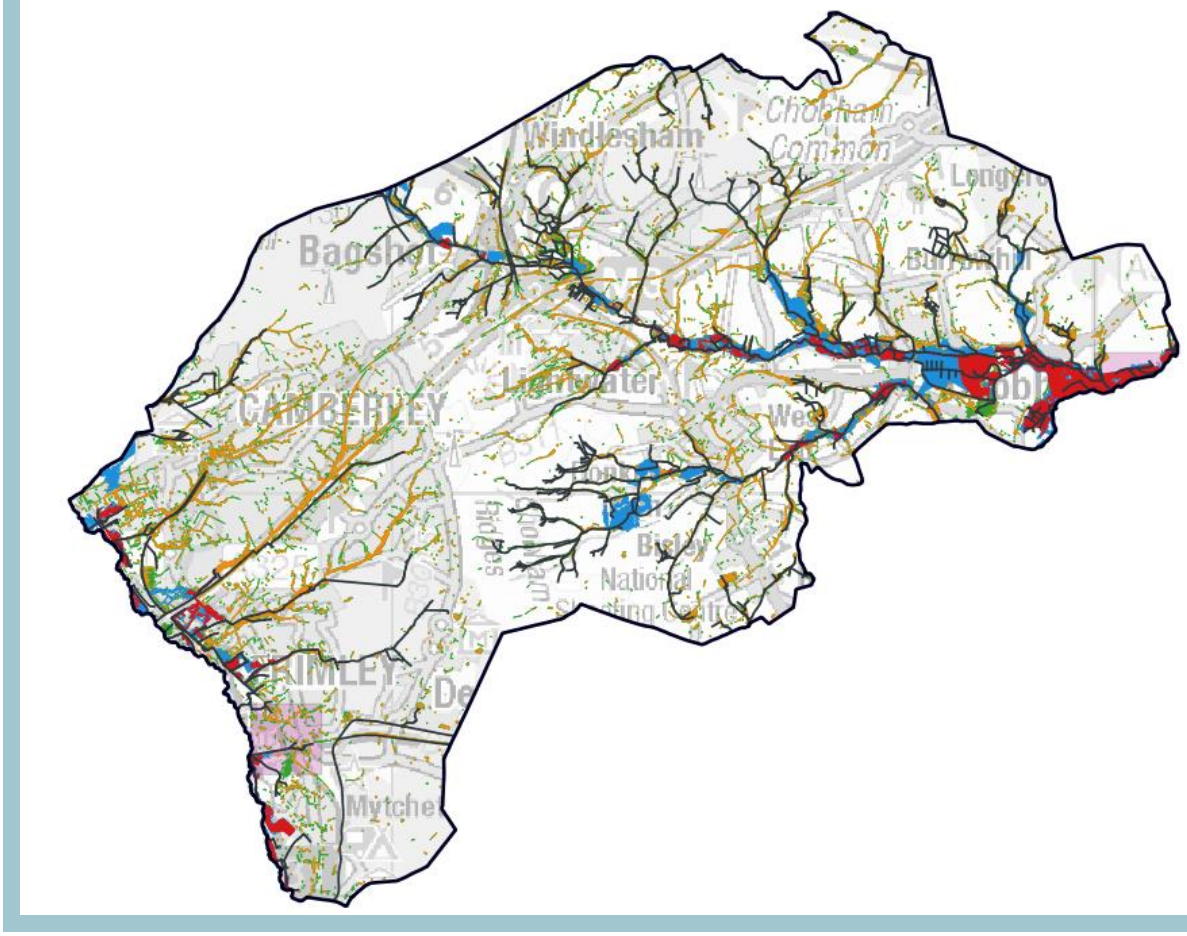
CAPITA

Surrey Heath Borough Council

Strategic Flood Risk Assessment

April 2021



We | Listen Create Deliver

Quality Management

Job No	CS/098308		
Project	Surrey Heath County Council Strategic Flood Risk Assessment		
Location	Surrey Heath Borough		
Title	Strategic Flood Risk Assessment 2019		
Document Ref	CS/098308-CAP-00-XX-RP-Z-0001_P01	Issue / Revision	2.0
File reference	Surrey Heath SFRA Report Draft v2.0.docx		
Date	April 2021		
Prepared by	Imogen Clow, Claire Gardner, Jack Pordham		
Checked by	Emma Elwood, Angus Kerry		
Authorised by	Bryony Smith, Jack Southon		

Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared	Checked	Authorised
1	October 2019	Draft for comment	IC / CG	EE/AK	BS
2.0	April 2021	Final	JP	JS	JS

Contents

Figures

Tables

Appendices

Glossary

Term	Definition
AEP	The probability of fluvial (river) flooding uses the Annual Exceedance Probability (AEP). This is sometimes known as the 'annual probability' of flooding. A flood event described as a 1% AEP has a 1% (or 1 in 100) chance of occurring in any given year. This could alternatively be described as a 100 year return period flood event, that is, it is an event that is likely to occur, on average, once every 100 years.
AStGWf	Areas Susceptible to Groundwater Flooding
Basement	The floor of a building which is partly or entirely below ground level
Catchment Flood Management Plan (CFMP)	A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
Critical Drainage Areas	Defined in the Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006 as "an area within Flood Zone 1 which has critical drainage problems and which has been notified… [to]…the local planning authority by the Environment Agency". Also see Wetspot
Design flood event	A flood event of a given probability. Common design flood events are • 1% annual exceedance probability for fluvial (river) flooding • 0.5% annual exceedance probability for tidal flooding
Exception Test	If it is not possible for development to be located in zones with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. For the exception test to be passed it should be demonstrated that: • the development would provide wider sustainability benefits to the community that outweigh the flood risk; and • the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall. Both elements of the exception test should be satisfied for development to be allocated or permitted.
Flood alleviation scheme	Infrastructure used to protect an area against floods such as floodwalls and embankments.
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra (Department for Environment, Flood & Rural Affairs) and WAG (Welsh Assembly Government).
Fluvial flooding	Flooding resulting from water levels exceeding the bank level of a watercourse
Flood Risk Assessment (FRA)	A site-specific assessment of all forms of flood risk to the site and the impact of development of the site to flood risk in the area.
Flood Risk Management Plans (FRMP)	FRMPs benchmark existing flood risk, set out strategic priorities and actions for managing flood risk, and identify more detailed measures that will reduce flood risk to communities
Flood Storage Area (FSA)	An area that is designed to store water during times of flood
Functional Floodplain	Flood Zone 3b / land where water has to flow or be stored in times of flood.
Greenfield	Undeveloped parcel of land
Groundwater rebound	The raising of groundwater levels resulting from a reduction in abstractions rates following a period of high abstraction which kept levels artificially low
Hydraulic model	A mathematical model of a water/sewer/storm system used to analyse the system's hydraulic behaviour.
Indicative Flood Risk Area	Nationally identified flood risk areas, based on the definition of 'significant' flood risk described by Defra and WAG.

Term	Definition
IDBs	Internal Drainage Boards
LFRMS	Local Food Risk Management Strategy
LLFA	Lead Local Flood Authority - Local Authority responsible for taking the lead on local flood risk management
LPA	Local Planning Authority
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers. However, the riparian owner has the responsibility of maintenance.
Minor development (in relation to flood risk)	Minor development in relation to flood risk includes • Minor non-residential extensions: industrial/commercial/leisure etc. extension with a footprint less than 250 square metres • Alterations: development that does not increase the size of buildings • Householder development: for example, sheds, garages etc. within the curtilage of the existing dwelling itself. It excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling
NPPF	National Planning Policy Framework https://www.gov.uk/government/publications/national-planning-policy-framework--2
Ordinary Watercourse	All watercourses that are not designated Main River. Local Authorities or IDBs (where they exist) have similar permissive powers as the Environment Agency in relation to flood defence work. However, the riparian owner has the responsibility of maintenance.
PFRA	Preliminary Flood Risk Assessment
Pitt Review	Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.
PPG	Planning Practice Guidance. Flood Risk and Coastal Change is the PPG most relevant to flood risk https://www.gov.uk/government/collections/planning-practice-guidance
Replacement dwellings	The replacement of an existing dwelling
Residual Risk	The risks remaining after applying the sequential approach to the location of development and taking mitigation actions.
Resilience measures	Measures designed to reduce the impact of water that enters property and businesses
Resistance measures	Measures designed to keep flood water out of properties and businesses
Risk	In flood risk management, risk is defined as a product of the likelihood of a flood occurring and the consequence of the flood.
RoFfSW map	Risk of Flooding from Surface Water map
Return period	The average recurrence interval of a flood event over an extended period of time.
Riparian owner	People who own the land or property with a watercourse which flows through it or a watercourse adjacent to the property boundary. This can include rivers, streams, ditches and piped or culverted watercourses. Where a watercourse forms the boundary to a property, the adjacent land owners are ordinarily deemed to be riparian owners up to the centre line of the watercourse.
Safeguarded land	Land where funding has been approved for future flood alleviation schemes.
Sequential approach	The general sequential, risk-based approach to the location of development, directing development to sites and areas so as to avoid, where possible, flood risk to people and property taking into account the current and future impacts of climate change. This includes the application of the Sequential Test at a site level, as well as the planning of on-site layouts to direct the most vulnerable parts of a development to areas of lowest risk where flood risk varies across a site.
Sequential Test	A requirement of the NPPF to steer new development to areas with the lowest probability of flooding. The Sequential Test is applied at site level to identify if there are reasonably available sites within Flood Zone 1 before considering sites within Flood Zone 2, and if there are reasonably available sites within Flood Zone 2 before considering sites within Flood Zone 3 , taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.

Term	Definition
	Development 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.
Sewer flooding	Flooding caused by blockages or exceeding the capacity of a sewer or drainage system.
SFRA	Strategic Flood Risk Assessment
Standard of Protection (SoP)	The probability of flood event that a flood defence is able to function effectively for. For example, a flood wall providing a 1% standard of protection, is designed to protect against floods with a 1% AEP of flooding or less.
Sustainable Drainage Systems (SuDS)	Management practices and structures designed to drain surface water in a way which mimics the natural drainage characteristics of an area.
Surface water flooding	Flooding as a result of runoff following high intensity, or prolonged, rainfall that exceeds the infiltration capacity of the ground.
Surface Water Management Plan (SWMP)	Plans which outline the preferred surface water management strategy and identify the actions; timescales and responsibilities of each partner.
Wetspot	A "wetspot" is a term used by Survey County Council (the LLFA) to record the location of a reported, recurring flood incident which is unlikely to be solved through the councils day-to-day activities. This might be a problem caused by or affecting the highway, or be an issue affecting homes, businesses or important infrastructure. The LLFA would expect developers to seek to address known wetspot issues where the opportunity arises through development. Details available from SCC or online https://www.surreycc.gov.uk/roads-and-transport/roadworks-and-maintenance/report-a-highway-problem/drainage-and-flooding/flooding-and-wetspots Also see Critical drainage area

1. Executive Summary

1.1 Introduction

This Strategic Flood Risk Assessment (SFRA) is an update to the 2015 SFRA and has been prepared in accordance with current best practice; the National Planning Policy Framework (NPPF) and its accompanying Flood Risk and Coastal Change Planning Practice Guidance (PPG). It will form part of the evidence base to support Surrey Heath's Local Plan.

The SFRA has been based on best available data and users need to consider limitation of the quality and extent of the data used. The SFRA has used information from the Environment Agency's detailed hydraulic models and has also used these models to run climate change simulations where this data was not already available. Other additional information on flood risk from government Open Source websites (data.gov.uk), the Environment Agency; Surrey County Council; Surrey Heath Borough Council; and Thames Water has also been used to inform the SFRA.

1.2 Flood Risk across Surrey Heath

Flood Risk Source	Summary	Related Information
Fluvial	The Environment Agency Flood Map for Planning (Flood Zones 2 and 3a), and the functional floodplain produced for this report (Flood Zone 3b) and historic flood incidents show fluvial flood risk is largely from the Main Rivers, including the Blackwater and its tributaries and the Addlestone Bourne. The River Bourne catchment, with its wide floodplains, has large areas at risk. However, much of this is rural, undeveloped land. The River Blackwater catchment and its tributaries flows through more urban areas, resulting in greater risk to individual properties and businesses.	Section 6.3.1 Section 7.2 Section 8.2 Appendix C
Surface Water	The Risk of Flooding from Surface Water (RoFfSW) map shows the most common areas of surface water flood risk are along roads, depressions (valley lines), and land adjacent to watercourses. The Surry County Councli 'Wetspot' database lists locations of a reported, recurring flood incident which is unlikely to be solved through the LLFA's day-to-day activities. This might be a problem caused by or affecting the highway, or be an issue affecting homes, businesses or important infrastructure. The LLFA would expect developers to seek to address known wetspot issues where the opportunity arises through development.	Section 6.3.2 Section 7.3 Section 8.3 Appendix E
Sewers	Sewer flooding incidents have been recorded throughout the Borough, mainly in urban areas, such as Camberley and Frimley, where the denser public drainage networks increase the probability of sewer flooding.	Section 8.4 Section 7.4 Section 8.4
Groundwater	Most of the study area is at low risk of groundwater flooding due to the underlying sandstone geology. There is an elevated risk of flooding from groundwater close to river valleys, where high water tables and fluvial sand and gravel deposits allow water to easily rise to the surface	Section 6.3.3 Section 7.5 Section 8.5 Appendix F

Reservoirs	The Environment Agency long term flood risk map shows areas at risk of flooding from reservoirs along the river valleys of the River Blackwater, Windle Brook and Hale Bourne, with outlines generally following the watercourses and associated floodplains. Due to the strict maintenance and monitoring regimes places on large raised reservoirs the likelihood of reservoir failure is low.	Section 6.3.4 Section 8.6
Canals	Flood risk of the Basingstoke Canal can occur through failure of its embankments. Due to the low probability of this occurring, flood risk from the Basingstoke Canal is considered to be low.	Section 6.3.5 Section 7.6 Section 8.7

1.3 Recommendations

1.3.1 Planning

- New development should be steered towards areas at the least risk of flooding from all sources in line with the Sequential Test for flooding. This Level 1 SFRA provides an evidence base for Surrey Heath Borough Council to carry out the Sequential Test and therefore should be used for future strategic land allocations.

- Consideration should be given to the potential risk of flooding to the proposed site, and as a result of developing the site, the potential risk to other locations. This is important for considering areas in rural upper catchments where, large amounts of development could increase runoff entering the river network and therefore increase fluvial flood risk in Surrey Heath and beyond.

- If the Sequential Test shows it is not possible to for all new development to be allocated away from areas of flood risk, a Level 2 SFRA should be prepared to provide information for the application of the Exception Test where appliable. A Level 2 SFRA should consider the detailed nature of the flood characteristics within a flood zone including flood probability, flood depth, flood velocity, rate of onset of flooding, and duration of flood.

1.3.2 Flood Risk Information

- Information and evidence for all sources of flooding continue to be collected. SFRA is a live document that should be updated when new information becomes available.

- Surrey Heath Borough Council should liaise with Surrey County Council to identify Critical Drainage Areas (CDAs) and policies for development in those areas to ensure that future development does not increase flood risk and reduces existing flood risk where possible. Developments within CDAs require a site-specific flood risk assessment and there is a requirement when determining planning applications for such sites to consult the LLFA as a statutory consultee. Surrey County Council maintain a 'wetspot' database[1] of locations of a reported, recurring flood incident which is unlikely to be solved through the LLFA's day-to-day activities. This might be a problem caused by or affecting the highway, or be an issue affecting homes, businesses or important infrastructure. The LLFA would expect developers to seek to address known wetspot issues where the opportunity arises through development.

- Watercourses with catchments smaller than 3km^2 may not be included in national flood zone modelling and therefore national mapping may under-estimate the flood risk for these smaller catchments. Assessment of the flood risk from unmodelled watercourses (where it is likely that the

[1] Surrey County Council - Flooding and wetspots available from https://www.surreycc.gov.uk/roads-and-transport/roadworks-and-maintenance/report-a-highway-problem/drainage-and-flooding/flooding-and-wetspots

risk is under represented on national flood zone mapping) should be assessed as part of site-specific Flood Risk Assessments (FRAs).

1.3.3 Development Control and Developers

- Development applications should consider the requirements for a site-specific flood risk assessment as set out in the NPPF and PPG. The mapping and information provided in this SFRA and Flood Map for Planning should be used to help inform where a more detailed assessment may be required.

- Drainage strategies must be prepared to accompany all major development using the guidance set out in the NPPF, PPG, Surrey County Council's Sustainable Urban Drainage (SuDS) Design Guidance (2019) and this document. The responsibility for ongoing maintenance of the proposed SuDS should be set out clearly covering the lifetime of the development, along with ownership for the SUDS.

- Where new developments are built in areas benefitting from existing flood defences there remains a residual risk in the event of overtopping or failure. This residual risk should be considered as part of a site-specific flood risk assessment clearly covering the lifetime of the development, along with ownership for the flood alleviation asset.

- Flood risk information in this SFRA, as well as local knowledge and mobility of occupants, should be considered when preparing evacuation plans. Advice should be sought from emergency planning officers to plan safe access and egress routes.

- All site-specific FRAs should include assessment of all sources of flooding including an assessment of groundwater flood risk. The scope of the assessment required should be conducted on a risk-based approach based on the geological conditions and site history including any history of groundwater flooding.

- Developments that may be at risk in the event of a breach from the Basingstoke Canal should consider this in the site-specific flood risk assessment.

1.3.4 Flood Risk Management

- SFRA is a live document that should be updated when new information such as updated hydraulic modelling and hydrological studies become available.
- Where limitations in data or the scale of assessment have been identified, information should be improved through more detailed study. Where modelling is carried out as part of a site-specific FRA, results should be captured by Surrey Heath Borough Council to inform the SFRA.

- Residents of existing properties should be encouraged to sign up to the Environment Agency's flood warning service, where available

- Policies should be developed to ensure that appropriate surface water management and mitigation is provided for developments to ensure that there is no increase in flooding as a result of development. Post-development surface water runoff rates for greenfield sites must be limited to greenfield run off rates. Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event. Brownfield sites should be limited as close to greenfield run off rates as is reasonably practicable. If greenfield run off rates cannot be achieved, clear written evidence must be submitted as to why a lower rate cannot be achieved. Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer

or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event

- Surrey Heath Borough Council should promote the use of SuDS within new and re- developments.
- Surrey Heath Borough Council should develop surface water management policies to ensure that surface water runoff from upstream catchments does not increase flood risk further down the catchment. Surrey Heath Borough Council should use the information in the SFRA as a starting point to produce Surface Water Management Plans (SWMP) across Surrey Heath.

1.3.5 SFRA Maintenance

- As noted above the SFRA is a live document that should be updated when new information as it becomes available.
- The SFRA Management and Maintenance Strategy set out in Section 15.3 should be adopted to ensure the SFRA is kept up to date.
- Information from site specific FRAs should be retained and used to inform the updates to the SFRA.

2. Introduction

2.1 Background

SFRAs are carried out by Local Planning Authorities (LPAs) to assess all sources of flood risk, to an area. The assessment includes consideration of the impacts of climate change as well as the impact that land use changes and development in the area will have on flood risk. Information provided in the SFRA is used to direct development away from areas at a higher risk of flooding through a sequential, risk-based approach. The revised National Planning Policy Framework (NPPF)[2] Paragraph 156 states "Strategic policies should be informed by a SFRA, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards".

SFRAs are also used by planning applicants to as an evidence base to inform site specific flood risk assessments and by LPAs as a material consideration when determining planning applications.

2.2 SFRA Levels

The NPPF Planning Practice Guidance (PPG) Flood Risk and Coastal Change[3] Paragraph 012 sets out two levels of SFRA.

Level 1

A Level 1 assessment should be carried out in local authority areas where flooding is not a major issue and where development pressures are low. The assessment should be sufficiently detailed to allow application of the Sequential Test to the location of development and to identify whether development can be allocated outside high and medium flood risk areas, based on all sources of flooding, without application of the Exception Test.

Level 2

Where a Level 1 assessment shows that land outside flood risk areas cannot appropriately accommodate all the necessary development, it may be necessary to increase the scope of the assessment to a Level 2 to provide the information necessary for application of the Exception Test where appropriate. A Level 2 SFRA should consider the detailed nature of the flood characteristics within a flood zone including flood probability, depth, velocity, rate of onset of flooding and duration of flooding. It should provide sufficient detail to assess that the proposed development will not increase flood risk elsewhere and that the development will be safe for site users. This should cover the lifetime of the proposed development including the appropriate allowances for the impact of climate change .

This report and associated appendices fulfil the requirements of a Level 1 SFRA.

2.3 Purpose of the SFRA

This SFRA is designed to update the Level 1 SFRA published in 2015. This update is required to ensure that Surrey Heath Borough Council have a robust evidence base when making future development decisions and strategies, including supporting the application of the Sequential Test as part of the preparation of the new Local Plan and any site allocations. Following adoption of the Local Plan the SFRA

[2] Department for Communities and Local Government, 2019. National Planning Policy Framework https://www.gov.uk/government/publications/national-planning-policy-framework--2

[3] Department for Communities and Local Government, 2014 (updated 2016). Planning Practice Guidance: Flood Risk and Coastal Change Reference ID: 7-003-20140306 https://www.gov.uk/guidance/flood-risk-and-coastal-change#planning-and-flood-risk

forms a reference document for use by development control officers for advising and determining decisions on windfall and allocated sites.

Since the 2015 SFRA was produced there have been several changes including:

Policy and guidance

- updates to the NPPF (in 2018 and most recently in February 2019) and PPG
- updates to climate change guidance and by the Environment Agency in February 2016
- publication of new documents which will inform the SFRA including Section 19 Flood Investigation Reports and a refreshed Surrey Local Flood Risk Management Strategy (LFRMS)

Available Data

- multiple updates to the Flood Map for Planning (Rivers and Sea)[4]
- updated climate change mapping

Flood Events

- a number of flood events have occurred since the 2015 SFRA was produced.

2.4 SFRA Objectives

In line with the guidance in the NPPF and scope provided by Surrey Heath Borough Council, the main objectives of this SFRA are to:

- present information on all sources of flooding to enable the Sequential Test to be applied in order to identify whether development can be allocated outside of high and medium risk zones
- map flood risk from all sources within Surrey Heath Borough Council, including definitions of the functional floodplain (Flood Zone 3b)
- assess the impacts of climate change and residual risk
- identify flood risk management measures in place and coverage of the flood warning systems
- identify areas where additional development may significantly increase flood risk elsewhere through the impact of existing sources of flooding, or by additional surface water runoff
- provide recommendations about the identification of critical drainage areas and the potential need for surface water management plans
- produce a concluding map showing the areas of the Borough which are at high risk of flooding
- inform any opportunities to re-locate existing vulnerable developments to a more secure area
- provide sufficient evidence to allow Surrey Heath Borough Council to justify existing policies and to write future Policies
- recommend measurements to meet Water Framework Directive (WFD) objectives in order to achieve wider environmental benefits
- provide advice on the likely applicability of sustainable drainage systems techniques for managing surface water run-off at key development sites.

