applicants towards prioritising green SuDS measures first, before other 'grey' solutions are selected. This approach would help to ensure that surface drainage is managed appropriately, reducing strain on sewer systems and helping to build in flood resilience into sites.

This approach would also help to ensure multi-functional benefits can be derived from SuDS design by seeking to maximise green infrastructure features that can manage drainage whilst also providing other benefits for people and the environment. It would also complement the greening aspirations of other elements of the Local Plan. An approach of having no local policy, or not prioritising green features could risk missing opportunities for multi-functional features and applicants selecting less optimal drainage solutions for their sites.