[4] It was noted during the preparation of the SFRA that the Environment Agency are in the process of updating the Addlestone Bourne detailed flood risk model including preparation of flood mapping for Windlesham Ditch for which no detailed flood risk model is currently available. However, the results of these studies were not available within the plan preparation period.

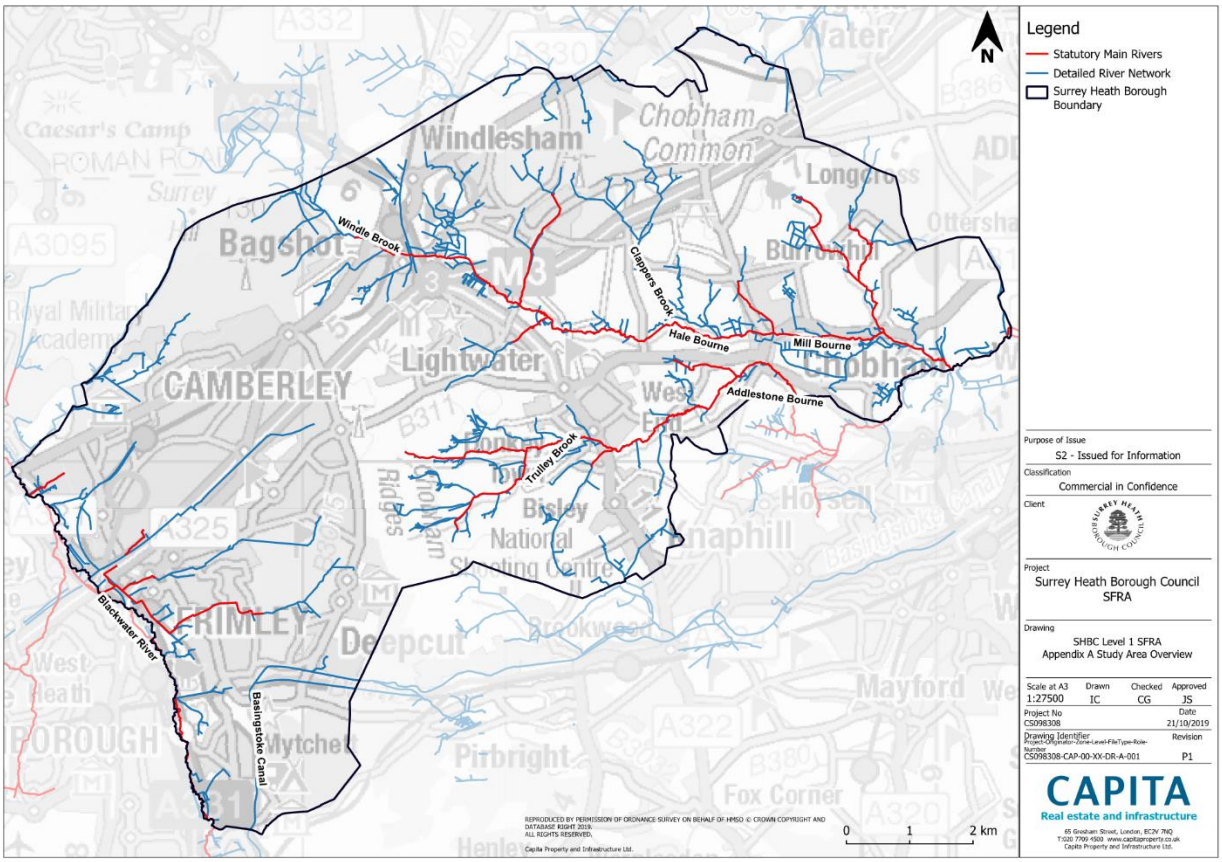
3. Study area overview

An overview of the study area is included in Appendix A. The SFRA covers a total area of 94.8 km^2 comprising two main catchments; the River Blackwater (Loddon Catchment) in the west and the Bourne Catchments in the east. In the west (close to the River Blackwater) the main urban areas are Camberley, Frimley, Frimley Green and Mytchett. In the east, the villages of Lightwater, Bagshot, Windlesham, Chobham, West End and Bisley lie in close proximity to the Bourne and its tributaries.

3.1 Hydrology

The Borough of Surrey Heath is divided into two basic catchment areas dictated by the high ground known as the Chobham Ridges. The ridges form a natural watershed boundary along The Maultway (B3015) road. Surface water from upland areas in the catchment primarily flows within minor open watercourses before discharging into the Main Rivers or the sewer network. In all cases, the flows towards the two river catchments are subjected to large areas of run-off and the resulting flows affect towns and villages throughout the Borough. Figure 3-1 below shows the extent of the Main River network as well as the ordinary watercourses in the borough – a full version of this figure is available as Appendix A.

Figure 3-1: Main River and Ordinary Watercourses within the Borough



3.1.1 River Blackwater Catchment

The River Blackwater rises on the south-western fringe of Aldershot and is approximately 35 km long from its source (in Aldershot) to its confluence with the River Loddon in Hart, Wokingham Borough, just north of

Swallowfield. The River Blackwater forms the boundary between Rushmoor and Guildford Districts before entering Surrey Heath Borough adjacent to the A331 between Farnborough and Mytchett. The Blackwater flows in a northerly direction along the border of the Surrey Heath and Rushmoor Boroughs, although the original route of the river was changed in places when the A331 was constructed. The River Blackwater accepts flows from the eastern side of the Chobham Ridges and flows north until Frimley Railway Station where the flows are conveyed around the elevated M3 motorway at junction 4. Surface water drainage around the Frimley Station area was extensively modified with the construction of the A331 and contributing flows from the Balmoral Ditch; Lyon Way Ditch and France Hill Ditch previously have caused flooding to nearby residential and commercial property. The River Blackwater then continues north, flowing back and forth over the Rushmoor and Surrey Heath boundaries, with inflows from Riverside Way and Doman Road.

The upper reaches of the Balmoral Ditch; Lyon Way Ditch and Francis Hill Ditch are the ordinary watercourses conveying flows from the Chobham Ridges. Lower down these watercourses become Main River and flows converge to the east of the railway before flowing under the railway line towards the River Blackwater at Frimley Business Park. The Blackwater flows out of the study area just south of Hawley.

3.1.2 Bourne Catchment

The Bourne catchment is divided into two main sub-catchment areas collecting flows from the north and south of the Borough. From the north, runoff from the villages of Bagshot; Lightwater; Windlesham; West End (part) and Chobham (part) discharge into the Mill Bourne running north of Chobham village centre. From the south runoff from the villages of Bisley; part of West End and part of Chobham discharge into the Addlestone Bourne running south of Chobham village centre.

The Addlestone Bourne flows from west to east through the south east side of the Borough. It then flows in a north easterly direction along the eastern boundary of the Borough, where it is joined by the Mill Bourne, and exits the study area in the south eastern corner. Downstream of the study area, the Addlestone Bourne flows into the Woburn Park Stream, which in turn flows into the Chertsey Bourne.

The Mill Bourne and its tributaries flow from west to east and drain the north east side of the Borough. The Mill Bourne begins at the confluence of the Hale Bourne and Clappers Brook, west of Chobham village, and a tributary of Hale Bourne, the Windle Brook, drains from Bagshot.

3.1.3 Basingstoke Canal

The Basingstoke Canal stretches a distance of 32 miles (51km) between the villages of Greywell in Hampshire and Woodham in Surrey. It incorporates 29 locks along its entire length to raise the canal from the River Wey up to the plateau in Hampshire 75m (245ft) above sea level. The canal enters the south west of the Borough at Mytchett Lake and flows in a northerly direction alongside the eastern side of Mytchett through the southern corner of the Borough towards Frimley Green. At Wharfenden Lakes, the canal begins to head east until it exits the study area south of Deepcut.

The canal, which flows at approximately 70m AOD until it reaches the lock flight at Deepcut, was constructed as a contour canal. Following the contours, rather than taking a direct course, reduced the elevation changes required along its course, and eventually brings the canal to the same level as the Wey Navigation at New Haw near Byfleet in Surrey. The canal is navigable as far upstream as the Greywell Tunnel, and connects to the River Wey Navigation, which in turn joins the River Thames. The Basingstoke Canal has been designated as a Site of Special Scientific Interest (SSSI). During its short reach through the study area, the canal does not interact with any Main River watercourses. Surface water connections have been made to the canal, and excess surface water within the canal is discharged through channels in Ash Vale and Pirbright.

Management and maintenance of the canal is coordinated in partnership with the Basingstoke Canal Authority. This Partnership also includes six local funding borough and district councils: Hart, Rushmoor,

Guildford, Surrey Heath, Woking and Runnymede. Hart District further comprises local parishes and Fleet Town Council who contribute revenue funding to maintain the canal.

3.2 Topography

The topography of the catchment is variable. The more urban, western areas slope from east to west and drain into the River Blackwater. The topography is relatively gentle on the west of the Borough with the River Blackwater surrounded by lakes and flat floodplains. East of the Chobham Ridges, the area is less densely populated and characterised by small villages, but the speed and volume of surface water run-off can be considerably greater due to the steeper gradients and open heath land areas. This effect is experienced through most villages, particularly where watercourses have been culverted.

3.3 Geology

The River Blackwater rises as springs in Bagshot Beds (sandstone) overlying London Clay. The catchment geology mainly consists of Bracklesham Beds (sandstones which overly the Bagshot Beds). Within the study area, the main bedrock geology of the Blackwater catchment is the sedimentary Bracklesham Group and Barton Group, which are undifferentiated sands; silts and clays.

Through Lightwater, in the centre of the catchment, the main bedrocks underlying the Bourne catchment are Windlesham Formation sands; silts and clays. To the east, Bagshot Formation sands underlie the lower reaches of the Bourne catchment. Along the river channels there are areas of fluvial gravel and sand deposits which are more permeable but also affected by high groundwater levels. There is little presence of chalk and related aquifers across the study area.

3.4 Infrastructure

The main transport infrastructure link within the study area is the M3 motorway, which bisects the Borough from the north east boundary to the south west boundary. However, this does not determine a divide in catchment areas as the watercourse routes traverse the M3. The M3 generates a large volume of surface water run-off which is generally unattenuated, leading to increased peak flows in the accepting watercourses. The main London to Southampton railway also crosses through the Borough in the south west corner. The Reading to Guildford railway runs to the east of the River Blackwater, through Mytchett, Frimley and Camberley. And the Ascot to Guildford branch line enters the Borough near Windlesham and exits at Mytchett. Any watercourse or floodplain intercepted by railway will have a significant effect on flooding processes.

Other major roads in the area include the A30, A325, A322, A319 and the A331. The A331 runs alongside the Blackwater. The A325 at Frimley is elevated over the River Blackwater, railway, A331 and Station Road. This section of highway spans the river floodplain but also, due to the highway exacerbating overland flows, properties (residential and commercial) in Station Road and Lyon Way Industrial Estate, are susceptible to flooding. The A322 runs north-south, on the eastern side of the Borough, passing through Bisley, West End; Lightwater; Bagshot and Windlesham. Localised flooding problems are known along the A322 route due to the proximity of Main River and minor watercourses.

The A319 runs from the A322 through parts of West End; Windlesham and Chobham. During times of heavy or prolonged rainfall the A319 at Chobham can be closed due to surcharge of the Mill Bourne River north of Chobham village centre. Flooding of the A319 at Chobham can be prolonged; restricting vehicle access through the village.

The only major sewerage works in the study area is situated in Doman Road, Camberley. This facility is owned by Thames Water Utilities Ltd and is located partially within the River Blackwater designated floodplain.

4. Policy and local studies

4.1 European policies

4.1.1 Floods Directive

The European Directive on the Assessment and Management of Flood Risks (European Union, 2007) came into force on 26 November 2007 and requires member states to consider how their own domestic policies could potentially impact their neighbouring member states' flood risks and management of flood risks. This directive was transposed into English and Welsh law as the Flood Risk Regulations (December 2009), and the Environment Agency was designated as the competent authority to implement the Directive in England. The Directive states that objectives regarding the management of flood risk should be determined by the member states themselves and should be based on local and regional circumstances. The Flood Risk Regulations (2009) transpose the EU Floods Directive into UK law. For England, the following elements must be undertaken:

- Preliminary Flood Risk Assessments (PFRAs) to identify areas that are at potentially significant flood risk
- Flood hazard maps (showing the likelihood and flow of the potential flooding) and flood risk maps (showing the impact)
- Flood risk management plans (showing measures to decrease the likelihood or impact of flooding)
- Updates every 6 years thereafter, taking into account the impact of climate change.

4.1.2 Water Framework Directive (EU Directive 2000/60/EC)

The Water Framework Directive (WFD), developed following a review of EU water policy, requires that rivers, coastal waters and groundwater achieve "good ecological and chemical status" (or potential for good status) by 2027 and are prevented from deteriorating. The WFD in England has been implemented using integrated River Basin Management Plans (RBMPs) which include the management of both biological and chemical elements and ensures that all requirements and pressures on the water environment are considered within a river basin. This directive makes sure that, as far as possible, flood alleviation schemes contribute to achieving 'good ecological status' and prevent deterioration through methods such as restoration of floodplains to their natural state and purpose. The Thames RBMP covers the Borough of Surrey Heath. The Water framework Directive has been retained in UK law following the UKs Withdrawal from the European Union.

4.2 National Policies and Guidance

4.2.1 Flood and Water Management Act (2010)

The Flood and Water Management Act (2010) defines the roles and responsibilities of different Risk Management Authorities in England and Wales. The Risk Management Authorities in England are the Environment Agency (EA), Internal Drainage Boards, Water and Sewerage Companies and Lead Local Flood Authorities (LLFAs). Within Surrey Heath Borough, Surrey County Council is the LLFA, Thames water is the Sewerage undertaker, and South East Water and Affinity Water are Water supply companies, there are currently no Internal Drainage Boards. The Act defines the necessity of co-operation between relevant authorities at national, regional and local levels. As the Lead Local Flood Authority (LLFA), Surrey County Council is required to:

- take an active role leading flood risk management
- cooperate with other relevant authorities to manage local flood risk
- investigate and report on flood incidents which meet the required threshold

- maintain an 'Asset Register' of assets that have a significant influence on local flood risk
- designate 'features' that have a significant influence on local flood risk
- regulate and undertake works on 'ordinary watercourses' and take enforcement action where required under the Land Drainage Act
- develop and implement Local Flood Risk Management Strategies
- Provide support to the Local Planning Authority (LPA), acting as the statutory consultee on the delivery of SuDS

The Flood and Water Management Act also clarifies three key areas that influence development:

- Sustainable Drainage Systems (SuDS) - the Act makes provision for a national standard to be prepared on SuDS. Developers will be required to obtain LPA approval for SuDS.
- Flood risk management structures - the Act enables the Environment Agency and local authorities to designate structures such as flood defences or embankments owned by third parties for protection if they affect flooding or coastal erosion. A developer or landowner will not be able to alter, remove or replace a designated structure or feature without first obtaining consent.
- Permitted flooding of third party land – In exceptional circumstances, the Environment Agency and local authorities have the power to carry out work which may cause flooding to third party land where the works are deemed to be in the interest of nature conservation, the preservation of cultural heritage or people's enjoyment of the environment or of cultural heritage.

4.2.2 National Planning Policy Framework (February 2019)

The National Planning Policy Framework (NPPF)[5] was originally published in March 2012 and updated in 2018 and again in February 2019. It sets out the Government's planning policy requirements for England and how these are expected to be applied.

The Framework states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. Where development is necessary in flood risk areas, it can be permitted provided it is made safe for its lifetime without increasing flood risk elsewhere. The essence of NPPF is that:

- Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and develop policies to manage flood risk from all sources, taking advice from the Environment Agency and other relevant flood risk management bodies, such as lead local flood authorities and internal drainage boards;
- Plans should apply a sequential, risk-based approach to the location of development.
- Polices in development plans should outline the consideration that will be given to flooding issues, recognising the uncertainties that are inherent in the prediction of flooding and that flood risk is expected to increase as a result of climate change;
- Planning authorities should apply the precautionary principle to the issue of flood risk, using a risk-based search sequence to avoid such risk where possible and managing it elsewhere;
- The vulnerability of a proposed land use should be considered when assessing flood risk;
- Where appropriate, applications should be supported by a site-specific flood risk assessment.

[5]Department for Communities and Local Government, 2019. National Planning Policy Framework https://www.gov.uk/government/publications/national-planning-policy-framework--2

- Planning authorities should recognise the importance of functional floodplains, where water flows or is held at times of flood, and avoid inappropriate development on undeveloped and undefended floodplains; and
- Development is based on the concept of Flood Risk Reduction, particularly in circumstances where development has been sanctioned on the basis of the "Exception Test".

The NPPF sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow. Where these tests are not met, national policy is clear that new development should not be allowed. The main steps to be followed are designed to ensure that if there are better sites in terms of flood risk, or a proposed development cannot be made safe, it should not be permitted.

4.2.3 National Planning Policy Guidance (2015)

The PPG provides guidance for implementing the NPPF. The PPG Flood Risk and Coastal Change[6] was originally published in March 2014 and was updated most recently in 2016. It sets strict tests to protect people and property from flooding. All local planning authorities are expected to follow the PPG. Where these tests are not met, national policy is clear that new development should not be allowed. The main steps to be followed are designed to ensure that if there are appropriate sites available at lower risk of flooding, or a proposed development cannot be made safe, it should not be permitted.

The National PPG document provides guidance on how the local planning authorities should:

- assess flood risk
- avoid flood risk
- manage and mitigate flood risk and coastal change.

There is also information on the requirements to consult the Environment Agency; the role of LLFA and on flood risk in relation to minor developments. In addition, the PPG provides information on the application of the Sequential and the Exception Tests in the preparation of a Local Plan.

4.2.4 Climate Change Allowance

The document 'Flood risk assessments: climate change allowances (2016)'[7] supports the NPPF in setting out how planning can minimise and provide resilience against climate change impacts, through making an allowance for climate change in strategic and site-specific flood risk assessments. The 2016 climate change guidance based on UKCP09 predictions is the current valid guidance at the time of publishing the SFRA. However, work is underway to publish updated guidance making use of UKCP18 climate change forecasts. Site-specific flood risk assessments should make use of the climate change allowances that are valid at time of the submission of individual planning applications.

4.2.5 Non-statutory Technical Standards for Sustainable Drainage Systems, March 2015

This document, published by Defra, sets out non-statutory technical standards for sustainable drainage systems. The non-statutory technical standards should be used in conjunction with the NPPF and PPG.

Non-statutory technical standards are provided for the following items:

[6] Department for Communities and Local Government, 2014 (updated 2016). Planning Practice Guidance: Flood Risk and Coastal Change https://www.gov.uk/guidance/flood-risk-and-coastal-change

[7] Environment Agency, February 2016 (updated 2020). Flood Risk Assessments: Climate Change Allowances https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

- flood risk outside the development;
- peak flow control;
- volume control;
- flood risk within the development;
- structural integrity;
- designing for maintenance considerations
- construction

Review of the non-statutory technical standards is underway. The current standards at the time of publishing the SFRA are the March 2015 standards. Site-specific flood risk assessments should make use of the standards that are valid at time of the submission of individual planning applications.

4.3 Regional Policies, Strategies and Guidance

4.3.1 Catchment Flood Management Plans

A Catchment Flood Management Plan (CFMP) is a high-level strategic plan, prepared by the Environment Agency, that provides an overview across a river catchment. CFMPs set out the long term management plan for flood risk from rivers; groundwater; surface water and tidal flooding, but not flooding directly from the sea (coastal flooding). They are used by the Environment Agency and other key stakeholders to identify and agree the most effective ways to manage flood risk over the next 50 to 100 years. CFMPs can be found on the Government's website.

There are six pre-defined national policies set out in CFMPs and these are applied to specific locations through 'sub-areas'. These policies are intended to cover the full range of long term flood risk management options in the catchment that can be applied to different locations. The policies are:

1. no active intervention (including flood warning and maintenance). Continue to monitor and advise
2. reducing existing flood risk management actions (accepting that flood risk will increase over time)
3. continue with existing or alternative actions to manage flood risk at the current level (accepting that flood risk will increase over time from this baseline)
4. take further action to sustain the current level of flood risk (responding to the potential increases in risk from urban development, land use change and climate change)
5. take action to reduce flood risk (now and/or in the future)
6. take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits, locally or elsewhere in the catchment

The approach that the Environment Agency would like to see taken to flood risk management within the Study Area is outlined in the Thames CFMP. The Surrey Heath SFRA study area is covered by the following sub-areas

- sub-area Seven (Expanding towns in floodplain locations): Policy option 4 has been applied to this sub-area
- sub-area Eight (Heavily populated floodplains): Policy option 5 has been applied to this sub-area.

4.3.2 Thames River Basin District Flood Risk Management Plan

Under the Flood Risk Regulations, the Environment Agency exercised an 'Exception' and did not prepare a PFRA, choosing instead to prepare Flood Risk Management Plans (FRMPs) for river basin districts (RBDs).

The Environment Agency FRMPs summarise the risk of flooding from Main Rivers; the sea; groundwater and reservoirs, within the RBD. They set out how organisations; stakeholders and communities will work together to manage flood risk and are updated with each six year cycle of the Flood Risk Regulations. The FRMPs draw from, and build on, existing flood and coastal erosion risk management plans such as CFMPs; Shoreline Management Plans (SMPs) and LFRMSs. The Surrey Heath study area is covered by the Thames River Basin District FRMP.

4.4 Local Policies, Strategies and Guidance

4.4.1 Local Flood Risk Management Strategy

Surrey County Council is the LLFA for the Surrey Heath Borough. Surrey County Council is required to develop, maintain, apply and monitor a LFRMS. The strategy aims to increase awareness of local flood risk issues and sets out how partners are working together to reduce flood risk. The document provides an overview of the ongoing flood risk management work underway across Surrey for 2017-2032. The Surrey Flood Risk Partnership Board oversees the strategy.

Reflecting the requirements of the FWMA (2010) and the National Flood and Coastal Erosion Risk Management Strategy (2011), the LFRMS aims to make it easier for Risk Management Authorities (RMAs) to work together and clarify roles as well as providing a clear overview of the levels of flood risk throughout the County by considering flooding issues at catchment level. The strategy must cover how and when flood risk reduction measures will be implemented; how much they cost and how they will be paid for. The document was refreshed in 2017 and can be found on the County Council's website at

https://www.surreycc.gov.uk/people-and-community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/surrey-local-flood-risk-management-strategy

4.4.2 Surrey Heath Local Plan

Surrey Heath Borough Council adopted a Core Strategy and Development Management Policies Development Plan Document in February 2012. The Council has adopted a spatial strategy which directs development to the more sustainable urban locations on the western side of the Borough with only limited development being provided for in the more rural, flood prone eastern parts. Policy CP3 of the Core Strategy expects the Council to provide for 3,240 net new homes over the plan period 2011 – 2028. This equates to an annual requirement for 191 net new homes.

The Council is currently in the process of updating its Local Plan evidence base. This evidence includes a new Housing Need Assessment, Strategic Land Availability Assessment (SLAA) and an Employment Land Technical Paper Update (ELTP).

4.5 Local Studies

4.5.1 Surrey Preliminary Flood Risk Assessment

LLFAs are also required under the Flood Risk Regulations to produce a PFRA. A PFRA was prepared for Surrey County Council in June 2011, to ensure the Council met this duty, and provides an initial assessment of local flood risk across Surrey, including information on past floods and the potential for future flooding.

The Surrey PFRA (2011) recognised that part of the County Council's administrative area is in a 'Flood Risk Area' and is therefore required to deliver flood hazard / risk maps and a flood risk management plan under the Regulations. The PFRA also formed the basis of the preparation of a LFRMS and Surrey County Council's strategic investment plan.

5. Responsibility for flood risk management

The roles and responsibilities of RMAs in Surrey Heath Borough are summarised below.

5.1 Surrey Heath Borough Council (Local Planning Authority)

As the Local Planning Authority, Surrey Heath Borough Council is responsible for plan-making and decision-taking regarding development in the local area. This includes developing policies to manage flood risk from all sources; creating a Local Plan and deciding whether a development should go permitted. The Council, as the LPA, determines applications for planning permission in accordance with the Local Plan and any relevant material considerations.

The LPA consults relevant statutory consultees, such as the LLFA and Environment Agency, to inform the assessment of planning applications. Where necessary, non-statutory consultees who may also have an interest in the planning application will also be consulted.

5.2 Surrey County Council (Lead Local Flood Authority)

As the LLFA, Surrey County Council is responsible for developing; maintaining and applying a strategy for local flood risk management in their areas and for maintaining a register of flood risk assets. They also have lead responsibility for managing the risk of flooding from surface water; groundwater and ordinary watercourses.

Under the Flood and Water Management Act 2010, Surrey County Council as the LLFA is required to:

- prepare and maintain a strategy for local flood risk management in their areas, coordinating views and activity with other local bodies and communities through public consultation and scrutiny, and delivery planning. They must consult Risk Management Authorities and the public about their strategy.
- carry out works to manage local flood risks in their areas (the power for works in relation to minor watercourses sits with either the district council or unitary authorities outside of IDB areas)
- maintain a register of assets – these are physical features that have a significant effect on flooding in their area.
- investigate significant local flooding incidents and publish the results of such investigations.
- have powers under the Land Drainage Act 1991 to regulate ordinary watercourses (outside of IDBs) to maintain a proper flow by:
    - issuing consents for altering, removing or replacing certain structures or features on ordinary watercourses; and
    - enforcing obligations to maintain flow in a watercourse and repair watercourses, bridges and other structures in a watercourse
- undertake a statutory consultee role for all major developments, as defined by the Town and Country Planning (Development Management Procedure) (England) Order 2010, in relation to the management of surface water drainage and flood risk. The LLFA will advise the local planning authority on whether the proposed drainage system complies with the relevant standards and policies. They will assess applications and, if required, provide comments and planning conditions.
- co-operate with other Risk Management Authorities

- play a lead role in emergency planning and recovery after a flood event. Local Authorities are 'Category One Responders' under the Civil Contingencies Act and must have plans to respond to emergencies, and control or reduce the impact of an emergency.

5.3 Environment Agency

The Environment Agency is an executive non-departmental public body that deals with environmental management issues in England including the management of flood and coastal erosion risk.

The Environment Agency's remit in the management of flood risk includes:

- developing long-term approaches to Flood and Coastal Erosion Risk Management (FCERM). This includes developing and applying the national flood and coastal erosion risk management strategy.
- allocating of national government funding to projects to manage flood and coastal erosion risks from all sources
- delivering projects to manage flood risks from Main Rivers and the sea
- working with others to prepare and deliver FRMPs. The Environment Agency and Defra provide guidance to LLFAs on their role in developing FRMPs.
- providing evidence and advice to support others. This includes national flood and coastal erosion risk information; data and tools to help other Risk Management Authorities and inform Government policy, and advice on planning and development issues
- working with others to share knowledge and the best ways of working. This includes work to develop FCERM skills and resources

The Environment Agency also has operational responsibility for managing the risk of flooding from Main Rivers and reservoirs which includes:

- constructing and maintaining river and coastal defences
- providing flood forecasting and flood warning information
- responding to flood emergencies
- regulating and enforcing works on Main Rivers
- Providing statutory consultee responses to planning applications
- Being a Category One Responder under the UK Civil Contingencies Act 2004

5.4 Water Companies

The core business of water and sewerage companies is to supply potable (drinking) water and remove domestic and industrial waste water. Companies providing sewerage services have the responsibility to maintain surface, foul and combined public sewers to ensure an area is effectively drained. They must also keep and maintain a register of properties that have suffered from internal flooding from the public sewer due to capacity issues and assess whether the public system has the spare capacity to accept additional flows from new or redevelopment. In Surrey Heath Borough, the responsibility for providing potable water supplies and maintaining most of the sewers lies with Thames Water Utilities Ltd.

5.4.1 Highways England

Highways England is the government organisation charged with operating; maintaining and improving England's motorways and major (trunk) roads. The M3 motorway, which runs through the centre of the Borough, is operated and maintained by Highways England.

5.4.2 Riparian Owners

Riparian owners are people who own the land or property through which a watercourse passes. This can include a river, stream, ditch and piped or culverted watercourses. Where a watercourse forms the boundary to a property, the ownership and responsibility for that watercourse is that of the adjacent land owner up to the watercourse's centre-line.

Riparian owner responsibilities include:

- reporting any incidents on the stretch of watercourse to the Environment Agency
- letting water flow naturally, by:
    - removing any obstructions or blockages which could obstruct or affect a public right of navigation, or reduce the flow or cause flooding to other landowners' property
    - keeping any structures clear
    - leaving all other trees, branches and shrubs are they can help prevent flooding
- preventing pollution by:
    - avoiding the disposal of waste water or chemicals etc. into the watercourse
    - removing litter from the banks
    - removing animal carcasses
    - avoiding disposing of garden waste into or on the banks of the watercourse
- protecting wildlife, by not disposing habitats and species and by preventing invasive species from spreading.
- getting permission from the relevant RMA before building anything in or around the watercourse
- not building anything which could divert water and increase flood risk

Further information on the rights and responsibilities of riparian owners is provided in the Government Guidance 'Owning a watercourse', published in February 2018.

6. Data collection, consultation and methodology

6.1 Data Collection

This Level 1 SFRA aims to collect and review the information available relating to flooding in the study area and present this in a manner suitable for Surrey Heath Borough Council to apply the Sequential Test. The Level 1 assessment uses available existing information and data compiled from a range of sources, should not be considered as an exhaustive list of all available flood related data for the study area.

6.2 Stakeholders and Consultation

A variety of stakeholders were consulted during the preparation of this report including:

- Surrey Heath Borough Council
- Surrey County Council
- Environment Agency
- Basingstoke Canal Authority
- Thames Water

The SFRA has been developed using existing knowledge of flood risk with the study area. The Borough Council; County Council, Environment Agency and Thames Water all have a rolling programme of flood risk investigations and management and this, combined with collated evidence from flood events from all parties, means that the knowledge and understanding of flood risk in Surrey Heath is constantly evolving. As such, it is important that users of this SFRA contact relevant RMAs to determine whether any new information or data is available since the publication of the SFRA.

6.3 Methodology

6.3.1 Fluvial Flood Risk

Flood Zone 2 and 3a

The Environment Agency's Flood Map for Planning[8] Flood Zones 2 and 3 have been used for Flood Zones 2 and 3a respectively. The Flood zones are made from a combination of detailed hydraulic mapping studies where available and supplemented with national flood zone mapping where not. See Section 8.2.3 for further information of Flood Zones 2 and 3a.

The Risk of Flooding from Rivers and Sea[9] is also a useful resource to review information about an areas fluvial (and coastal) risk of flooding and should be referenced alongside Flood Map for Planning within site-specific flood risk assessments.

Functional floodplain

The functional floodplain (also known as Flood Zone 3b) has been derived using the methodology set out in the PPG. Identification of functional floodplain needs to take account of local circumstances and

[8] Environment Agency. Flood Map for planning https://flood-map-for-planning.service.gov.uk/

[9] Environment Agency. Risk of Flooding from Rivers and Sea https://flood-warning-information.service.gov.uk/long-term-flood-risk/

probability parameters. Land which would naturally flood with a 5% AEP event or greater in any year, or is designed to flood (for example, a flood storage scheme) should provide a starting point for identifying functional floodplain. It should also consider the effects of defences and other flood risk management infrastructure. For example, areas which would naturally flood but are prevented from doing to by existing defences; infrastructure or solid buildings is not considered to be functional floodplain.

The detailed hydraulic modelling results provided by the Environment Agency provided a starting point for the identification of functional floodplain. Where available, the 5% AEP modelled flood extent has been used as an indication of those areas which may be acting as functional floodplain. If defences are present, the 5% AEP defended flood outline has been used. The Flood Map for Planning Flood Storage Areas dataset was analysed to determine if there were any storage areas that should be incorporated into the functional floodplain; no storage areas were identified in the study area.

In addition to the detailed hydraulic model results, the Environment Agency's Detailed River Network (DRN) layer has been used to identify river channels that also form part of the functional floodplain. Note: the DRN may not take account of culverted watercourses or watercourses where the channel has been modified or diverted.

Where detailed modelling is not available, Flood Zone 3b is presumed to be equivalent to Flood Zone 3a. Development proposals for sites in Flood Zone 3 should be supported by site specific FRAs that include an assessment of whether the site falls within Flood Zone 3a or Flood Zone 3b.

The datasets used to compile Functional Floodplain are set out in Table 6-1.

Table 6-1 Functional Floodplain Hydraulic Model Data Sources

Hydraulic Model	Modelled Flood Extent Used
Addlestone Bourne 2007	5% AEP
Blackwater Aldershot to Sandhurst 2007	5% AEP defended
Blackwater Sandhurst to Bramshill 2009	5% AEP
Blackwater Tribs Model 2 (2012)	5% AEP
Blackwater Tribs Model 8 (2012)	5% AEP
Blackwater Tribs Model 10 (2012)	5% AEP
Blackwater Tribs Model 12 (2012)	5% AEP

Climate Change

There is increasing concern about the impacts of climate change on the global environment. The nature of climate change at a regional level will vary. In the UK climate projections are prepared by the Met Office Hadley Centre Climate Programme which is supported by the Department of Business, Energy and Industrial Strategy (BEIS) and the Department of Environment, food and Rural Affairs (DEFRA). The projections indicate more frequent, short duration, high intensity rainfall and more frequent periods of long duration rainfall of the type responsible for the summer 2007 and winter 2013/14 floods. These changes are likely to result in the more frequent occurrence of all types of flooding, including fluvial, tidal, coastal, surface water, sewer and groundwater flooding. NPPF requires that climate change is considered as part of the spatial planning process, and as such is considered as part of this SFRA.

The document 'Flood risk assessments: climate change allowances (published 2016 last updated July 2020)'[10] sets out how strategic and site specific flood risk assessments should make allowances for climate change. The 2016 climate change guidance based on UKCP09 predictions is the current valid guidance at the time of publishing the SFRA.

The published guidance stipulates which allowance category should be applied in the assessment depending on the flood risk vulnerability classification the proposed use.

The table below sets out the current climate change allowances for the Thames region (including Surrey Heath)

Table 6-2 Peak river flow allowances for Thames River basin district (based on a 1961 to 1990 baseline)

Allowance category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
H++	25%	40%	80%
Upper End	25%	35%	70%
Higher Central	15%	25%	35%
Central	10%	15%	25%

Based on this latest guidance, the Upper End and Higher Central climate change allowances (35% and 70% respectively) for the 2080s epoch have been utilised for this SFRA assuming most development will include highly vulnerable or more vulnerable uses and have a 100 year lifetime of development.

These climate change allowances were available for the following models:

- Blackwater Aldershot to Sandhurst 2007
- Blackwater Sandhurst to Bramshill 2009

To gain a better appreciation of future flood risk where the council have proposed development allocations, the following Environment Agency detailed models were re-run to produce up to date climate change data (with 35% and 70% climate change allowances):

- Addlestone Bourne 2007[11]
- Blackwater Tribs Model 12 (2012)

The remaining Blackwater Tribs models were not re-run with the updated climate change allowances as no allocations have been proposed in areas likely to be affected by flooding from these watercourses. Developers will need to consider the impact of climate change for planning applications for windfall sites proposed in locations that may be affected by these watercourses. Should local plan allocation sites be proposed in this area at a later date then this SFRA will need to be updated with climate change mapping in this area.

[10] Environment Agency, February 2016 (updated 2020). Flood Risk Assessments: Climate Change Allowances https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

[11] It was noted during the preparation of the SFRA that the Environment Agency are in the process of updating the Addlestone Bourne detailed flood risk model including preparation of flood mapping for Windlesham Ditch for which no detailed flood risk model is currently available. However, the results of these studies were not available within the plan preparation period.

It should be noted that work is underway to publish updated guidance making use of UKCP18 climate change forecasts. Site-specific flood risk assessments should make use of the climate change allowances that are valid at time of the submission of individual planning applications.

6.3.2 Surface Water Risk

Present Day

The Environment Agency Risk of Flooding from Surface Water (RoFfSW) mapping has been used to identify the present day risk of surface water flooding in Surrey Heath. Previously known as the updated Flood Map for Surface Water (uFMfSW), the RoFfSW identifies flow paths of existing watercourses from the topography of the land. Table 6-3 describes the four categories[12] for surface water risk in the RoFfSW maps.

Table 6-3 RoFfSW categories

Category	Definition
High	Each year, the area has a chance of flooding of greater than 1 in 30 (3.3%)
Medium	Each year, the area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)
Low	Each year, the area has a chance of flooding of between 1 in 1,000 (0.1%) and 1 in 100 (1%)
Very Low	Each year, the area has a chance of flooding of less than 1 in 1,000 (0.1%)

Additionally, Surry County Council's 'Wetspot' records[13] which show known areas susceptible to flooding issues – particularly on the Highway have been used to inform present day surface water flood risk.

Climate Change

As noted above, the document 'Flood risk assessments: climate change allowances (published 2016 last updated July 2020)'[14] sets out climate change allowances to be used for strategic and site-specific flood risk assessments. At the time of publication of the SFRA these were based on UKCP09 projections as shown in the table below.

Table 6-4 peak rainfall intensity allowance in small catchments (less than 5km^2) or urban drainage catchments (based on a 1961 to 1990 baseline)

Allowance category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper End	10%	20%	40%
Central	5%	10%	20%

No surface water climate change modelling is available for Surrey Heath Borough. As such, the 0.1% AEP (low) RoFfSW category should be used to give an indication of the increase in the 1% AEP (medium) RoFfSW category due to climate change.

[12] Environment Agency. Risk of flooding from surface water – understanding the flood map https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297429/LIT_8986_eff63d.pdf

[13] Surrey County Council - Flooding and wetspots available from https://www.surreycc.gov.uk/roads-and-transport/roadworks-and-maintenance/report-a-highway-problem/drainage-and-flooding/flooding-and-wetspots

[14] Environment Agency, February 2016 (updated 2020). Flood Risk Assessments: Climate Change Allowances https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

It should be noted that work is underway to publish updated guidance making use of UKCP18 climate change forecasts. Site-specific flood risk assessments should make use of the climate change allowances that are valid at time of the submission of individual planning applications.

6.3.3 Groundwater Risk

Current understanding of groundwater risk is limited, with few groundwater risk maps available. The Environment Agency's Areas Susceptible to Groundwater Flooding Map (AStGWf) has been used to identify groundwater risk in the Surrey Heath Area.

The AStGWf map is a strategic scale (1 km square grid) map showing the proportion of each 1 km square which may be susceptible to groundwater emergence. It is likely that only isolated locations within the overall susceptible area suffer the consequences of groundwater flooding rather than the entire 1km square.

The dataset does not show the likelihood of groundwater flooding occurring, nor does it consider the chance of flooding from groundwater rebound. Groundwater rebound is the raising of groundwater levels resulting from a reduction in abstractions rates following a period of high abstraction which kept levels artificially low. The AStGWf is not suitable for site level analysis and should only be used as a starting point for further investigation into groundwater risk.

Existing local studies, such as LLFA Section 19 investigations were also reviewed for records of groundwater flooding incidents and these have been included within this report.

6.3.4 Reservoir Risk

The Environment Agency's Reservoir Flood Maps were used. These show the risk of inundation as a result of reservoir breach or failure, using a credible worst case scenario. The credible worst case scenarios used for breach of different types of reservoirs is set out in the Environment Agency publication Reservoir Flood Maps (RFM) Guide[15] which also provides greater detail on how the maps were developed. The maps do not show the likelihood or probability of reservoir failure, nor do they reflect the structural integrity of the dam or the chance of it failing. They also do not include reservoirs with an impounded volume less than 25,000m^3 (i.e those that do not fall under requirements of the Reservoirs Act) or reservoirs commissioned after the mapping was produced.

6.3.5 Canal Risk

Sources of information on canals in Surrey Heath include:

- **Canal and River Trust** Launched in 2012, the Canal and River Trust took over guardianship of British Waterways' canals, rivers, reservoirs and docks in England and Wales, after British Waterways was abolished, including liabilities and responsibilities
- **Basingstoke Canal Authority** The Canal Authority was set up in 1992 to manage the Basingstoke Canal as a managing agent on behalf of the Surrey and Hampshire County Councils (who are joint owners of the canal)

6.3.6 Flood Defences

The assessment on the type of defence, design standard of protection and authority with permissive powers for the defences used the Environment Agency Spatial Flood Defences including attributes GIS layer downloaded from the Spatial Data Catalogue.

[15] Environment Agency, 2016. Reservoir Flood Maps (RFM) Guide: Explanatory Note of Reservoir Flood Maps for Local Resilience Forums – version 5 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/558441/LIT_6882.pd f

7. Flood history

7.1 Background

This section discusses flood history within the Borough of Surrey Heath. Historic flooding information can vary in quantity and quality as well as spatially throughout an area. Historic flood incidents should be considered anecdotal and used to help review 'problem areas'. Additionally, whilst flood records are a valuable tool for understanding the past behaviours and magnitudes of flooding, it is important to acknowledge that actions such as the installation of flood defence schemes may have been taken since the flooding event to improve flood risk and, as such, areas that suffered from flooding in the past may no longer be at risk or may now only be at risk from events of a lower frequency than that suffered previously.

Appendix G shows where flood incidents have been reported in the past based on a combination of flood records sourced from the Environment Agency, Surrey County Council and the Borough Council's own records.

7.2 Fluvial

Fluvial flood events occurred in September 1968; February 1990; November 2000; August 2006; July 2007 and January 2009 in both the Blackwater and Bourne catchments. In addition, there was flooding in the Blackwater catchment in October 1993, and in the Bourne catchment in October 1997; July 2007 and January 2009.

7.3 Surface Water

Surface water flooding has historically occurred within Surrey Heath. The 2006 and 2007 flood events seen across Surrey Heath were mostly attributed to surface water flooding from overland flow paths, followed by fluvial flooding once the rivers and public/private drainage systems had reached capacity.

Historic flooding information, provided by Surrey County Council, shows that surface water flooding has occurred along Station Road near Mimbridge, due to unattenuated runoff. Guildford road (Bagshot), Lightwater By-pass (Broadway Road bridge), Bridge Road (Frimley) and Station Road (Frimley) are also subject to a combination of fluvial and surface water flood risk.

7.4 Sewers

The use of historic data to estimate the probability of sewer flooding is the most practical approach, however does not take account of possible future changes due to climate or future development. Historic results should also be viewed with caution as the sewer network is constantly being maintained, upgraded and improved. As such, flooding issues may be relatively short lived (<10 years). If identified by the Environment Agency or the water company as a major risk, sewer flooding will need to be assessed in greater detail in individual flood risk assessments. The number of internal and external flooding incidents recorded in Thames Water's DG5 Register are provided in Table 7-1.

Table 7-1 DG5 Register of Flooding Incidents

Postcode Area	Number of Internal Flooding incidents	Number of External Flooding incidents
GU125	0	2
GU151	9	18
GU152	5	25
GU153	4	8
GU154	0	1
GU166	4	11
GU167	12	4

Postcode Area	Number of Internal Flooding incidents	Number of External Flooding incidents
GU168	3	10
GU169	4	0
GU170	0	5
GU179	0	0
GU185	2	14
GU195	17	2
GU206	0	2
GU212	0	1
GU240	0	1
GU248	0	6
GU249	2	3
GU466	0	0
GU467	0	0
GU470	0	0
GU478	0	0
GU479	0	0

7.5 Groundwater

There are very few records of groundwater flooding across the Borough and the Surrey County Council historic flooding database does not attribute any of the recorded incidents to groundwater. The lack of incidents recorded may not be reflective of the occurrence of groundwater flooding, as groundwater flooding may occur following prolonged rainfall events simultaneously with other types of flooding. Areas of Mytchett and Frimley Green, adjacent to the River Blackwater, were historically excavated for the extraction of gravels. This action has led to a number of lakes being formed along the River Blackwater, expanding the relative sub-soil saturation area.

7.6 Canals

There have been few known Canal flooding incidents within the last 20 years, according to the Basingstoke Canal Authority. However, flood events are known to have occurred. In 1984, a 150m stretch of embankment between the Deepcut Locks 26 and 27 breached resulting in flooding downstream in Guildford (outside of the study area) via surcharging of the drainage system. In August 2006, a surface water attenuation system within Deepcut Barracks failed, allowing unattenuated flows to discharge into the canal before discharging into the Hodge Brook towards Pirbright (outside of the study area). This facility has not been replaced and the discharge into the canal is now direct and unattenuated.

Anecdotal information also reported that Tomlins Pond has breached its embankment in the past (no known date), resulting in water flowing via an overland route towards Alphington Pond. Breaches were reported on 15 September 1968, and 2007. The 1968 event was caused by maintenance neglect and a period of exceptionally heavy rain, which resulted in the canal bursting its banks in two places. This event led to the restoration of the Basingstoke Canal.

7.7 Recent Flood Events

More information on recent flood events is provided below.

7.7.1 Winter 2013/14

Flooding experienced in Surrey Heath over the winter of 2013/14 was a combination of both fluvial and surface water runoff, caused by unprecedented rainfall during the winter. During December, January and February 2013/14 the recorded rainfall was 275% of average winter rainfall. In particular, the storm event of 23 December 2013 resulted in approximately 60mm of rainfall recorded over an 18-hour period at the Cranleigh Waters rain gauge, south of Guildford. The cumulative effects of rainfall following this event led

to high river levels and saturated catchments, meaning that flooding started to occur after relatively small rainfall events.

Overall, there were road closures and between six and ten incidents of internal property flooding within Surrey Heath in Camberley and Lightwater. Flooding was mainly a result of surface water flooding for this location. Flooding was recorded on Robins Bow; Middleton Road; the Maultway and a short section of London Road.

Lightwater is located within the Bourne catchments, in particular within the Mill Bourne sub-catchment. Flooding was mainly as a result of a combination of surface water and fluvial flooding. Flooding led to several road closures in and around Lightwater, and flooding was recorded on Grasmere Road; Blackstroud Lane East and West and Burnt Pollard Lane.

During this event, the Environment Agency operated Flood Alert and Warning services and command stations were set up at Surrey Police Headquarters to respond to the flooding across Surrey. Thames Water focused on maintaining customer services; protecting assets vital for the ongoing delivery of service and ensuring that where there was disruption, normal service was able to resume as soon as possible. Surrey County Council closed roads temporarily for public safety and operated a call centre to deal with residents. Surrey Heath Borough Council had no flood risk management functions relevant to this flood event.

This event is documented by the Section 19 Flood Investigation Report: Surrey Heath (Surrey County Council, October 2015).

7.7.2 August 2015

On Wednesday 26 August 2015, heavy rain led to roads and property flooding in Camberley and Frimley Green. At both locations, water was reported to be knee-deep. In Camberley at Verron Road, numerous gardens; garages roads and drains were flooded. The M3 motorway was flooded as well as other roads near Verron Road.

In Frimley Green, there was a report of flooding around Gresham Way, there was a report of a person being trapped in a vehicle and flooding to garages.

7.7.3 Winter 2019/2020

Following intense rainfall across Surrey on Monday 10th June 2019, the Met Office issued Flood Alerts for the River Blackwater as it flowed through Camberley. Again, in November 2019, this same area was issued with another Flood Alert due to high levels in the watercourse. In both these events, roads and farmlands were considered to be at risk rather than properties.

8. Assessment of flood risk in Surrey Heath Borough

8.1 Flood Risk Probability

The probability or likelihood of flooding uses the annual exceedance probability (AEP). This is sometimes known as the 'annual probability' of flooding and refers to the chance of an event occurring each year. For example, a 1% AEP event has a 1% chance of being exceeded in any one year. This could alternatively be described as a 100 year return period flood event; an event that is likely to occur, averaged over a long time period, once every 100 years.

8.2 Fluvial Flooding

The Surrey Heath SFRA study area lies within the catchments of the Loddon (the River Blackwater) in the west of the Borough, and the Bourne in the east of the Borough. This section will assess and discuss the risk of river (fluvial) flooding within the Borough from these watercourses.

8.2.1 Causes and Consequences

Fluvial flooding occurs when the volume of water in the river exceeds the capacity of the channel (i.e. water levels rise higher than bank levels), causing excess water to spill across adjacent land (floodplain). The main reasons for water levels rising in rivers are:

- intense or prolonged rainfall causing runoff rates and flow to increase in rivers, exceeding the capacity of the channel
- constrictions in the river channel causing flood water to backup
- snow melt
- blockage of structures or the river channel causing flood water to backup
- high water levels and/or locked flood gates preventing discharge at the outlet of the river

The consequences of river flooding depend on how hazardous the flood waters are and what the receptor of flooding is. The hazard of river flood water is related to the depth and velocity, which depends on:

- the magnitude of flood flows
- size, shape and slope of the river channel
- width and roughness of the floodplain
- types of structures that cross the channel

Flood hazards can vary greatly throughout catchments and even across floodplain areas. The hazard posed by floodwater is proportional to the depth of exposure; the velocity of flow and the speed of onset of flooding. Hazardous river flows can pose a significant risk to exposed people; property and infrastructure. Whilst low hazard flows are less of a risk to life (shallow, tranquil water), they can disrupt communities; require significant post-flood clean-up and can cause costly and possibly structural damage to property.

8.2.2 Watercourse Classes

There are two types of watercourse within Surrey Heath Borough:

- Main River - usually larger rivers and streams but may also be watercourses of local significance. The Environment Agency has permissive powers to carry out flood defence works, maintenance and operational activities for Main Rivers only. There is no duty on the Environment Agency to maintain these watercourses. Where the Environment Agency choose not to exercise permissive powers, maintenance responsibilities lie with the riparian owner.

- Ordinary watercourses – all rivers; streams; ditches; cuts; culverts; dykes; sluices and passages through which water flows that are not designated Main Rivers. The responsibility for maintaining

ordinary watercourses lies with the riparian owner; however, the LLFA has permissive powers to undertake certain works.

Many watercourses are classed as ordinary watercourse in their upper reaches and designated as Main River in their lower reaches.

8.2.3 Flood Zones

The assessment of risk from fluvial sources is based on the Environment Agency Flood Map for Planning, which contains flood extents for catchments greater than 3km^2 for several different probability events. The Flood Zones are based on an undefended scenario (i.e. assumed flood defences do not exist) and are used for planning purposes as set out in the PPG. Definitions of the four Flood Zones are provided in Table 8-1.

Table 8-1 Planning Policy Guidance Flood Zone Definitions

Flood Zone	Probability	Definition
1	Low	Land having a less than 1 in 1,000 annual probability (<0.1% AEP) of river flooding.
2	Medium	Land having between a 1 in 100 and 1 in 1,000 annual probability (1% - 0.1% AEP) of river flooding
3a	High	Land having a 1 in 100 or greater annual probability (>1% AEP) of river flooding
3b	Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. See Section 6.3.1 for more details of how this is defined for this SFRA.

8.2.4 Residual Flood Risk

Residual risk refers to the risks that remain after flood alleviation measures have been taken. Residual risk includes:

- Overtopping of flood defences, or failure of flood gates or pumping stations to cope with the level of flow occurring due to a flood event greater than the standard of protection of the defences
- failure of the flood risk management measures or defences to perform as intended such as breaches to flood embankments or walls, or failure of flood gates and walls to operate as intended

In areas where flood alleviation measures have been taken, it is important to assess residual risks to confirm if the consequences can be safely managed.

8.2.5 Assessment of Fluvial Flood Risk

Maps of the Flood Zones, including Flood Zone 3b (functional floodplain) are provided in Appendix C. Fluvial flood risk in Surrey Heath is primarily associated with the following watercourses:

- the River Blackwater;
- Balmoral Ditch;
- Lyon Way Ditch
- Francis Hill Ditch
- Addlestone Bourne
- Mill Bourne
- Hale Bourne
- Windle Brook
- Windlesham Ditch

A summary of flood risk to the main settlements in Surrey Heath is provided below:

Mytchett

To the west of Mytchett, the River Blackwater flows in a northerly direction parallel to the A331. Flood Zone 2 covers a large proportion of the undeveloped areas around the Mychett Lakes on the site of a former gravel extraction pits. Flood Zone 2 also covers a small proportion of properties on the western side of Mytchett including residential properties on Coleford Bridge Road; residential and commercial properties on Linsfield Lane and Hazlewood Drive, and Mytchett Farm Park caravan park. The Flood Zone 3 outline is much smaller than the Flood Zone 2 outline, and only covers undeveloped areas.

Frimley and Frimley Green

To the west of Frimley Green, the River Blackwater flows in a northerly direction between the A331 (eastern side) and the former gravel extraction pit lakes. Further downstream, at Frimley, the River Blackwater flows parallel of the A331 on the western side of the highway. Flood Zone 2 covers the undeveloped areas around the Quays and Coleford Bridges lakes with the north-south Frimley-Ash Vale railway line forming the boundary of Flood Zone 2.

Tributaries of the River Blackwater (Balmoral Ditch, Lyon Way Ditch and Francis Hill Ditch) pass under the railway and the A331 which restricts overland flow and exacerbates flooding. Flood Zones 2 and 3 cover part of a commercial site off Frimley Green Road; residential areas close to Frimley railway station, and part of the Lyon Way Industrial Estate. The Industrial Estate is susceptible to prolonged flooding due to the extensive catchment area; surrounding raised land forming boundaries and the limited discharge options available.

Camberley

To the west of Camberley, the River Blackwater flows parallel to the western side of the A331. The industrial area around Riverside Way lies in Flood Zone 2. The industrial area south of York Town lies partly within Flood Zone 2 and 3, and the sewerage works accessed from Doman Road falls partly within Flood Zone 2. In addition, South Camberley Primary and Nursery School Orchard campus and the surrounding residential area (east of James Road and around Bain Avenue, Greenlands Road and Orchard Way) are within Flood Zones 2 and 3.

Bagshot

The Windle Brook flows through the centre of Bagshot. Flood Zone 2 covers an area on and north of the B3029 Guildford Road, including where the Windle Brook intersects the A30 (London Road). This area mostly consists of residential properties with some commercial properties including two public houses. Flood Zone 2 also covers a short section of the railway line north of the Windle Brook. A smaller area of the residential estates around the railway line, between Bridge Street and New Road, is covered by Flood Zone 3.

To the east of Bagshot, there are large expanses of rural land; a relatively long section of New Road and a caravan site in Flood Zone 2. A far smaller rural area is covered by Flood Zone 3.

Lightwater

The Windle Brook flows north of Lightwater, through a rural area with few properties. Flood Zone 2 is far more extensive than Flood Zone 3 at this location which mostly covers rural land along with very few residential properties.

Residential properties in the south-east of Lightwater are also at risk from the Lightwater Stream. Parts of Riverside Avenue; Wychelm Road; The Willows and Birchwood Drive fall within Flood Zone 3, with Flood Zone 2 covering a slightly larger area. There is also medium (Flood Zone 2) risk of flooding along the A322 dual carriageway where this watercourse crosses the road and joins the Windle Brook, and at the sewerage treatment works (NGR 493765, 162200).

To the east of Lightwater, along the Hale Bourne, there is a wide Flood Zone 2 and a considerably narrower Flood Zone 3 which covers woodland and rural / agricultural fields. Although the extent of Flood Zone 2 is considerable, there are very few properties or infrastructure at risk. Where Halebourne Lane crosses the Hale Bourne, the road and a small number of properties are in Flood Zone 3.

West End and Bisley

Addlestone Bourne flows to the south of West End village, and to the north of Bisley village. Between the two villages, Flood Zone 2 covers mostly rural land, with only a few properties on Lucas Green Road and Oldhouse Lane at risk, and a small number of commercial properties around the A322 Guildford Road and Oldhouse Lane. Between the two villages, Flood Zone 3 is constrained and limited to rural areas.

On the eastern side of West End village, Addlestone Bourne crosses under Beldam Bridge Road, running in close proximity to the highway in Pennypot Lane before reaching a ford for vehicle crossing in Lovelands Lane. The ford in Lovelands Lane lies in Flood Zone 3 and can quickly become impassable to all vehicles when flows are increased. Properties along Pennypot Lane lie in Flood Zone 2.

Chobham

Northwest of Chobham village centre, the Hale Bourne confluences with Clappers Brook forming the Mill Bourne, which flows just north of the high street and south of residential area. In addition, the Addlestone Bourne flows south of the high street, close to the Hale Bourne and Mill Bourne. Chobham is not at risk from Clappers Brook; however, it is at risk from the Hale Bourne; Mill Bourne and Addlestone Bourne. Flooding that was previously controlled around a Mill Pond on the Mill Bourne is no longer contained due to the loss of the mill and the associated flow controls, which exacerbates flooding and usually affects vehicles using the A319.

Where the Addlestone Bourne runs close to the Mill Bourne, there is a large area in Flood Zones 2 and 3 between the Addlestone Bourne and Mill Bourne, where the flood zones connect through the village centre and with Surrey Heath Borough Council Suitable Alternative Natural Green Space (SANGS) to the east. This area is particularly at risk if peak flows from both watercourses coincide across open ground; breaching the individual catchment areas. Flood Zone 2 covers the High Street and properties on the A3046 Station Road and A319 Bagshot Road close to their respective junctions with the High Street. Flood Zone 2 also covers Chobham Recreation Ground. Flood Zone 3 covers many properties, including those on A3046 Station Road; A319 Bagshot Road; the High Street between the junctions with A319 Bagshot Road and A319 Chertsey Road; A319 Chertsey Road; Barnmead and Green Lane.

Along Gracious Park Brook and Chobham Brook, the Flood Zone 2 and 3 outlines are similar and relatively narrow. Only rural land is at medium or high risk of flooding.

On the eastern outskirts of Chobham (around Mimbridge) and further east, there are large expanses of rural and agricultural land with few properties in Flood Zones 2 and 3, both of which have similar extents although Flood Zone 2 does cover a greater area. However, on Philpot Lane, properties are at risk. Properties on Philpot Lane closer to Mill Bourne lie in Flood Zone 3, and properties on Philpot Lane closer to Addlestone Bourne lie in Flood Zone 2.

Windlesham

The Windlesham Ditch is a Main River that runs through Windlesham. Current flood mapping shows that Windlesham lies in Flood Zone 1. However, an updated study is being prepared by the Environment Agency (not available at time of submission) to update flood mapping in this location. The surface water flood map shows areas of flood risk along the length of the Main River however this will not have included an allowance for channel or culvert capacity. There are records of past flood incidents around Windlesham but it is not clear if these are from fluvial flood risk or another source of flood risk (e.g. surface water).

Deepcut

There are no Main Rivers close by and therefore Deepcut lies in Flood Zone 1.

8.2.6 Climate Change Considerations

There is increasing concern about the impacts of climate change on the global environment. The nature of climate change at a regional level will vary. In the UK projections indicate that climate change will result in more frequent, short duration, high intensity rainfall and more frequent periods of long duration rainfall. These changes are likely to result in the more frequent occurrence of all types of flooding, including fluvial.

The PPG for Flood Risk and Coastal Change states that 'A SFRA is a study carried out by one or more local planning authorities to assess the risk to an area from flooding from all sources, now and in the future, taking account of the impacts of climate change, and to assess the impact that changes or development in the area will have on flood risk'.

The most recent climate change guidance at the time of this Level 1 SFRA was published by the Environment Agency on 19 February 2016 and last updated in July 2020. This guidance supports the NPPF and must be considered in all new developments and planning applications. The guidance includes climate change predictions of anticipated change for peak river flow and peak rainfall intensity. More information on allowances and the guidance can be found in Section 6.3.

Results from detailed modelling were used to define the Upper End and Higher Central climate change allowances for the River Blackwater, its tributaries and the Addlestone Bourne. Results mostly show a trend of only a small increase in the area of land at risk from a 1% AEP (Flood Zone 3a) event in the future compared to the current extent. Climate change mapping is provided in Appendix D.

Planners and developers should consider whether development may be at risk (or increased risk) of flooding in the future when undertaking the Sequential and Exception Tests and consult the latest available guidance.

8.3 Surface Water Flooding

The Surrey Heath SFRA study area includes the developed urban areas, all of which have significant areas of impermeable surface such as roads; pavements and driveways. These are all likely to contribute to surface water runoff and subsequently present a significant risk of surface water flooding. This section provides a brief background to the definition and causes of surface water flooding and assesses the flood risk in the study area using historic records and the Environment Agency's Risk of Flooding from Surface Water map and Surry County Council's 'Wetspot' records[16] which shows known areas susceptible to flooding issues – particularly on the Highway.

8.3.1 Causes and Consequences

Surface water includes:

- rainfall that infiltrates into the soil but resurfaces further down the hill
- water in lakes, marshes and reservoirs
- surface water runoff/overland flow - water flowing over the ground surface that has not entered a natural channel or artificial drainage system

[16] Surrey County Council - Flooding and Wetspots available from https://www.surreycc.gov.uk/roads-and-transport/roadworks-and-maintenance/report-a-highway-problem/drainage-and-flooding/flooding-and-wetspots

Surface water runoff/overland flow occurs when intense rainfall is unable to soak into the ground or enter drainage systems. Often surface water flooding can be short-lived, lasting only as long as the rainfall event. However, flooding may persist in low-lying areas where ponding occurs.

The volume and rate of surface runoff will usually depend on catchment size and shape; geology; slope; climate; rainfall; saturation; soil type and vegetation. Geological considerations include rock and soil types and characteristics, as well as degree of weathering. Porous material (sand, gravel, and soluble rock) absorbs water more readily than fine-grained, dense clay or unfractured rock, and has a lower runoff potential. Poorly drained material, particularly material that is saturated; parched or frozen, has a higher runoff potential and is more likely to cause flooding.

Surface water runoff can cause localised flooding in normally dry, natural low spots within valleys (for example the bottom of hillslopes; in natural valley lines or in hollows), due to surface water accumulation. Surface water flooding can affect both urban and rural areas. In urban areas, surface water flooding may be due to numerous reasons, including:

- urban settlements often have large areas of impermeable surfaces, such as roads, pavements and driveways, which behave similarly to poorly drained materials
- drainage channels, railway lines, road cutting and flood management infrastructure can act as surface water flow paths
- urban areas usually have extensive drainage or sewer systems where blockage or constraints can exacerbate surface water flooding
- urban areas can have structures used to manage flooding, which are at risk of failure (e.g. failure of maintenance not allowing a system to drain between events, or failure of a structure where the resulting uncontrolled discharge can cause flooding not usually experienced)
- urban areas can be inundated by flow from adjacent farmlands which have high runoff potential

Areas that are downslope of land that has a high runoff potential; impermeable areas and compacted ground may be at increased risk of surface water flooding. Flooding may occur as sheet flow, or as rills and gullies causing increased erosion of agricultural land. This can result in ‘muddy floods’ where soil and other materials are eroded and washed onto roads and into properties, requiring extensive clean-up.

Both rural and urban land use changes are likely to alter surface water runoff rates and volumes in the future. For instance, developments that include significant impermeable surfaces, such as roads and car parks may increase the occurrence of surface water runoff unless appropriately mitigated.

8.3.2 Assessment of Surface Water Flood Risk

Appendix E shows the Risk of Flooding from Surface Water map. It indicates the most common areas to experience increased surface water flood risk are roads; depressions (valley lines), and land adjacent to watercourses.

The 3.3% AEP outline predominantly lies on roads, including the M3 motorway, along watercourse valleys and either side of the railways, particularly around Frimley and Camberley. There are limited number of properties at risk.

The 1% AEP outline follows the same flow paths but covers a larger area than the 3.3% AEP, so it encroaches on more properties, although the number of properties at risk is still limited. The 0.1% AEP outline covers a significantly larger area again, covering a large proportion of the Borough, but is an exceptionally unlikely surface water flood event.

8.3.3 Climate Change Considerations

Future climate change projections indicate that more frequent short-duration, high intensity rainfall and more frequent periods of long duration rainfall are to be expected. Studies into the impact of climate change on surface water are ongoing. The RoFfSW dataset does not include any climate change flood extents.

In the absence of any other data, the Low Risk RoFfSW dataset should be used to provide an indication of the future Medium Risk extent.

Surface Water drainage calculations for new developments use the 40% climate change allowance (Upper End allowance for the 2080s – Table 2 Flood Risk Assessments: climate change allowances https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#types-of-allowances).

8.4 Sewer flooding

The Flood and Water Management Act defines sewer flooding as "*a flood from any part of a sewerage system if wholly or partly caused by an increase in the volume of rainwater (including snow and other precipitation) entering or otherwise affecting the system*".

New sewer systems are typically designed to accommodate the 3.3% AEP storm without flooding at the ground surface in accordance with Sewers for Adoption[17]. New sewers should be design and installed in lien with the Design and Consultation guidance[18]. However, many existing sewers were not built to this specification. These sewers can become overloaded as new development adds to the load on the network.

Even where sewers are built to the current specification, they may become overwhelmed by events with a higher magnitude. Sewer flooding can also be caused due to blockages; collapses or component failure.

8.4.1 Causes and Consequences

Flooding from sewers occurs when rainfall exceeds the capacity of available networks or when there is an infrastructure failure. Flooding from foul sewers can occur when defective surface water connections allow rainfall to enter, causing the design capacity of the network to be exceeded. The main causes of sewer flooding are:

- blockages or other infrastructure failures in the sewer network
- lack of capacity in sewer drainage networks due to any of the below:
    - under-design of the network or events larger than the system is designed for
    - increased inflows due to climate change and/or new developments
    - reduction in channel capacity due to incorporation of watercourses into the sewer network (lost watercourses).
    - modification of a piped structure leading to reduced capacity within the network
- lack of maintenance or damaged sewer networks leading to reduction in capacity and/or blockages
- groundwater infiltration
- water mains bursting/leaking
- restricted outflows from the sewer systems due to high water levels in receiving watercourses (drowned outfalls).

The impact of sewer flooding is usually confined to relatively small localised areas. When flooding is associated with blockage or failure of the sewer network, flooding can be rapid and unpredictable.

Poor water quality from sewer flooding can be a hazard to health. Should foul sewer flooding occur, the resultant flood water is often contaminated with raw sewage and is likely to have a high concentration of solid, soluble and insoluble contaminants. The spreading of illness and disease can be a concern to the local population if this form of flooding occurs on a regular basis. This can also lead to a reduction in the environmental quality of receiving watercourses and ground water, which will have implications on

[17] Water UK (2018) Sewers for Adoption: A Design and Construction Guide for Developers. Eight edition – August 2018

[18] Ofwat (2019). Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code") https://www.water.org.uk/wp-content/uploads/2019/03/Appendix-C-to-draft-sewerage-Sector-Guidance-Design-and-Construction-Guidance.pdf

achieving objectives within the RBMPs which in turn feed in to the WFD legislation. Flooding of contaminated land (such as landfills, motorways, and petrol station forecourts) will transport contaminants such as organics and metals to vulnerable receptors if the respective drainage systems are not designed to treat the water.

Drainage systems often rely on a gravity assisted network to convey water into trunk sewers of increasing size towards the lower end of the catchment. Failure of these trunk sewers can have serious consequences, often exacerbated by topography, as water from surcharged manholes will flow into low-lying land likely to be already inundated from other types of flooding.

8.4.2 Assessment of Sewer Flood Risk

Thames Water have provided DG5 register data for use in this SFRA. The dataset shows postcodes where properties are known to have experienced sewer flooding. The register shows 62 internal incidents and 113 external incidents.

Use of historic data to estimate the probability of sewer flooding does not take into account possible future changes due to climate change or future development. It also does not take into account where measures have been taken to address the cause of the flooding.

8.4.3 Climate Change Considerations

Climate change is expected to impact on sewer flooding due to an increase in rainfall intensity. This may require new infrastructure with greater capacity and upgrading of existing infrastructure to maintain the same level of service. See section 6.3 for further discussion.

8.5 Groundwater Flood Risk

Groundwater flooding occurs when water emerges on the surface from sub-surface strata due to a rise in groundwater level. The rise in groundwater level is sufficient for the water table to intersect the ground surface and inundate or flow from low lying land.

8.5.1 Causes and Consequences

Groundwater levels rise and fall in response to rainfall patterns and distribution, with a time scale of months rather than days. Therefore, groundwater flooding tends to occur slowly and to be long in duration, developing over weeks or months and sometimes lasting for days or weeks. The rise and fall of groundwater level depends largely on the type of ground it occurs in, i.e. how permeable to water the ground is, and whether the water level comes close to or meets the surface. For example, chalk aquifers are vulnerable to groundwater flooding due to having many pores and fissures, which can result in rapid rises in groundwater levels that may take a long time to recede.

The risk of groundwater flooding is dependent on local conditions at a particular point in time, so groundwater flooding generally occurs in specific locations. The primary controls on the distribution and timing of groundwater flooding include:

- spatial and temporal distribution of rainfall
- spatial distribution of aquifer properties
- recharge mechanisms
- spatial distribution of geological structures (drift deposits, stratigraphy)
- efficiency of the surface drainage network

The interaction and combination of the above with site-specific factors (geological; hydrogeological; topographic and recharge) can lead to high groundwater levels.

There are many mechanisms associated with groundwater flooding. Groundwater floods may emerge from either point or diffuse locations. The main mechanisms are detailed in Table 8-2, using a source-pathway-receptor model.

In general terms, groundwater flooding rarely poses a risk to life. However, groundwater flooding can be associated with significant damage to property and infrastructure. The main impacts of groundwater flooding are as follows.

- flooding of basements of buildings below ground level – in the least severe cases this may involve seepage of small volumes through walls, temporary loss of services etc. In more extreme cases larger volumes may lead to the catastrophic loss of stored items and failure of structural integrity.
- overflowing of sewers and drains – surcharging of drainage networks can lead to overland flows causing significant but localised damage to property. Sewer surcharging can lead to inundation of property by polluted water. Note: it is complex to separate this flooding from other sources, notably surface water or sewer flooding.
- flooding of buried services or other assets below ground level – prolonged inundation of buried services can lead to interruption and disruption of supply. Service ducts owned by utility companies can also act as drainage runs, conveying water between catchment areas.
- inundation of farmland, roads, commercial, residential and amenity areas – inundation of grassed areas can be inconvenient; however, the inundation of hard-standing areas can lead to structural damage and the disruption of commercial activity. Inundation of agricultural land for long durations can have financial consequences.
- flooding of ground floors of buildings above ground level can be disruptive and may result in structural damage. The long duration of flooding can outweigh the lead time which would otherwise reduce the overall level of damages.

Groundwater flooding can also cause a change in the structural properties of clay overlying chalk aquifers. This may cause costly damage to structures in the ground and the buildings that they support.

The rarity of groundwater flooding combined with the mobility of the population means that people often do not know there is a groundwater flood risk. New developments are particularly at risk because little consideration is given to groundwater as a source of flooding in the planning process. The sparse frequency of groundwater flood events can contribute to poor decision-making. The economic and social costs of groundwater flooding are compounded by the relative long duration of events.

Table 8-2 Main mechanisms for groundwater flooding

Flooding phenomenon	Sources	Pathways	Receptors	Hazard	Characteristics
Rising groundwater levels in response to **prolonged extreme rainfall** (often near or beyond the head of ephemeral streams)	Long duration rainfall	Permeable geology mainly chalks	People, properties, environment	Basement flooding/ rural ponding	Responsible for the large majority of groundwater flooding. May occur a few days after the rainfall or up to several weeks after. Usually lasts for a number of weeks. An increase in the baseflow of channels, which drain aquifers, is often associated with elevated groundwater levels and may lead to an exceedance of the carrying capacity of these channels. Floodwaters are most often clear and so this form of groundwater flooding may be referred to as 'clear water flooding'. High groundwater levels may also inundate sewer and storm water drainage networks, exceed capacity and lead to flooding in locations, which would otherwise be unaffected. This flooding can be associated with pollution.
Rising groundwater levels due to leaking sewers, drains and water supply mains	Water in water mains, drainage and sewerage networks	Cracks in pipes/permeable strata	People, properties, environment	Basement flooding/ water quality issues	Leakage from sewer, storm water and water supply networks can lead to a highly localised elevation in groundwater levels, particularly where the leak is closely associated with chalk bedrock.
Groundwater rebound owing to rising water table and failed or ceased pumping	Groundwater	Permeable geology and artificial pathways e.g. adits	Property, commercial	Basement flooding/ flooding of underground infrastructure	Where historic heavy abstraction of groundwater for industrial purposes has ceased, a return of groundwater levels to their natural state can lead to groundwater flooding. This process can potentially cover large areas.
Upward leakage of groundwater driven by **artesian head**	Groundwater emerging from boreholes or through permeable geology	Artesian aquifer and connection to surface	Property	Basement flooding/ flooding at surface	Mainly associated with short duration and localised events, this process can lead to significant volumes of discharge. It can occur in locations where boreholes have been drilled through a confining layer of clay to reach the underlying aquifer.
Inundation of trenches intercepting high groundwater levels	Groundwater	Permeable geology	Property	Routing of floodwaters	The excavation and fill of engineering works with permeable material can create groundwater flow paths. High groundwater levels maybe intercepted, resulting in flooding of trenches and land to which they drain.
Other – alluvial aquifers, aquifer, sea level rise	Rivers, rainfall, sea	Floodplain gravels, permeable geology	Property, environment	Basement flooding/ flooding at surface/ saline intrusion.	Other mechanisms of groundwater flooding include leakage of fluvial flood waters through river gravels to surrounding floodplains e.g. behind flood defences; and a rise in groundwater levels as a result of adjacent sea level due to the discharge boundary rising.

8.5.2 Assessment of Groundwater Flood Risk

The underlying bedrock across most of the study area is made up of Bracklesham Group and Barton Group sedimentary geology. To the east of Chobham, the bedrock is also sedimentary clays, silts and sands, of the Thames Group bedrock. As a result of relatively impermeable bedrocks with little capacity for storage in underlying aquifers, there is very little potential for groundwater emergence within most of the Borough.

There is no groundwater monitoring across Surrey Heath due to the lack of underlying chalk, and groundwater flood risk is considered very low across most of the Borough.

The 2015 SFRA identified small pockets of areas where there is potential for groundwater flooding to occur at the surface. These locations include the wetland and parkland areas around Mytchett, areas of central and south west Bagshot, Burrowhill and Valley End and the area surrounding Fairoaks Airport. Most of these locations are on low lying land adjacent to river channels where high water tables and fluvial sand and gravel deposits allow water to easily rise at the surface.

8.5.3 Climate Change Considerations

There is currently no research specifically considering the impact of climate change on groundwater flooding. The mechanisms of flooding from aquifers are unlikely to be affected by climate change, however if winter rainfall becomes more frequent and heavier, groundwater levels may increase. Higher winter recharge may, however, be balanced by lower recharge during the predicted hotter and drier summers.

8.6 Reservoir Flood Risk

Reservoirs are defined as artificial lakes, used to store water for various uses. They can be either modified natural structures or completely man-made. An 'attenuation' or 'impoundment' reservoir is used to prevent flooding to lower lying lands or to regulate flows for abstraction and irrigation purposes. Control reservoirs collect water at times of excess (or unseasonably high) rainfall, then discharge at a rate that can be accommodated by the downstream systems. Managed or un-managed reservoir release can increase floodwater depths and velocities in adjacent areas.

8.6.1 Causes and Consequences

Reservoirs in England and Wales are regulated under the Reservoirs Act 1975, as amended by the Flood and Water Management Act 2010. The Act defines a large raised reservoir as having an impounded volume greater than 25,000 m^3. These reservoirs are listed on a register held by the Environment Agency. The Act prescribes tight regulations on periodic inspections and maintenance of the reservoir, and on water level monitoring.

Reservoir flooding may occur from total failure of the civil structure, overtopping of the available retained water level, blockage or malfunction of the water level control system not allowing the system to discharge, or from a precautionary or emergency drawdown of a reservoir.

The two main risks of flooding from impounded reservoirs are failure of the reservoir structure and precautionary or emergency drawdown of a reservoir. Drawdown relates to the lowering of a reservoir's water level to ensure safety in the event of a problem occurring which threatens the structural performance of the reservoir dam. The aim of drawdown is to reduce the load on the dam, reduce the likelihood of failure and minimise the impacts downstream in the event of failure. Drawdown may have the potential to cause localised flooding downstream of the reservoir. The effect of drawdown on the extent of flooding is dependent on a number of factors including the existing flows and levels in the receiving watercourse, the amount of water released from the reservoir and the rate it is released.

The nature of reservoir failure means there is little or no warning in the event of a flood. Although potentially large uncontrolled releases of water from the reservoirs could result in deep and fast moving floodwaters

and place people's lives in danger, the tight regulations mean the probability of occurrence is very low, and therefore flood risk is considered as low.

8.6.2 Assessment of Reservoir Flood Risk

The Environment Agency's Risk of Flooding from Reservoirs Map, which shows the maximum extent of flooding from reservoirs possible, has been used to identify areas at risk of reservoir flooding. Flood risk from reservoirs across Surrey Heath is mostly very low. However, there are areas at risk from reservoirs along the river valleys of the River Blackwater, Windle Brook and Hale Bourne, with outlines generally follow the watercourses and associated floodplains. Settlements particularly at risk from reservoirs are Mytchett, York Town in Camberley and Bagshot.

River Valley of the River Blackwater:

The risk of reservoir flooding outline generally follows the watercourse of the River Blackwater. The risk of reservoir flooding outlines are usually smaller than the fluvial flood zones, except for at Mytchett and York Town, Camberley, where the risk of reservoir flooding outline covers a greater area than fluvial flood zones. Most of the areas subject to inundation are wetland and parkland areas. However, properties in Mytchett, including those along Mytchett Road, are at risk from flooding from the Mytchett Lake reservoir. The lake itself belongs to the Ministry of Defence; however, the embankment is owned and managed by Surrey County Council. York Town, Camberley and other areas downstream of the confluence of the Cove Brook and River Blackwater are at risk from failure of the Hawley Lake and the Cove Brook FSR infrastructure (outside of the study area).

River Valley of the Windle Brook and Hale Bourne:

The risk of reservoir flooding outline generally follows the Windle Brook and Hale Bourne watercourses. The risk of reservoir flooding outlines are far smaller than the fluvial flood zones, except for within Bagshot where the reservoir and flood zones are very similar between the A30 and A322. The risk of reservoir flooding decrease in size with distance downstream.

8.7 Canal Flood Risk

8.7.1 Causes and Consequences

Canals are artificial channels which cut across a catchment, built for the purpose of transportation or water supply. Canals do not pose a direct flood risk because they are regulated water bodies with controlled water levels. Flooding can still occur, however, through:

- Overtopping - this occurs when control structures (e.g. weirs), designed to discharge water from canals when water levels exceed a threshold, experience a blockage or their capacity is exceeded. This prevents further surface water entering a canal from being discharged, resulting in water levels rising and overtopping occurring. The water level may exceed the thresholds following excessive rainfall and/or increased surface water runoff from diverted road drains, public sewer systems and railway drainage.
- A breach - this can be caused by a variety of factors including damaged embankments due to overtopping or animal burrowing, or a collapse of culverts under the canal. The probability of embankment breach is dependent on maintenance of the canal. A breach would cause surcharging or backing-up of surrounding drains, causing water logging and flooding of surrounding areas. A

breach can also lead to indirect flooding, as embankments and containment bunds/watercourses running parallel to the canal are susceptible to failure once the channel is breached.

- Indirect flooding – examples of indirect flooding including blockage or capacity exceedance of culverts passing under the canal or transfer of water between canals and waterbodies running near to each other.

8.7.2 Assessment of Canal Flood Risk

The Basingstoke Canal runs through the southern corner of the Borough. It is a contour canal, meaning that it runs along an excavated ledge and the bank is formed from the spoil on the downhill side to retain water. Whilst this is considered a low risk form of canal construction, there is an inherent residual risk of a breach of the embankments. If the embankments were to breach, there is potential for immediate flooding to land and property adjacent to the canal.

The 2015 SFRA undertook analysis using OS mapping contour lines and information on the elevation of the canal to show the low lying areas that would be liable to flooding in the event of embankment breach. This includes an area between the north-south Frimley-Ash Vale railway line and the canal, which covers Frimley Lodge Park along with a few residential properties south of Guildford Road. It is also understood that flows can discharge through Frimley Lodge Park and cause flooding under the Sturt Road railway bridge. There is also an area south of Deepcut and north of the east-west Woking-Basingstoke railway line which is at risk from the Basingstoke Canal. However, this area is predominantly rural with only a few residential properties.

In addition, there is also a major embankment at Mytchett Lake. This embankment retains the Basingstoke Canal as well as acting as a dam for the Mytchett Lake. Even though the lake itself belongs to the Ministry of Defence, the Canal and embankment is owned by Surrey County Council, and so they have the responsibility for the maintenance of the bank.[19]

8.8 Summary of High Risk Areas

A map showing the areas of the Borough which are at a high risk of flooding, taking into account all sources of flooding, residual risk and climate change, is shown in Appendix J.

The flood risk classifications have been defined according to the following criteria:

Table 8-3 High Risk Areas

Criteria	Very High	High
Fluvial	5% AEP (Flood Zone 3b)	1% AEP (Flood Zone 3a)
Surface Water	3.3% AEP (RoFfSW High Risk)	3.3% AEP (RoFfSW Medium Risk)
Groundwater	AStGWf >75% classification	

[19] The Basingstoke Canal Society https://basingstoke-canal.org.uk/headline/work-started-on-mytchett-lake-embankment-reinforcement/ , accessed 7th May 2019

9. Flood risk management

9.1 Fluvial Flood Risk Management

Defences are built to help reduce the occurrence, and therefore consequences of flooding. Some structures provide flood defence benefits; however, they are also built to manage low flows or are part of the infrastructure network. These assets can be owned, operated and maintained by the Environment Agency, Local Authorities, private business and/or local residents. This chapter summarises some of the defences identified within Surrey Heath.

Flood defences typically fall into two categories

- Formal: a structure built specifically for the purpose of flood defence which is maintained by its owner.
- Informal: a structure that has not been built specifically to protect against flooding, but which may afford some protection. These defences are not maintained for the purpose of flood defence.

Flood defences are typically designed and constructed to protect people and property from a given magnitude of flood. For example, a flood defence with a 1% AEP standard of protection means that the flood risk in the defended area is reduced to a 1% chance of flooding in any given year. This is referred to as the design standard. Over time the standard of protection may decrease due to deterioration in condition or increases in flood risk due to climate change. The protection provided once these factors are taken into consideration is referred to as the actual standard.

In addition to defences, infrastructure such as major roads and railway lines influence river flows. Significant modifications were made to the Blackwater River to facilitate the construction of the A331. The M3 motorway, A30, and railway network cross the main watercourses in the study area. Although these features are not considered flood defences, they influence flood flow routes and floodplain extents.

In some instances, river processes can be modified over time by defences (such as river walls, flood storage areas, flood alleviation channels and embankments) and by undertaking maintenance activities (such as river dredging). However, the close proximity of river, road and rail networks does restrict the options for efficient draining of some areas and careful consideration should be made for development proposals located anywhere within the designated floodplain.

9.1.1 Flood defences

The Environment Agency's Spatial Flood Defences layer show a number of flood defences within the study area:

- River Blackwater - sections of 2-staged channel alongside the most southerly lake in the study area, and just upstream of the confluence with the Balmoral Ditch, Lyon Way Ditch and France Hill Ditch.
- River Blackwater's tributaries - at York Town in Camberley, a tributary has a raised wall with 2% AEP design standard on its right bank.
- There is also a raised earth embankment surrounding a caravan site to the east of Bagshot. This, however, only has a 20% AEP standard of protection and is not built as a flood defence.

In addition to the defences shown in the Environment Agency's dataset, there is evidence of other defences in the Borough including

- Thames Water balancing ponds in Frimley, Bisley, West End, Lightwater, Windlesham and Bagshot
- Historic bunds at Chobham, Frimley, Lightwater and Camberley

- Unspecified defences at Bagshot, Chobham Common, Lightwater, and West End.

Further details of the defences within Surrey Heath are set out in the table below:

Table 9-1 Description of main flood defences within Surrey Heath

Name of Defence	Location	Asset Owner
Bagshot Recreation Ground Bund	School Lane Bagshot	Parish Council
Chobham Common Bunded Tracks	Chobham Common	SWT
Clearsprings Bund	Clearsprings, Lightwater	SHBC
Coxhill Green Pond	Station Road, Chobham	SWT
Glovers Ponds	Chobham Common, Chobham	SWT
Gordons School Hollow and Bund	Streets Heath, West End	Private
Hammonds Ponds - Middle and Lower Ponds	Lightwater Country Park, Lightwater	SHBC
Lightwater Country Park Attenuation Bunds	Lightwater Country Park, Lightwater	SHBC
Milford Green Pond	Sandpit Hall Road, Chobham	SWT
Staple Hill Pond (in progress)	Staple Hill, Chobham	SWT
Station Road Frimley (56) Reinforced Embankment	Station Road, Frimley	Private
West End Recreation Ground Hollow	Streets Heath, West End	Parish Council
Kalima Traveller Site - Historic Boundary Historic Bund	Chertsey Road, Chobham	SCC
Alphington Pond Historic Bund	Alphington Avenue, Frimley	SHBC
Frimley Fuel Allotments Hollow/Pond Historic Bund	Frimley Fuel Allotments, Field Lane, Frimley	SHBC
Hammonds Pond – Upper Historic Bund	Lightwater Country Park, Lightwater	SHBC
Tomlins Pond Historic Bund	Tomlins Avenue, Frimley	SHBC
Watchetts Lake Historic Bund	Verran Road, Camberley	SHBC
Balmoral Drive Balancing Pond	Frimley	TWU
Clews Lane Balancing Pond	Bisley	TWU
Fuchsia Way Balancing Pond	West End	TWU
Ludlow Close Balancing Pond	Frimley	TWU
Nasturtium Drive Balancing Pond	Bisley	TWU
Red Road / Burdock Close Balancing Pond	Lightwater	TWU
Turpins Rise / Mill Pond Road Balancing Pond	Windlesham	TWU
Waggoners Hollow Balancing Pond	Bagshot	TWU

Any redevelopment within a catchment area that relies upon existing balancing facilities will be required to fully attenuate surface water and return discharge rates equivalent to the pre-developed greenfield run-off rates within the development proposal.

Chobham Flood Alleviation Scheme

In 2010, a Flood Relief Study commenced to review the flooding issues in Chobham South and surrounding areas. The Chobham Flood Alleviation Study (Chobham FAS - formally known as Chobham South) has been constructed to partially help attenuate surface water in the area.

More recently further flood alleviation works are currently being undertaken in Chobham to alleviate the risk of flooding from surface water. The works are in 5 different locations in Chobham, and the scheme is expected to be fully completed in 2022.

Future Flood Alleviation Scheme

Additionally, the Environment Agency are currently investigating the viability of a Addlestone Bourne Catchment Scheme to reduce flood risks in the catchment. This is primarily looking at Natural Flood Risk Management solutions and will focus on looking at opportunities to alleviate flood risk in Bagshot Chobham and Windlesham.

9.1.2 Flood warning systems

The Environment Agency's Flood Warnings Direct Service provides flood warnings, for fluvial and tidal flooding, to homes and businesses in Flood Zones 2 and 3 via telephone, email or text. The following link can be used to sign up to the service https://www.gov.uk/sign-up-for-flood-warnings. The different levels of warning are shown in Table 9-2.

The Environment Agency also provides a Targeted Flood Warning Service (TFWS), which provides real-time, targeted warnings to organisations covered by the Civil Contingencies Act, including energy, transport, telecommunication, water and utility companies.

Table 9-2: Flood Warning Levels

Warning Level	Symbol	Description
Flood Alert	 Flood Alert	Flooding is possible – be prepared
Flood Warning	 Flood Warning	Flooding is expected – immediate action is required
Severe Flood Warning	 Severe Flood Warning	Danger to life

Source: https://flood-warning-information.service.gov.uk/warnings

The Environment Agency provides a flood warning service for the Addlestone Bourne, River Blackwater and Mill Bourne, which are within the Surrey Heath SFRA study area. There are flood alert areas within the SFRA study area for these watercourses and these would be used when water levels along the river are forecast to overtop the banks. A map of the flood warning coverage is provided in Appendix H with the relevant warning listed in the table below.

Table 9-3: Flood Warning Areas within Surrey Heath

Warning Level and reference	Description
Flood Alert - 061WAF29Addstne	Windle Brook and Hale, Mill and Addlestone Bournes including Bagshot, Windlesham, Lightwater, Chobham, West End, Emmetts Mill, Woodham and Addlestone
Flood Alert - 061WAF24BlkWater	River Blackwater including Badshot Lea, Aldershot, Farnborough, Camberley, Sandhurst, Eversley, Bramshill and Swallowfield, and the Cove Brook at Farnborough and Cove
Flood Warning - 061FWF29Bagshot	Windle Brook at Bagshot including Swift Lane Caravan Park, Surrey
Flood Warning - 061FWF29M3J3	Hale Bourne from the M3 junction 3 to Clappers Lane including Windlesham Arboretum, Halebourne Lane and Burnt Pollard Lane, Surrey
Flood Warning - 061FWF29Chobham	Hale Bourne and Addlestone Bourne at Chobham and Mimbridge, Surrey
Flood Warning - 061FWF29EmmMill	Mill Bourne at Emmetts Mill, Surrey
Flood Warning - 061FWF24Camberly	River Blackwater at Camberley and Sandhurst including Frimley Business Park, Shepherd Meadows Nature Reserve and Trilakes Country Park, Surrey and Berkshire
Flood Warning - 061FWF24Aldersht	River Blackwater at Aldershot and Farnborough including Lakeside Park, Ash Vale, Farnborough Park and Mytchett, Hampshire and Surrey

9.2 Management of Surface Water Flood Risk

As the LLFA, Surrey County Council is responsible for managing flood risk from surface water within Surrey Heath, in conjunction with Surrey Heath Borough Council.

Strategic plans for the management of surface water flood risk within the Borough are set out with the Surface Water Management Plan and the Local Flood Risk Management Plan.

The location of surface water flood incidents are captured by Surrey County Council within their wetspot database to record recurring flood incidents which are unlikely to be solved through the councils day-to-day activities. This might be a problem caused by or affecting the highway, or be an issue affecting homes, businesses or important infrastructure. The LLFA would expect developers to seek to address known wetspot issues where the opportunity arises through development.

Each wetspot is assessed and given a score. A number of factors are taken into account when assessing each site, but the key things that contribute to a high score include:

- Risk to safety
- Property flooding
- Disruption to critical services
- Social and economic impacts
- Long duration and/or high frequency of flooding

All of this information is analysed and the overall score calculated. The score is a fact-based assessment to reflect the severity of the flood risk.

Table 9-4:Wetspot Risk level scoring

Wetspot score	Risk Level
Less than 50	Lower
Between 50 and 150	Medium
More than 150	High

The LLFA prioritise work to the highest scoring wetspots and review the Medium and High categories annually with the Local Highways Teams. The score of all wetspots is updated with the most recent information as it is received.

Additionally, the status of the wetspots are recorded. There are four wetspot statuses:

- Current - The wetspot is an active flooding location but has not yet been prioritised for work
- In progress - The wetspot is being investigated for works to mitigate the risk; either through our works or through third party negotiations.
- Resolved - Works have already been carried out to try to reduce the flooding and the site is awaiting review during a heavy rainfall event to ensure the works have been successful
- Dormant - The wetspot has no recorded instances of flooding within the last two years and is being kept for information only.

The table below reports the current wetspot list at the time of submitting this SFRA (published December 2019). Surrey Council Coucil's website20 should be reviewed for uptodate information as this becomes available.

Table 9-5: Wetspots within Surrey Heath (2019)

Wetspot ID	Road Name	Town/Village	Status	Score	Risk Level
SH018	Chertsey Road	Chobham	Dormant	186	High
SH030	Riverside Avenue	Lightwater	Dormant	181	High
SH064	A331 Blackwater Valley Relief Road	Frimley	Current	178	High
SH059	Watchetts Drive	Camberley	Current	174	High
SH008	High Street	Chobham	Dormant	167	High
SH003	Philpot Lane	Chobham	Current	106	Medium
SH040	Castle Grove Road	Chobham	Dormant	101	Medium
SH057	Station Road	Frimley	Dormant	101	Medium
SH025	Frimley Road	Frimley	Current	96	Medium
SH062	Mytchett Road	Camberley	Current	82	Medium
SH027	Lightwater Bypass	Lightwater	Dormant	71	Medium
SH061	Bridge Road	Bagshot	Current	57	Medium
SH004	Lake Road	Deepcut	Current	55	Medium
SH007	Upper Chobham Road	Camberley	Current	47	Lower
SH005	Station Road	Chobham	Resolved	46	Lower
SH063	Bracknell Road	Bagshot	Resolved	46	Lower
SH017	London Road	Camberley	Resolved	41	Lower
SH019	Guildford Road	Bisley	Resolved	41	Lower
SH028	Guildford Road	Bagshot	Dormant	27	Lower
SH039	Windlesham Road	Chobham	Dormant	21	Lower

[20] Surrey County Council - Flooding and wetspots https://www.surreycc.gov.uk/roads-and-transport/roadworks-and-maintenance/report-a-highway-problem/drainage-and-flooding/flooding-and-wetspots.

As can be seen Surry Heath has 5 high priority wetspots of which 2 have recent recorded instances of flooding. There are 4 wetspots where works have been carried out to try and resolve the flooding issues and the LLFA is awaiting a heavy rainfall event to evaluate their success.

When investigating sites for potential capital works, the LLFA try to resolve the highest scoring wetspots first, as these have the greatest impact. However, they do resolve lower scoring wetspots if the works can be carried out by the local area highway team, are incorporated into a larger maintenance scheme, or can be funded by a third party.

New development has the potential to contribute to the management of existing surface water flood risk and can be an important enabler to local surface water flood risk management schemes.

In addition to the potential to support and contribute to local surface water management schemes development has the potential to increase flood risk elsewhere if surface water runoff from a site is not managed. Sustainable Drainage Systems are recognised as an essential management strategy for surface water. Section 11 provides further detail on management of surface water flood risk, drainage and SuDS.

9.3 Management of Sewer Flood Risk

Flooding from sewers or urban areas can theoretically be managed with engineering works for any size event. However, such works may not be viable when in close proximity to watercourses and they are not always economically or environmentally sustainable. Improvements to urban drainage can also lead to increased or rapid rainfall runoff into rivers, exacerbating flood risk downstream and potentially transporting contaminants.

The NPPF recommends that SuDS are used to decrease the probability of flooding by limiting the peak demand on urban drainage infrastructure. All new developments are required to separate out foul drainage from surface water drainage to ensure that any flooding that does occur is not contaminated.

As part of the Surrey Heath Borough Council role in delivering SuDS, policy and guidance should promote the adoption of sustainable drainage techniques on all new developments where appropriate.

9.4 Management of Groundwater Flood Risk

As the LLFA, Surrey County Council is responsible for managing flood risk from groundwater within Surrey Heath, in conjunction with Surrey Heath Borough Council. The County Council LFRMS does not detail any specific management measures for groundwater flooding within Surrey. However, it is recommended that along with other sources of flooding, Surrey Heath Borough Council should endeavour to record and investigate any groundwater flood incidents to enhance the historic record and understanding of the groundwater flooding mechanism across Surrey Heath.

Groundwater flooding is often highly localised and complex; management is highly dependent on the characteristics of the specific situation. The costs associated with the management of groundwater flooding are highly variable. The implications of groundwater flooding should be considered and managed through development control and building design. Whilst groundwater flood risk across most of Surrey Heath is very low, possible management measures could include:

- Improved conveyance of floodwater through and away from flood prone areas.
- Raising property ground or flood levels.
- Providing local specific problem areas specific flood proofing.
- Replacement and renewal of leaking sewers, underground drains and water supply reservoirs.
- The management of SuDS techniques should also be considered in relation to groundwater levels.

Although groundwater flood risk across most of the Borough is very low, it is important it is still considered as part of site specific FRAs. Developers should consider the following indicators that a site may be at risk of groundwater flooding.

- If the development site is near to the junction between geological strata of differing permeability.
- If the development site is located at a similar level to nearby springs, or stream headwaters.
- If the development proposals include basements or excavation into the ground.
- If the vegetation on the site suggests periodic waterlogging due to high groundwater levels.
- If nearby recorded borehole levels reach those of the site ground levels.

9.5 Management of Flood Risk from Canals and Reservoirs

Summer Weir Protocols (instructions on the operation of the canal weirs held by the Basingstoke Canal Authority) ensures that the adjustable sections of weirs in the Surrey section of the Basingstoke Canal will be restored to their normal working heights to maintain full water levels in the canal. Winter Weir Protocols require the adjustable sections of weirs on the Surrey section of the canal to be reduced in height by 100mm to establish a flow on the canal towards the weirs. In the event of extreme rainfall or a canal emergency, the protocol states that the canal should be isolated into discrete sections, which can then be controlled via the use of sluices. In the case of an emergency it is advised in the protocol that the sluices are fully drawn to allow canal water to drain quickly. Although this would result in an immediate relief of flood risk to the area, this action does cause flooding problems elsewhere in the vicinity. In such an event the Environment Agency would be informed of this magnitude of weir movement.

10. Information for planning and developers

10.1 The Sequential Test

Appendix C to Appendix F provide an overview of the spatial variation in flood risk from all sources throughout Surrey Heath. A sequential approach should be adopted when considering where land should be allocated for future development and this is described in the following sections. The SFRA maps should be used to inform this sequential approach.

10.1.1 What is the Sequential Test?

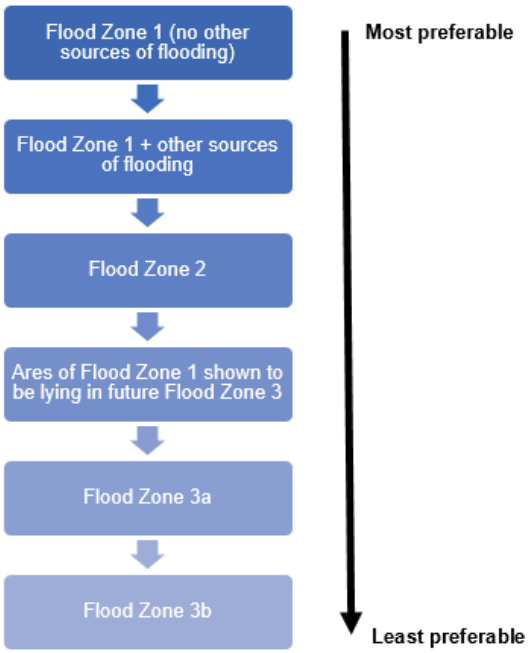
Paragraph 158 of the revised NPPF describes how the aim of the Sequential Test is:

"to steer new development to areas with the lowest risk of flooding. Development 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. The SFRA will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding".

Figure 10-1 sets out the order of Flood Zone preference for the location of development. The aim is to steer new development to Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses (Table 10-1) and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required (

Table 10-2). Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.

Figure 10-1: Order of Flood Zone Preference for Location of Development



The Sequential Test is also required if evidence suggests there may be flooding issues in the future due to climate change, or if the area may be at risk of flooding from sources other than fluvial, such as surface water, groundwater, sewers or artificial sources.

Some developments may contain different element of vulnerability; the highest vulnerability category should be used when applying the Sequential Test.

Table 10-1 Flood risk vulnerability classification

PPG Table 2: Flood risk vulnerability classification	
Essential infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly vulnerable	• Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent.
More vulnerable	• Hospitals • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.

	• Non–residential uses for health services, nurseries and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less vulnerable	• Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill, as defined in Schedule 10 of the Environmental Permitting England and Wales Regulations 2010, and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Water-compatible development	• Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Table 10-2: Flood risk vulnerability and flood zone compatibility

PPG Table 3: Flood Risk Vulnerability and flood zone 'compatibility'					
Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
1	✓	✓	✓	✓	✓
2	✓	Exception Test required	✓	✓	✓
3a	Exception Test required*	✗	Exception Test required	✓	✓
3b	Exception Test required**	✗	✗	✗	✓**

✓ Development is appropriate

✗ Development should not be permitted

* In Flood Zone 3a, essential infrastructure should be designed and constructed to remain operational and safe in times of flood

** In Flood Zone 3b, essential infrastructure that has to be there and has passed the Exception Test, and water compatible uses, should be designed and constructed to

- Remain operational and safe for users during times of flood
- Result in no net loss of floodplain storage
- Not impede water flows and not increase flood risk elsewhere

10.1.2 When does the Sequential Test not Need to be Applied?

The Sequential Test does not need to be applied for individual developments on sites that have been allocated in development plans through the sequential test, or for applications for minor development or change of use (except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site).

It is also not normally necessary to apply the Sequential Test to development proposals in Flood Zone 1 unless evidence suggests there may be flooding issues in the future, or if the area may be at risk of flooding from sources other than fluvial and tidal, such as surface water, groundwater, sewers or artificial sources.

10.1.3 Definition of Minor Development

In relation to flood risk, minor development is outlined within paragraph 046 of the Flood Risk and Coastal Change Guidance [21]as being:

- Minor non-residential extensions: industrial/commercial/leisure etc extensions with a footprint less than 250 square metres
- Alterations: development that does no increase the size of buildings e.g. alterations to external appearance
- Householder development: for example, sheds, garages, games rooms etc within the curtilage of the existing dwelling, in addition to physical extension to the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling e.g. subdivision of houses into flats

[21] Environment Agency, February 2016 (updated 2020). Flood Risk Assessments: Climate Change Allowances https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

10.1.4 Applying the Sequential Test to the Local Plan

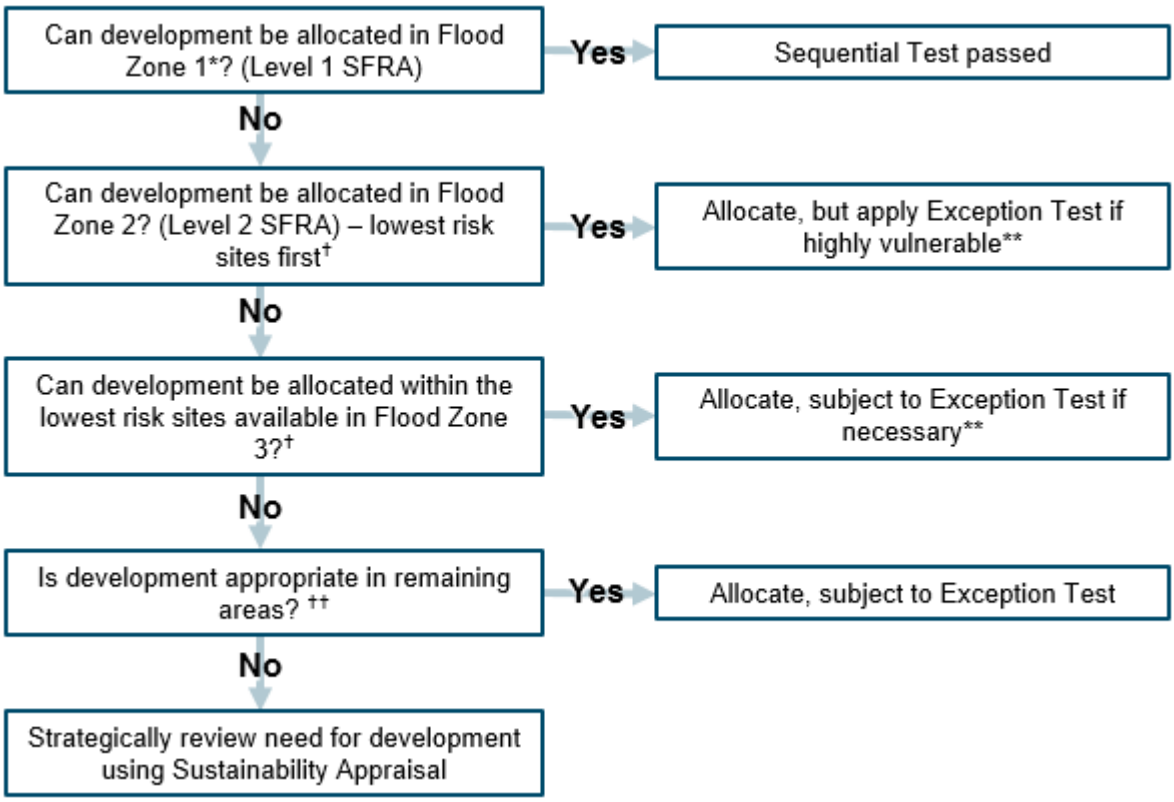
When allocating sites for development, it is acknowledged that flood risk information must be considered alongside other spatial planning issues such as transport, housing, economic growth, natural resources, regeneration, biodiversity, the historic environment and management of other hazards.

Surrey Heath Borough Council will need to sequentially test all reasonably available sites and promote sites based on those at least risk of flooding and appropriate land uses. The test should include all sources of flooding. Where development can be allocated in Flood Zone 1, the risk from other sources of flooding should be considered and development directed to areas of lower risk from these other sources.

The Sequential Test should be accurately documented to ensure that the decision processes followed for the locating of a development are consistent and transparent.

Figure 10-2 shows how the Sequential Test should be applied for Local Plan preparation as set out in PPG Paragraph 030: Diagram 2.

Figure 10-2:: PPG Diagram 2 - Application of Sequential Test for Local Plan preparation



10.1.5 Applying the Sequential Test to Individual Planning Applications

For individual sites where there has been no sequential testing in the local plan, or where the use of the site being proposed is not in accordance with the local plan, the area to apply the Sequential Test across will be defined by local circumstances relating to the catchment area for the type of development proposed. Likewise, when applying the Sequential Test, a pragmatic approach on the availability of reasonably alternatives sites should be taken. The starting point for identifying reasonable alternative sites will be review of sites allocated in the Local Plan. Where no allocated sites can be identified alternative sites within the search criteria should be considered. The search criteria for what constitutes a reasonably alternative site should be agreed with the Local Planning Authority for individual planning applications via

pre-application consultation. Search criteria should reflect the nature of the development and be linked to development characteristics of the identified development demand. Search Criteria may include but are not limited to such factors as geographic restrictions, limits on distance from existing transport infrastructure, and serviceability by other existing facilities. In the absence of any agreement the search area will be all areas within Surrey Heath Borough. There are circumstances where development is promoted near the edge of the Borough boundary where it may be reasonable to consider alternative sites within a neighbouring local authority area. Where agreed search criteria should be proportionate to the scale of the development proposed.

The Sequential Test needs to include all sources of flooding. If the development is in Flood Zone 1, but evidence shows there is a risk from other sources the Test should be undertaken to determine if any reasonable alternative sites are available that are at a lower risk from these other sources.

Surrey Heath Borough Council, with advice from the Environment Agency when appropriate, are responsible for deciding whether an application has passed the Sequential Test.

10.2 The Exception Test

10.2.1 What is the Exception Test?

Flood risk mapping in Appendix C shows some areas of the Borough are within Flood Zones 2 and 3. It is expected the Exception Test will have to be applied to allocating sites in Surrey Heath as it is unlikely that is will be possible to avoid all development in Flood Zones 2 and 3. The Exception Test allows necessary development to go ahead when sites with a lower risk of flooding are not available, assuming the Test's criteria can be passed.

For the Exception Test to be passed the following criteria must be met:

- Part 1: it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh the flood risk, informed by a SFRA where one has been prepared; and
- Part 2: a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere and, where possible, will reduce flood risk overall.

Both elements of the test will have to be passed for development to be allocated or permitted, and the test should not be undertaken until the Sequential Test has been carried out. Figure 10-3 shows how the Exception Test should be applied for Local Plan preparation as set out in PPG Paragraph 027: Diagram 3.

Part 1

Using the sustainability objectives set out in the Local Plan's Sustainability Appraisal, the proposed development should be assessed to determine whether it may provide wider sustainability benefits to the community and if these benefits weighed against the issues of located development in a flood risk area. If a proposed site is not capable of demonstrating sustainability benefits, the Council should consider whether planning conditions and/or planning obligations could make it do so. If this is not possible then the site has not passed the Exception Test and should not be allocated.

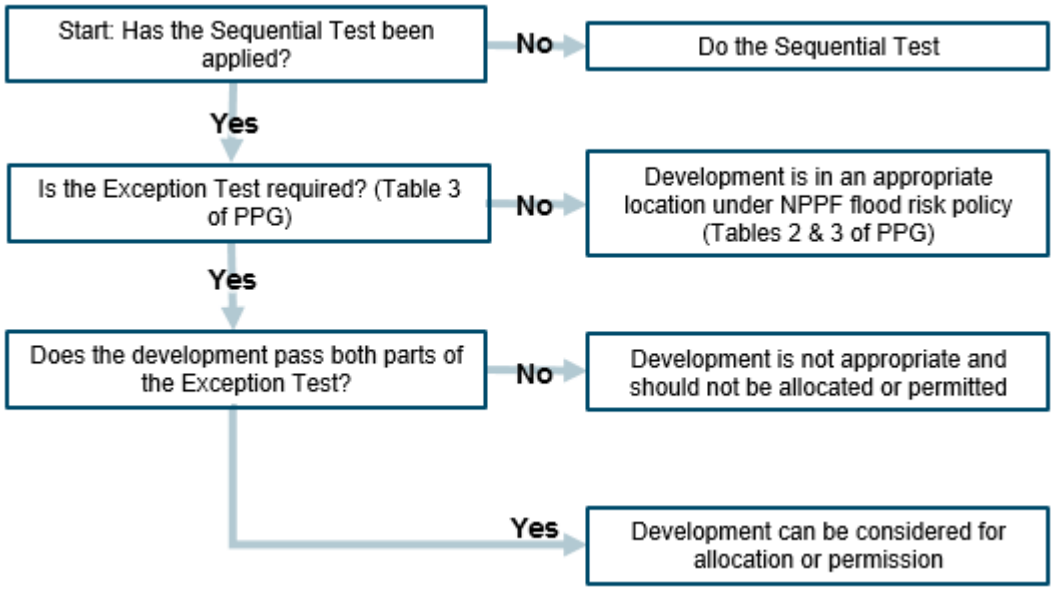
Part 2

The second part of the Exception Test relates to the 'safety' of the development across its lifetime. Planners should use their knowledge of their locality to assess the likely lifetime of a development. When considering safety, specific local circumstances need to be taken into account, including:

- the characteristics of a possible flood event, e.g. the type and source of flooding and frequency, depth, velocity and speed of onset;

- the safety of people within a building as it floods, as well as people around a building and in adjacent areas. This includes the ability of residents and users to safely access and exit a building during a design flood and to evacuate before an extreme flood;
- access and egress for emergency services;
- the structural safety of buildings; and
- the impact of a flood on the essential services provided to a development.

Figure 10-3: PPG Diagram 3 - Application of Exception Test for Local Plan preparation and Individual sites



It is important that a record is retained of all the assumptions and decisions made with regards to the Exception Test, in order to demonstrate the process has been adequately applied. Further information on the Exception Test can be found in the Planning Practice Guidance[22].

10.3 A Sequential Approach

Following the application of the Sequential and where relevant the Exception tests, where sites are found to be appropriate development, a sequential approach should be applied when designing the layout of sites. This is particularly important where flood risk is shown to vary across sites and for mixed use development. Sites should be designed so that the vulnerability of the individual elements of the proposed development within the site is taken into consideration and the elements with the highest vulnerability are located within areas with the lowest risk of flooding from all sources.

10.4 Site-specific Flood Risk Assessment Guidance

All development applications should consider the need for a further, more detailed, assessment of flood risk. The SFRA flood risk maps summarise the risk of flooding from all sources and should be used to trigger a more detailed assessment of flood risk related issues within a site.

[22] Environment Agency 2012 (updated 2017). Flood risk assessment: the sequential test for applicants: The Exceptions Test - https://www.gov.uk/guidance/flood-risk-assessment-the-sequential-test-for-applicants#the-exception-test

Failure to adequately consider flood risk in development proposals can have implications for the planning and development processes as well as on residents of new or existing developments. However, if adequately understood, flood risk can be managed through positive planning, location and designing of developments. The understanding of flood risk needs to consider flood risks to the development as well as the potential impact of the development on flood risk.

The information presented in this Level 1 SFRA and appendices presents sufficient information to assist Surrey Heath Borough Council to apply the Sequential Test and identify where the Exception Test may be required. This Level 1 SFRA has used best available information at the time of preparation; however, more detailed information of flood risk may be available through Level 2 SFRAs as well as through the production of site specific FRAs.

It is also important to recognise that Environment Agency Flood Zones are not defined for all watercourses. Catchments with an area less than 3km^2 are typically omitted from the Flood Zones. Therefore, there will be some locations in proximity to a watercourse that are shown to be in Flood Zone 1 with no fluvial flood risk. Any development proposals in these locations will need to investigate flood risk from the watercourse in more detail to ensure development is appropriate in the area.

Site-specific FRAs are used to support planning applications, when required, and assess the flood risk posed to proposed developments and to ensure, where required, suitable mitigation measures are included in the development proposal.

10.4.1 When are Site Specific Flood Risk Assessments Required?

In accordance with NPPF, footnote 50, site specific FRAs should be provided for

- All development in Flood Zone 2 and 3
- In Flood Zone 1
    - Sites of 1 hectare or more
    - Land which has been identified by the Environment Agency as having critical drainage problems (note: Surrey Heath has no areas identified by the Environment Agency as having critical drainage problems at present).
    - Land identified in a SFRA as being at increased flood risk in future
    - Land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

10.4.2 Site Specific Flood Risk Assessment Requirements

Where a FRA is required as part of a planning application, it is necessary for developers to prepare a document to the satisfaction of the decision maker (Surrey Heath Borough Council) who will seek the advice of the Environment Agency and the LLFA when required. Applicants are encouraged to demonstrate their proposal will deliver a betterment in flood risk.

Site specific FRAs should be proportionate to the degree of flood risk, as well as appropriate to the scale, nature and location of development. They should consider all sources of flooding, as well as the vulnerability to flood risk over the development's lifetime, including the potential impact of climate change.

Development lifetime should be agreed with the Local Planning Authority for individual planning applications via pre-application consultation. For practical reasons it is difficult to define the lifetime of development as each development will have different characteristics. For guidance, residential development should be considered for a minimum of 100 years, unless there is specific justification for considering a shorter period. An example of this would be if the development was controlled by a time limited planning condition such as a 'meanwhile' permission or temporary installation. For development

other than residential, the development lifetime will depend on the characteristics of that development. Development lifetime should be based on assessment of how long the development is anticipated to be present for. Where no agreement is in place a default lifetime of development of 100 years should be assumed.

Where the lifetime of development is agreed the relevant climate change epochs should be used the climate change allowance guidance[23] that are valid at time of the submission of individual planning applications.

Where flood defences, both formal and informal, are within the proximity of the site, the residual risk to the site should also be assessed. Further guidance on the content of site specific Flood risk assessments is available[24].

10.5 Development Management Recommendations and Guidance

Table 10-3 sets out flood risk spatial planning and development management recommendations that should be used by planners and developers.

The table is set out to initially consider the Flood Zones that a development falls into. However, it should be read in the context that the Flood Zones act as a starting point/trigger to screen development requirements in terms of Sequential Test and where relevant Exception Test and requirements for a site specific flood risk assessment. But then at a site specific level all sources of flood risk should be considered including the impact of climate change on site specific features and flood risk on sites, and flow paths etc. The table is not exhaustive and reference to Flood Risk Standing Advice[25] is encouraged.

[23] Environment Agency, February 2016 (updated 2020). Flood Risk Assessments: Climate Change Allowances https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

[24] Environment Agency 2014 (updated 2017). Guidance - Flood risk assessments if you're applying for planning permission - https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

[25] Environment Agency 2012 (updated 2021) Guidance - Preparing a flood risk assessment: standing advice https://www.gov.uk/guidance/flood-risk-assessment-standing-advice

Table 10-3: Development Management Recommendations and Guidance

Recommendation	FLOOD ZONE			
	Zone 3b (Functional Floodplain)	**Zone 3a (High Probability)**	**Zone 2 (Medium Probability)**	**Zone 1 Low Probability**
SPATIAL PLANNING RECOMMENDATIONS				
Sequential Test	Required.	Required (unless the site falls under one of the circumstances below)	Required (unless the site falls under one of the circumstances below)	Not required unless information shows there may be flooding issues now or in the future (considering all sources of flood risk). If information shows the site may be at risk in the future, the Sequential Test should be undertaken to determine if there are more appropriate sites for the development.
	Minor developments (as defined by the Environment Agency) need not undertake the Sequential Test Sequential Test does not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site Replacement dwellings with no increase in the number of dwellings or footprint of dwellings need not undertake the Sequential Test			
Exception Test	Must be passed for Essential Infrastructure	Must be passed for More Vulnerable development and Essential Infrastructure	Must be passed for Highly Vulnerable development	Not required
Land Use	Subject to the Sequential test: Should be restricted to Water Compatible development. Essential Infrastructure only appropriate if Exception Test is passed (subject to review of all sources of flood risk).	Subject to the Sequential test: Should be restricted to Water Compatible, Essential Infrastructure or Less Vulnerable development. More Vulnerable development and Essential Infrastructure only appropriate if Exception Test can be passed (subject to review of all sources of flood risk).	Subject to the Sequential test: Should be restricted to Water Compatible, Less Vulnerable, and Essential Infrastructure or More Vulnerable development. Highly Vulnerable only appropriate if Exception test can be passed (subject to review of all sources of flood risk).	Subject to review of all sources of flood risk - All appropriate
Important Considerations	Where developments contain different elements of vulnerability, the highest vulnerability category should be used, unless the development is considered in its component parts			
	All sources of flood risk should be assessed and to review flood risk now and in the future taking to consideration the lifetime of the development and associated climate change guidance. Essential Infrastructure that has to be in Zone 3b and has passed the Exception Test, and Water Compatible development should: • be designed and constructed to remain in operation and safe for users in times of flood • result in no net loss of floodplain • not impede water flows and not increase flood risk elsewhere	All sources of flood risk should be assessed and to review flood risk now and in the future taking to consideration the lifetime of the development and associated climate change guidance. Essential Infrastructure should be designed and constructed to remain operational and safe in times of flood	All sources of flood risk should be assessed and to review flood risk now and in the future taking to consideration the lifetime of the development and associated climate change guidance.	Sites in Zone 1 may be at risk from other sources of flooding e.g. surface water, groundwater, and artificial sources. Developers should assess this risk and provide an explanation of how the risk will be addressed/managed now and in the future taking to consideration the lifetime of the development and associated climate change guidance. Flood Zones do not normally include risk from watercourses with a catchment area less than 3km^2. Risk from these watercourses will need to be considered as part of a detailed FRA.
	Need not apply if the site is allocated in the Local Plan unless the proposal is for a use for which the site was not allocated for or if evidence suggests the level of flood risk has increased since the site was allocated. Minor developments and changes of use (as defined by the Environment Agency) need not undertake the Sequential Test, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site Replacement dwellings with no increase in the number of dwellings or footprint of dwellings need not undertake the Sequential Test			
Detailed FRA	Required, including minor development and change of use	Required – including minor development and change of use	Required – including minor development and change of use	Required for sites greater than 1 ha in area Required for sites where they could be affected by other sources of flooding other than rivers and sea
Finished Floor Level	Finished floor level should be agreed with the Local Planning Authority (in consultation with the LLFA and Environment Agency where relevant) for individual planning applications via pre-application consultation. In the absence of such an agreement ground floor levels should be a minimum of whichever is higher of: • 300 millimetres (mm) above the general ground level of the site or • 600mm above the estimated river or sea flood level (normally assessed against the 1% AEP flood event including an allowance for climate change). Site specific advice should be sort where applications include provision to include below ground level / basement development.			No minimum level

Recommendation	FLOOD ZONE			
	Zone 3b (Functional Floodplain)	**Zone 3a (High Probability)**	**Zone 2 (Medium Probability)**	**Zone 1 Low Probability**
Access and Egress	Access and Egress during times of flood should be agreed with the Local Planning Authority (in consultation with the LLFA and Environment Agency where relevant) for individual planning applications via pre-application consultation. Flood access and egress routes should allow occupants to safely access and exit their property in design flood conditions for the lifetime of the development (including an allowance for climate change). Vehicular access for emergency services to safely reach the development will also normally be required. Wherever possible, safe access routes should be provided that are located above design flood levels and avoid flow paths. Where this is not possible, limited depths of flooding may be acceptable, providing the proposed access is designed with appropriate signage etc to make it safe. The acceptable flood depth for safe access will vary depending on flood velocities and the risk of debris within the flood water[26]. In areas protected by defences, a safe refuge should be available on an upper floor to provide an immediate route of escape in the event of a defence breach. Evacuation routes should not direct evacuees to 'dry islands' i.e. dry areas completely surrounded by flood water.			No restrictions stipulated by PPG
Surface Water and Site Drainage	Surface water drainage assessment needed			
	Surface water drainage assessments need to report into how surface water affects a site and the surrounding area. They should also include information on what effect the development will have on surface water flood risk and outline measures the developer will need to take so that runoff rates will meet local and national guidance. For Greenfield developments, the peak runoff rate to any highway, drain, sewer or surface water body for the 100% AEP (1 in 1 year) rainfall event and the 1% AEP (1 in 100 year) rainfall event should never exceed the peak greenfield runoff rate for the same development. For all previously developed sites, existing discharge rates will be required to be lowered to greenfield rates along with sufficient proof that flood risk will not be increased by the proposed discharge. If the LLFA consider that an unacceptable flood risk may result from the calculated brownfield runoff rate then a reduced discharge rate will be imposed on, or agreed with, the developer.			
Cumulative Impact of Development	Development, including minor development, proposed in areas of past and planned future development, should consider the cumulative impact of the development as part of site-specific FRAs and drainage strategies. The cumulative impact assessment should also consider the effect of the development on sewerage capacity.			
Buffer Zone	Development free minimum 8m buffer zones around Main Rivers and 5m buffer zones around Ordinary Watercourses should be provided. This is to provide access for maintenance or future flood risk management. Pre-application advice should be sort on buffer zones as some sites may require larger buffer zones to accommodate specific local conditions such as high status morphology waterbodies or ecologically important watercourses e.g. SSSI/ SAC rivers.			
Floodplain Compensation	Where proposed development will result in a reduction in the total volume of floodplain storage, developers should provide compensatory floodplain storage. The compensatory flood storage should be provided within areas currently outside of Flood Zones 3b, 3a and 2, flood water must be able to flow in and out unaided, and must be provided on a level for level, volume for volume basis within the site boundary. The compensation should be considered in the context of the 1% AEP flood level and include an allowance for climate change. If the land is not inside the site boundary, the compensatory storage should be in the immediate vicinity of the site and under the developer's ownership/control. All proposed compensatory storage should be supported by a site specific FRA which needs to demonstrate there is no loss of flood storage capacity, no subsequent effect on flood risk elsewhere, and must include details of an appropriate maintenance regime to ensure it continues to function throughout the lifetime of the development. Guidance on how to address floodplain compensation is provided in Appendix A3 of the CIRIA publication C624. The default approach to floodplain compensation should be level for level compensation up to the 1% AEP event including an allowance for climate change. Where this is not possible alternative approaches may be considered by exception with agreement from the Local Planning Authority (in consultation with the LLFA and Environment Agency where relevant) for individual planning applications via pre-application consultation. Compensatory storage areas should be included within the Functional Floodplain layer to protect the land against any development in the future.			-
Raising of ground levels	Generally raising of ground levels should not be permitted in this Zone. Exceptions such as the construction of flood defences should be agreed with the Local Planning Authority in consultation with the Environment Agency.	If modifying ground levels to raise the land above the required flood level is proposed care must be taken to ensure there is no subsequent effect on flood risk elsewhere and compensatory storage should be provided within areas that currently lie outside of Flood Zones 2 and 3 to ensure the total volume of flood storage is not reduced. Flow paths should be maintained. All proposals should be supported by a detailed site specific FRA. The FRA should also show that raising of ground levels will not cause increased ponding or build-up of surface water on third party land or property, including those in Flood Zone 1.		
Flood Resistance	Flood resistance involves measures designed to keep flood water out of properties and businesses, for example permanent or temporary barriers or community level demountable barriers. In cases where flood risk remains to a development, for example residual risk, additional measures can be implemented to reduce damage. These measures should not be relied upon as an appropriate mitigation measure and their effectiveness is often reliant on a reliable forecasting and warning system to ensure measures are deployed in time. Resistance measures should be designed for the lifetime of the development and include an allowance for climate change in their design standard.			-
Flood Resilience	Flood resilience involves measures designed to reduce the impact of water once it enters a property. Buildings can be designed and constructed to accept that water will enter the building itself, by aiming to reduce the impact of water entering to avoid permanent damage, maintain structural integrity and allow easy drying and cleaning. This allows faster re-occupancy of the building after the flood event. Resilience measures should be designed for the lifetime of the development and include an allowance for climate change in their design standard. More detailed information regarding flood resilience measures can be found within the Environment Agency's standing advice: https://www.gov.uk/guidance/flood-risk-assessment-standing-advice#standing-advice-for-vulnerable-developments			-
Other	The proposed development must not result in an increase in flood risk to neighbouring properties and communities downstream And should be safe for site users for the lifetime of the development with reference to the development type epoch and climate change allowance, and consider including that opportunities should be sought to reduce flood risk in addition to ensuring flood risk is not increases			

[26] Department for Communities and Local Government, 2014 (updated 2016). Planning Practice Guidance: Flood Risk and Coastal Change Reference ID: 7-003-20140306 https://www.gov.uk/guidance/flood-risk-and-coastal-change#planning-and-flood-risk

11. Drainage and sustainable drainage systems

11.1 Background

Traditionally developments have used piped drainage systems to manage surface water and convey it away from developed areas as quickly as possible. These systems usually connect to the public sewer system for treatment and / or discharge into local watercourses. The resulting alteration of natural drainage processes can potentially impact on downstream areas by increasing flood risk and reducing water quality.

As development progresses or urban areas expand, the drainage systems can become inadequate for the volumes and rates of surface water they receive, resulting in increased flood risk and / or pollution of watercourses. Connected to this, the implications of climate change on rainfall intensities is predicted to result in flashier responses to rainfall and surcharging of piped systems.

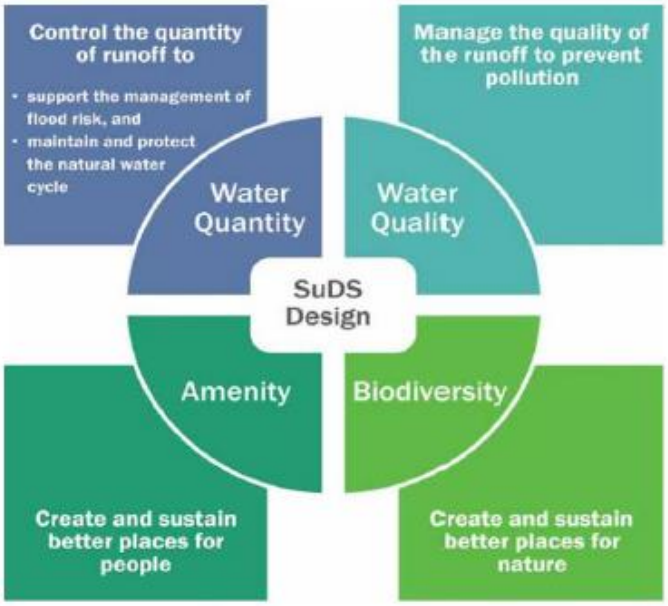
SuDS are the preferred method for reducing the volume and / or rate of water entering watercourses and the sewer system from development.

11.2 What are Sustainable Drainage Systems (SuDS)?

SuDS are a varied collection of techniques designed to manage surface water in a sustainable manner. SuDS achieve this by seeking to manage surface water as close to its source as possible and by mimicking the surface water flow regime present on a site prior to development. This approach usually involves a move away from conventional piped systems to softer engineering solutions inspired by natural drainage processes. The variety and flexibility of SuDS means they can be retrofitted to existing development as well as in most new developments.

For SuDS to be fully sustainable they should seek to comply with the key SuDS principles as set out inFigure 11-1.

Figure 11-1: Four Principles of SuDS Design (Source: The SuDS Manual C753 Ciria (2015))



Water Quantity

SuDS practices can play a key role in managing surface water through two mechanisms: runoff rate and storage volumes. As SuDS features often utilise pervious surfaces, they reduce runoff rates from the site compared to conventional development comprised primarily of impervious surfaces. SuDS can also help supplement the volume of water that must be stored on-site (attenuation volume) to achieve the desired runoff rate from the site. SuDS practices can store and/or infiltrate surface water into the surrounding soil, providing the necessary for attenuation storage for frequent rainfall events.

Water Quality

SuDS techniques help to improve surface water quality through the use of a 'Management Train,' which recommends incorporating a chain of techniques throughout a development, (as outlined in CIRIA C697 (Woods Ballard et al, 2007), where each component adds to the performance of the whole system. The Management Train approach consists of four stages:

- **Prevention:** good site design and upkeep to prevent runoff and pollution (e.g. limited paved areas, regular pavement sweeping)
- **Source control:** runoff control at/near to source (e.g. rainwater harvesting, green roofs, pervious pavements)
- **Site control:** water management from a multitude of catchments (e.g. route water from roofs, impermeable paved areas to one infiltration/holding site)
- **Regional:** control integrate runoff from a number of sites (e.g. into a wetland).

Amenity/Biodiversity

As SuDS techniques can be integrated within the fabric of a site, they provide opportunities to create amenity areas and improve the site's biodiversity. Many SuDS techniques are landscaped with grasses and/or plantings that help to create green streets, neighbourhoods and commercial/industrial properties. SuDS can also be implemented as part of multi-functional places, enabling both the management of surface water and other uses like recreation within the same space.

11.3 SuDS Techniques

In accordance with PPG paragraph 80, all planning applications must follow the hierarchy for discharge destinations.

1) Into the ground (infiltration)
2) To a surface water body
3) To a surface water sewer, highway drain, or another drainage system
4) To a combined sewer

Where it is not possible to achieve the first hierarchy, discharge through the ground, applicants must demonstrate in sequence why the subsequent discharge destinations were selected. Table 11-1 sets out a variety of example components.

Table 11-1: Different Types of SuDS Components

SuDS Approach	Technique	Description
Source Control	Green Roofs	Vegetated roofs that reduce the rate and volume of runoff and remove pollution[27].
	Rainwater Harvesting	The collection and storage of rainwater for re-use on site
	Permeable Pavement	Permeable surfaces that allow rainwater to pass through into the ground beneath
(Balancing) Ponds / Wetlands / Detention basins	Pond / Wetland	Areas set aside with the purpose of storing surface runoff
	Detention Basin	
Infiltration	Infiltration Trenches / Basins	Structures set below the surface to promote the infiltration of surface water
	Soakaways	
	Bioretention / Filter Strips	Vegetated areas that collect and treat water before it is discharged (either directly into the ground or via a piped system)
Open Channels	Swales	Shallow, vegetated channels that retain water.
Retention	Underground Storage / Oversized Pipes	These options should only be considered when no other option is suitable.

11.3.1 Design of SuDS Techniques

The design of SuDS measures should be undertaken as part of a drainage strategy and design for a development site. A ground investigation should form part of the SuDS assessment to determine ground conditions and the most appropriate SuDS technique(s). Hydrological analysis should be undertaken using industry approved procedures to ensure an appropriate design is developed. This should account for the effects of climate change over the lifetime of the proposed system/development and based on an agreed permitted rate of discharge from the site.

During the design process, liaison should take place with the authority responsible for the receiving water body and any organisations involved in the long term maintenance of the system. This may include liaison with Surrey County Council, Hart District Council, Guildford Borough Council, Waverley Borough Council and Woking Borough Council, the Environment Agency and Thames Water. The adjacent borough councils should also be contacted, including Hart, Runnymede and Woking. Liaison with these organisations should focus on establishing a suitable design methodology, any restrictions and provision for the long-term maintenance of the SuDS system.

11.4 SuDS Constraints

The underlying ground conditions of a development site will often influence the type(s) of SuDS technique suitable at an individual site. While this will need to be determined through ground investigations carried out on-site, an initial assessment of the site's suitability to the use of SuDS can be obtained from a review of the available soils/geological survey of the area.

Parts of the Surrey Heath Borough are located on sandstone which is a suitable geology for the use of infiltration based SuDS. Sustainable drainage can also be achieved within areas of high groundwater by

[27] Green walls can also be considered within the SuDS design where they provide similar benefits to a green roof. However, not all green walls provide the same drainage benefits and some require active irrigation reducing their sustainable benefits.

the use of ponds, swales and wetlands when managed and implemented appropriately. There are no identified groundwater abstractions within the Borough, or Source Protection Zones, and therefore there are very few limiting factors on the types of infiltration based SuDS. It is recommended that for all sites where infiltration drainage is proposed, on-site tests are carried out to determine specific infiltration rates during the site investigation. For sites where on-site tests show infiltration based SuDS are not suitable, Surrey County Council request evidence to be provided if other techniques are proposed.

It is recommended that developers should consult Surrey County Council (the LLFA), Surrey Heath Borough Council, relevant service authorities and Utility Companies and where relevant the Environment Agency at the earliest stage of the development process to establish the best solution for a particular site.

During the design process, in addition to considering the properties of the underlying soils and strata it is necessary to also consider the sensitivity of the receiving water body and any previous uses of the site.

The use of SuDS can be limited based on a number of constraints, which include:

- Groundwater vulnerability and potential contamination of an aquifer;
- Current or target water quality of a receiving watercourse;
- The presence of groundwater Source Protection Zones (SPZs) and potential contamination of a potable water source;
- Restrictions on infiltration on contaminated land to prevent the spread of contamination; and,
- Restricted area on development sites where housing densities are high.

Groundwater Vulnerability

Groundwater resources can be vulnerable to contamination from both direct sources (e.g. into groundwater) or indirect sources (e.g. infiltration of discharges onto land). Groundwater vulnerability within the study area has been determined by the Environment Agency based on a review of aquifer characteristics, local geology and the leachability of overlying soils.

The vulnerability of the groundwater is important when advising on the suitability of SuDS. The Environment Agency is the responsible drainage authority for any discharges to groundwater and should be consulted on proposals to discharge to ground. Groundwater vulnerability for the study area can be assessed by reviewing the most up-to-date maps on the Environment Agency's website.

Groundwater Source Protection Zones

In addition to groundwater vulnerability, the Environment Agency also defines groundwater SPZs around groundwater abstraction points. SPZs are defined to protect areas of groundwater that are used for potable supply, including public/private potable supply, (including mineral and bottled water) or for use in the production of commercial food and drinks.

SPZs are defined based on the time it takes for pollutants to reach an abstraction point. Depending on the nature of the proposed development and the location of the development site with regards to the SPZs, restrictions may be placed on the types of SuDS appropriate to certain areas.

Any restrictions imposed on the discharge of site generated runoff by the Environment Agency will be determined on a site by site basis using a risk based approach. SPZ for the study area can be assessed by reviewing the most up-to-date maps on the Defra Magic Map Application[28].

[28] Department of Environment, Food and Rural Affairs Magic Map Application: https://magic.defra.gov.uk

Contaminated Land

Previous site uses can leave a legacy of contamination that if inappropriately managed can cause damage to local water bodies. During the design of SuDS, it is essential to have regard to the nature of potential ground contamination.

Particular restrictions may be placed on infiltration based SuDS, forcing consideration of attenuation based systems. Early discussion with the authority responsible for the receiving water body should be undertaken to establish the requirements of SuDS on contaminated sites.

High Development Densities

Where developments are required to achieve high development densities it is essential that the requirement for SuDS and their constraints are identified early in the site master planning process. High development densities can restrict the land area available for SuDS, which if mandatory can affect the ability of a site to gain planning permission.

Guidance on masterplanning for sites with high development densities is available on the Surrey County Council website.

Early consideration of SuDS enables the drainage requirements to be integrated with the design, limiting the impact they have on developable area and development densities.

11.5 Surface Water Drainage Strategies

A Surface Water Drainage Strategy should be submitted to support all major planning applications. It may form part of the site's FRA or as a standalone document. The document should set out the surface water drainage assessment and proposals for the site in accordance with the following policies

- NPPF
- PPG
- Surrey Heath Local Plan
- Non-Statutory Technical Standards for SuDS
- This SFRA

The Surrey County Council Surface Water Drainage Pro-Forma should be completed and submitted as part of the planning application.

For full applications, it is not acceptable to leave the design of SuDS to a later stage to be dealt with by planning conditions.

More information, including a Surface Water Drainage Summary Pro-forma (2017), can be found at Surrey County Council's website: https://www.surreycc.gov.uk/people-and-community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/suds-planning-advice

11.6 SuDS Policies and Guidance

11.6.1 NPPF and PPG

Following changes within the NPPF on the 6 April 2015, all Major Development planning applications will require the inclusion of SuDS designs.

As of 6th April 2015, SuDS are a material planning consideration for major development, where major developments are defined as:

a) Winning and working of minerals or the use of land for mineral-working deposits;
b) Waste development;
c) The provision of dwelling houses where:
    i. The number of dwelling houses to provided is 10 or more; or
    ii. The development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls under c i
d) The provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or
e) Development carried out on a site having an area of one hectare or more

As a result, the inclusion of SuDS designs is required with all Major Development planning applications. Full planning applications are required to be accompanied by a detailed SuDS drainage design including simulation modelling of the proposed system. The SuDS proforma must be completed and signed by a competent drainage engineer and submitted as part of the planning application. The proposed drainage system shall be designed in accordance with the Non-Statutory Technical Standards for Sustainable Drainage Systems and any forthcoming Sustainable Drainage Systems Guidance from Surrey Heath Borough Council.

Following the 2015 changes within NPPF, local planning authorities are expected to

- Consult LLFAs regarding surface water management and flood risk on major developments;
- Satisfy themselves that the proposed minimum standards of operation for SuDS are appropriate; and
- Ensure there are clear arrangements in place for ongoing maintenance over the lifetime of the development through the use of planning conditions or obligations

The NPPF was further updated in July 2018 and now includes the following guidance regarding SuDS:

- Major developments should incorporate sustainable urban drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:
    a) Take account of advice from the lead local flood authority;
    b) Have appropriate proposed minimum operational standards;
    c) Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
    d) Where possible, provide multifunctional benefits.

11.6.2 Surrey County Council SUDS Design Guidance (July 2019)

Surrey County Council have prepared this document[29] which provides advice relating to surface water drainage and sets out the minimum operating requirements as required by the NPPF. It sets out the design criteria that should be evidenced within the drainage strategy, standard conditions and information on any other approvals that may be required.

The guidance sets out the LLFA's vision for SuDS in Surrey and their requirements and related policy. The guidance stipulated the relevant design criteria for SuDS systems and the evidence require for individual drainage strategies at planning submission. As well as standard SuDS replated planning conditions, the details of other typical approvals required and how to obtain preapplication advice from the LLFA.

[29] Surrey County Council 2019. SUDS Design Guidance https://www.surreycc.gov.uk/__data/assets/pdf_file/0020/201944/Sustainable-drainage-systems-SuDS-planning-advice.pdf

11.6.3 Non-statutory Standards for Sustainable Drainage Systems (Defra 2015)[30]

This provides the current benchmark for designing SuDS and should be used in conjunction with the NPPF and PPG. The Standards cover the following:

- Flood risk outside the development
- Peak flow control
- Volume control
- Flood risk within the development
- Structural integrity
- Designing for maintenance considerations
- Construction

11.7 Available Datasets for the Application of SuDS Systems

The British Geological Society (BGS) produce a range of datasets which provide information surrounding the suitability of the ground for infiltration SuDS. The selection and design of an appropriate system depends on the properties of the ground and in particular the following four factors:

- the presence of severe constraints that must be considered prior to proposing use of infiltration
- the drainage potential of the ground
- the potential for ground instability when water is infiltrated
- the protection of groundwater quality

The Infiltration SuDS Map is based on 15 nationally derived subsurface property datasets, some of which are a result of direct observations, whilst others rely on modelled data.

The dataset is structured using the above four factors, and allows consideration of the subsurface permeability, the depth to groundwater, the presence of geological floodplain deposits, the presence of artificial ground, ground stability (soluble rocks, collapsible ground, compressible ground, running sand, shallow mining, landslide and shrink/swell clays), potential for pollutant attenuation and the Environment Agency's SPZ.

The maps show data at 1:50,000 scale and contains the following:

Infiltration SuDS Map: Detailed

The detailed map provides the data layers described above, along with a further 20 individual, bespoke data layers. These data layers provide information on the properties of the ground, which can be used to guide local SuDS planning and design.

The data can be used to determine the likely limitations present at a site and make preliminary decisions on the type of infiltration SuDS that may be appropriate. We anticipate that this map will be used by planners, developers, consultants and SuDS Approval Bodies.

[30] The 2015 Non-statutory Standards for Sustainable Drainage Systems are valid at the time of publishing this SFRA. However, DEFRA are currently consulting on updates to the guidance and Site-specific drainage assessments should make use of the standards that are valid at time of the submission of individual planning applications.

The dataset is intended to be used at a preliminary stage and is not a replacement for a site investigation.

Infiltration SuDS Map: Summary

The summary map comprises four summary layers, providing an indication of the suitability of the ground for infiltration SuDS. The layers summarise: the presence of severe constraints; the drainage potential of the ground; the potential for ground instability as a result of infiltration and the susceptibility of the groundwater to contamination. The layer is derived from the following datasets:

- Infiltration constraints summary
- Superficial deposit permeability
- Superficial deposit thickness
- Bedrock permeability
- Depth to water level
- Geological indicators of flooding

This map is anticipated to be of use in strategic planning and not for local assessment. It does not provide specific subsurface data or state the limitations of the subsurface with respect to infiltration.

11.8 SuDS Suitability Assessment

For this high level SFRA study, the infiltration constraints layer within the BGS Summary Infiltration SuDs map has been analysed to provide a summary of the locations that may be unsuitable for infiltration SuDS techniques across Surrey Heath Borough.

Areas which are shown to have very significant constraints include:

- Pockets of land along the western boundary of the Borough, along the A331
- Land adjacent to the Basingstoke Canal
- Bagshot Heath around the London Road and Highwater Country Park area
- Land adjacent to School Road, Windlesham
- Land between Windlesham Road and Halebourne Lane
- Land to the west of Burrowhill
- Land around Chobham Common
- Land adjacent to the eastern boundary of the Borough south of the A319

The constraints could include:

- Landslide
- Made ground
- Shallow groundwater
- Shallow mining
- Soluble rock
- Or a combination of the above.

12. Emergency planning

Sir Michael Pitt's Review of the 2007 floods recognises the 'dedicated and quick response' of emergency services which prevented the worsening of many situations. However, he also identified a number of failings and opportunities to improve our preparedness for future flood events. In particular he advises that with 'stronger local leadership of flood risk management, clarification of roles, more effective co-operation between responsible organisations, better protection of infrastructure and wiser and deeper public engagement' the impact of flooding on communities could be reduced.

For many of the opportunities identified by the Pitt Review to be achieved, the role local authorities have in planning and responding to flood events must be clearly defined. To assist local authorities in understanding their role it is essential to have a technically sound emergency plan in place to provide clear procedural instructions to the organisations, companies and individuals involved and affected.

The mobilisation and organisation of the emergency planning services and supporting agencies (for example, Surrey Heath Borough Council) can be integral to the coordinated rescue, treatment and transport of potentially large numbers of displaced residents or casualties. Similarly, during and after a flood event the role of the local authority can include providing transport for the evacuees and safe rest centres in the event of homes being flooded. Further health and welfare issues are inevitable as a result of serious flood events, which may impact on the ability of people to return to their homes or places of business.

Whilst this SFRA is not designed to fulfil the role of providing an emergency plan, it does contain useful information for Surrey Heath Borough Council, the Local Resilience Forum and emergency responders to assist them in understanding their risks (direct and indirect) and begin the process of developing an appropriate co-ordinated response.

12.1 Surrey Local Resilience Forum

Surrey's Local Resilience Forum (LRF) is a multi-agency partnership made up of representatives from local public services, including the Emergency Services, Local Authorities, NHS England and the Environment Agency, which are all Category One Responders under the Civil Contingencies Act 2004. The LRF is also supported by Category Two Responders, such as Highways England and Utility Companies. The Surrey LRF brings together all agencies with a significant role to play in responding to and recovery from the effects of emergencies and was formed to meet the requirements of the Civil Contingencies Act 2004. The LRF aims to plan and prepare for local incidents and large scale emergencies.

12.2 Emergency Plans

With the appropriate management of flooding taking increasing importance in the planning system, more developments will be required to ensure they appropriately manage their risks and do not exacerbate the risks to surrounding property and residents and a consequence of development.

Whilst much of the impact of development should be mitigated through appropriate proactive planning (through application of the Sequential Test), there will remain some developments that will take place in areas at risk of flooding. In such circumstances, developments should be constructed in such a way as to safeguard them and their residents from flooding. However, the impact of the development on the ability of emergency services to maintain current standards of service should also be considered.

Where land allocation in flood risk areas is unavoidable and flood warning is proposed to complement other measures being used to minimise residual risk, the vulnerability of the proposed new development should be considered, and appropriate communication of flood warnings established. Planners and developers need to consider the land use when proposing new development, for example if occupiers are likely to be transient, the level of local knowledge and level of mobility. The availability of safe access and egress

routes for occupiers and emergency services is of key importance, as is the availability of safe refuge in the event that evacuation is not possible, for example failure of a defence with little or no warning. Advice should be sought from emergency planning officers when proposing evacuation plans for new developments.

Surrey Heath Borough Council provide information on flood preparation on their website:

https://www.surreycc.gov.uk/people-and-community/emergency-planning-and-community-safety/flooding-advice/preparing-for-flooding.

The Environment Agency provide information on flood preparation and preparing personal, community/group and business flood plans on their website: https://www.gov.uk/prepare-for-flooding/future-flooding.

13. Water Framework Directive

13.1 Background

The EU Water Framework Directive (WFD) is European water legislation that was adopted and came into force in December 2000. The purpose of the Directive is to establish a framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater throughout Europe. The Directive requires Member States to establish river basin districts and for each of these a River Basin Management Plan (RBMP). The Directive envisages a cyclical process where river basin management plans are prepared, implemented and reviewed every six years.

The WFD was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003, which was subsequently replaced by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The Directive requires that Environmental Objectives be set for all surface and ground waters in England and Wales to enable them to achieve Good Status (or Good Ecological Potential for Heavily Modified and Artificial Water Bodies) by a defined date. These Environmental Objectives are listed below:

- prevent deterioration of the status of each body of water;
- protect, enhance and restore each body of water (other than an artificial or heavily modified water body) with the aim of achieving good status (subject to the criteria set out in the Directive), if not already achieved, by 22nd December 2021 (unless otherwise stated in the Directive e.g. a few chemical substances have a deadline of 22nd December 2027);
- protect and enhance each artificial or heavily modified water body with the aim of achieving good status (subject to the criteria set out in the Directive), if not already achieved, by 22nd December 2021 (unless otherwise stated in the Directive e.g. a few chemical substances have a deadline of 22nd December 2027);
- aim progressively to reduce pollution of surface water from priority substances and aim to cease or phase out emissions, discharges and losses of priority hazardous substances;
- prevent or limit the input of pollutants into groundwater;
- reverse any significant and sustained upward trend in the concentration of any pollutant in groundwater bodies resulting from the impact of human activity in order to progressively reduce pollution of groundwater;
- for shellfish water protected areas, in addition to the objectives for the surface water bodies in which they are located, the objectives are such as are necessary or desirable to improve or protect the shellfish water protected area in order to support shellfish life and growth and to contribute to the high quality of shellfish products suitable for human consumption as the appropriate authority may direct.

In England, the Environment Agency is responsible for the delivery of the WFD objectives. The Environment Agency has produced RBMPs for the whole of England which describe how the WFD will be achieved; Surrey Heath is covered by the Thames RBMP.

The purpose of a RBMP is to provide a framework for protecting and enhancing the benefits provided by the water environment. The RBMP sets out the baseline classification of water bodies to prevent water bodies deteriorating, statutory objectives for protected areas, statutory objectives for water bodies and the deadline to achieve the objectives by, and a programme of measures to achieve statutory objectives.

All waterbodies have to achieve Good Ecological Status or Good Ecological Potential (GEP) by a set deadline. GEP is the best ecological improvements that can be achieved for a water body while still enabling Flood and Coastal Erosion Risk Management (FCERM) works to be undertaken to protect people and property from flooding.

Appendix I shows the 2016 classification status of the main water bodies in Surrey Heath. The majority of the water bodies have moderate ecological status, except for the Blackwater (Aldershot to Cove Brook confluence at Hawley) and the Chertsey Bourney (Sunningdale to Virginia Water) which have poor status. All catchments in the study area have good chemical status.

Future development should ensure there is no adverse impact on the quality of watercourses within the Borough.

13.2 Artificial or Heavily Modified Water Bodies

A heavily modified water body is defined as a body of surface water which as a result of physical alterations by human activity is substantially changed in character.

Good ecological status is defined as a slight variation from natural conditions in natural water bodies. However, artificial and heavily modified water bodies are unable to achieve natural conditions. Instead, artificial and heavily modified water bodies have a target to achieve GEP, which recognises their important uses, whilst making sure ecology is protected as far as possible. Ecological potential is also measured on the scale high, good, moderate, poor and bad.

13.3 WFD Assessments

A WFD assessment will be required if an activity could affect the quality of a water body. Assessments should:

- Make sure that the risk assessment covers the receptors protected by the WFD
- Demonstrates that the activity supports the objectives of the local RBMP
- Carry out more investigation into the risks on WFD receptors and possible ways of managing that risk if a high level of confidence that the activity supports the objectives of the RBMP cannot be reached
- Show the activity meets the sustainability criteria set out in Article 4(7) of the WFD if it is concluded that the activity does not support the RBMP objectives. The Environment Agency should be contacted for help with this.

Environment Agency guidance on WFD assessments can be found on their website:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/522426/LIT_10445.pdf

13.4 WFD Improvement Measures

A number of measures can be taken to improve the WFD status of a waterbody. These may include, but are not limited to, de-culverting, structure removal, backwater creation or installation of fish passages. The European Centre for River Restoration provides information and guidance on environmental improvements.

http://www.ecrr.org/RiverRestoration/Floodriskmanagement/HealthyCatchments-managingforfloodriskWFD/tabid/3098/Default.aspx

Defra, alongside a number of other organisations including the Welsh Government, Environment Agency, Natural Resources Wales, the Scottish Environment Protection Agency and Woodland Trust, have also produced an interactive natural flood management map which maps the potential for working with natural processes. These maps identify potential areas for floodplain reconnection, runoff attenuation features and gully blocking, and woodland planting, covering floodplain planting, riparian planting and wider catchment woodland. The maps and user guide are found at

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/725264/Working_with_natural_processes_mapping_user_guide.pdf

14. SFRA maintenance and management

14.1 Data Ownership

The datasets obtained for use in the SFRA have come from several sources including open source data and data under licence agreement. Datasets under a licence agreement cannot be passed to external sources without permission from the owner and those requiring the data should ensure that they possess the appropriate copyrights and access. Surrey Heath Borough Council should be aware of the Intellectual Property Rights they possess so that they only issue data that is contractually appropriate. Datasets produced during the SFRA are owned by Surrey Heath Borough Council and can be passed to external parties at their discretion.

14.2 SFRA Data Management System

The data management strategy developed for the SFRA is designed to account for likelihood that external parties will seek to make use of the information within the SFRA in preparing FRAs and assessing sites. It is also necessary to ensure, at regular intervals in the future, that the information within the SFRA, including the outcomes and conclusions, remains valid. The SFRA has been written in a way that it can be periodically updated as new information and guidance becomes available.

It is important to recognise that the SFRA has been developed using the best available information at the time of preparation. It is the responsibility of the user to ensure they are using the best available information. It may be necessary for the user to undertake their own assessment, for example, through undertaking a site-specific FRA or climate change modelling.

It is recommended that the following maintenance checks be undertaken on a regular basis.

1. Has any flooding been observed within the Borough since the previous review?
2. Have any amendments to NPPF or the PPG been released since the previous review? Does the revision to the policy guidance alter the definition of the Flood Zones presented within the SFRA?
3. Has the implementation of the SFRA within the spatial planning and/or development control functions of the Council raised any particular issues or concerns that need to be reviewed as part?
4. Has the Environment Agency issued any amendments to their flood risk mapping and/or standing guidance since the previous policy review?

Whilst all datasets should be checked for updates and key organisations contacted, Table 14-1 contains a list of datasets that are likely to be updated regularly.

Table 14-1 Datasets that are known to be updated regularly

Dataset	Owner	Update Frequency
Flood Zones	Environment Agency	Updated quarterly
Surface Water Flood Maps	Environment Agency	Updated quarterly
Spatial Flood Defences	Environment Agency	Updated quarterly
Historic flood incidents	Environment Agency, Water companies, Fire Brigade, Highways Dept, Surrey Heath Borough Council	Unknown

15. Conclusions and recommendations

15.1 Summary of Flood Risk in Surrey Heath

An assessment of flood risk from all sources in the Borough has been undertaken throughout this SFRA. A summary of the findings is provided in Table 15-1 below.

Table 15-1 Summary of Flood Risk

Flood Risk Source	Summary
Fluvial	The Environment Agency Flood Map for Planning, and the functional floodplain (Flood Zone 3b) derived for this SFRA using detailed hydraulic model outputs, show fluvial flood risk is concentrated along the river valleys. The Bourne catchment, with its wide floodplains, has large areas at risk. However, much of this is rural, undeveloped land. The River Blackwater catchment and its tributaries flows through a more urban area, resulting in risk to properties and businesses.
Surface Water	The RoFfSW datasets shows the most common areas to experience increased surface water flood risk are along roads, depressions (valley lines), and land adjacent to watercourses.
Sewers	Sewer flooding incidents have been recorded throughout the Borough, mainly in urban areas where the denser public drainage networks increase the probability of sewer flooding.
Groundwater	Most of the study area is at low risk of groundwater flooding due to the underlying sandstone geology. There is an elevated risk of flooding from groundwater close to river valleys.
Reservoirs	There are areas at risk from reservoir flooding along the river valleys of the River Blackwater, Windle Brook and Hale Bourne, with outlines generally following the watercourses. However, due to the strict maintenance and monitoring regimes places on large raised reservoirs the likelihood of reservoir failure is low. As such, flood risk from reservoirs in Surrey Heath is considered to be low.
Canals	Flood risk of the Basingstoke Canal can occur through failure of its embankments. Due to the low probability of this occurring, flood risk from the Basingstoke Canal is considered to be low.
Climate change	Climate change is expected to impact on all sources of flooding due to an increase in rainfall intensity. This may require new infrastructure with greater capacity and upgrading of existing infrastructure to maintain the same level of service. Section 6.3 sets out the allowances used in this assessment to assess the impact of climate change on flood risk and approach that site-specific flood risk assessments should follow.

15.2 Policy Recommendations

15.2.1 Planning

This SFRA has collated data on potential sources of flood risk, provided as a series of maps in the appendices to this report.

- This mapping, and other information presented in this report, should be used as the basis for the application of the sequential approach to flood risk, including the Sequential Test, where required.

  By using the flood risk information in this SFRA and applying the sequential approach, the Council should aim to steer development away from areas of flood risk, in accordance with the policy and guidance set out in NPPF and the PPG.

  Consideration should be given both to areas indicated as at potential risk of flooding, and to the rural upper catchments, as large amounts of development in these areas could increase runoff entering the river network and therefore increase fluvial flood risk in Surrey Heath and beyond.

- If, after applying the Sequential Test, it is deemed not possible to place development away from areas of flood risk, it is recommended a Level 2 SFRA be prepared to provide information for the application of the Exception Test.

15.2.2 Flood Risk Information

- It is recommended that information on all sources of flooding continue to be collected.
- It is recommended that Surrey Heath Borough Council liaise with Surrey County Council to identify critical drainage areas and policies for development in those areas.
- Where watercourses have not been included in the national Flood Zone mapping (catchments less than 3km^2), it should be acknowledged that these watercourses may still pose a flood risk problem. Assessment of the flood risk from these watercourses should be assessed as part of site-specific FRAs.
- The SFRA is a living document and should be updated as necessary to reference the latest available flood risk information.

15.2.3 Development Control and Developers

Site Specific FRAs

As set out in the PPG, development applications should consider the requirements for a site-specific FRA. The mapping and information provided in this SFRA should be used to help inform where a more detailed assessment may be required. Where an FRA is required as part of a planning application, it is necessary for developers to prepare a document to the satisfaction of Surrey Heath Borough Council who will seek the advice of the Environment Agency and the LLFA, when required.

Site-specific FRAs should include an assessment of whether the site falls within Flood Zone 3a or Flood Zone 3b.

Drainage

Surrey County Council have prepared the guidance documents to support the development of drainage strategies for development. Drainage strategies must be prepared to accompany all major development using the guidance set out in the NPPF, PPG, Surrey County Council's guidance and this document. The responsibility for ongoing maintenance of the proposed SuDS should be set out clearly.

Residual Risk

Where new developments are built in areas benefitting from existing flood defences there remains a residual risk in the event of overtopping or failure. Additionally, the defence may provide protection against one watercourse, but there may be other watercourses within the locality that pose a risk from which the

development is not protected. The impact of overtopping or failure should be considered as part of a site specific FRA.

Emergency Planning

Flood risk information in this SFRA, as well as local knowledge and mobility of occupants, should be considered when preparing evacuation plans and advice should be sought from emergency planning officers to plan safe access and egress routes.

Surrey Heath Borough Council, the Local Resilience Forum and emergency responders should use the findings of this SFRA to refine and inform emergency plans developed for the area.

15.2.4 Flood Risk Management

Managing Fluvial Flooding

- Polices should be developed, with agreement from the Environment Agency, to seek to reduce fluvial flood risk through development as well as ensuring development does not increase flood risk elsewhere.
- Results of updated hydraulic modelling and hydrological studies should be incorporated into future updates of the SFRA.
- Where limitations in data or the scale of assessment have been identified, information should be improved through more detailed study. Where modelling is carried out as part of an FRA, results should be captured by Surrey Heath Borough Council to inform the SFRA.
- Residents of existing properties should be encouraged to sign up to the Environment Agency's flood warning service, where available.

Managing Surface Water Flooding

- Policies should be developed to make certain that appropriate surface water management and mitigation is provided for developments to ensure that there is no increase in flooding as a result of development. Post-development surface water runoff rates for greenfield sites must be limited to greenfield run off rates. Brownfield sites should be limited as close to greenfield run off rates as is reasonably practicable. If greenfield run off rates cannot be achieved, clear written evidence must be submitted as to why a lower rate cannot be achieved.
- Surrey Heath Borough Council should engage in its responsibility to promote and deliver the use of SuDS within new and re-developments.
- Surrey Heath Borough Council should use Appendix E in the development of surface water management policies, to reduce surface water runoff from developments in the upstream generating catchments and manage flooding in the downstream receiving catchments.
- Surrey Heath Borough Council should use the information in Appendix E as a starting point for the production of SWMPs across Surrey Heath. The purpose of a SWMP is to improve understanding of local flood risk, develop flood mitigation solutions and justify their construction via a variety of funding sources. SWMPs should be prioritised in areas with known local flood risk issues and / or areas where significant future development is proposed.

Managing Groundwater Flooding

- Given the uncertainty regarding groundwater flooding, and the localised nature of this source of flooding, it is recommended that site-specific FRAs complete a more detailed assessment of groundwater flood risk.

Managing Flooding from Canals and Reservoirs

- Developments that may be at risk in the event of a breach from the Basingstoke Canal should consider this in the site-specific FRA.

- Policies should be developed, with agreement from the Environment Agency and the Basingstoke Canal Authority, for development at risk from a canal breach. For example, raised flood levels, or developing evacuation plans.
- Policies should be developed, with agreement from the Environment Agency, for development at risk from reservoir inundation.

15.3 SFRA Maintenance

- It is recommended the SFRA Management and Maintenance Strategy set out in Section 14 is adopted to ensure the SFRA is kept up to date.
- Information from site level FRAs will be submitted to the council, and the Environment Agency shall be consulted as per the statutory requirement, as part of the development control process and this information should be used to inform the SFRA in the future.
- it is therefore recommended that the SFRA is made available for viewing and download through the council webpage.
- It is important the liaison is maintained between the LPA, LLFA, Thames Water, the Environment Agency, Highways Agency, and other stakeholders to work towards sustainable management of flood risk now and in the future.

Appendix A Study area overview map

Appendix B Development locations

Appendix C Fluvial flood risk maps

Appendix D Climate change maps

Appendix E Surface water flood risk map

Appendix F Groundwater flood risk map

Appendix G Historic flooding map

Appendix H Flood warning service map

Appendix I Water quality map

Appendix J Combined Flood Risk

CAPITA

Capita Property and Infrastructure Ltd

3rd Floor
3 Brindleyplace
Birmingham B1 2JB