Level 1 Strategic Flood Risk Assessment

Elmbridge Borough Council

Report Version 2

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
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Table of Contents

Figures

Tables

Abbreviations

Acronym	Definition
AEP	Annual Exceedance Probability
AIMS	Asset Information Management System
AMP	Asset Management Plan
AOD	Above Ordnance Datum
BCR	Benefit-Cost-Ratio
BGS	British Geological Survey
CFMP	Thames Catchment Flood Management Plan
DCO	Development Consent Order
DTM	Digital Terrain Model
EBC	Elmbridge Borough Council
FAS	Flood Alleviation Scheme
FRA	Flood Risk Assessment
FRAP	Flood Risk Activity Permit
GI	Green Infrastructure
GIS	Geographical Information Systems
HRA	Hydrogeological Risk Assessment
IA	Initial Assessment
LiDAR	Light Detection and Ranging
LPA	Local Planning Authority
LRF	Local Resilience Form
MAFP	Multi-Agency Flood Plan
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
NSIP	Nationally Significant Infrastructure Project
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
PV	Present Value
RBMP	River Basin Management Plan
RMA	Risk Management Authority
RoFSW	Risk of Flooding from Surface Water
RTD	River Terrace Deposits
SA	Sustainability Appraisal
SCC	Surrey County Council
SFRA	Strategic Flood Risk Assessment
SPA	Special Protection Area
SPZ	Source Protection Zones
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
TWUL	Thames Water Utilities Limited
UK	United Kingdom
WWNP	Working with Natural Processes

1. Introduction and User Guide

1.1 Introduction

1.1.1 In its role as the Local Planning Authority (LPA), Elmbridge Borough Council (EBC) is currently preparing documents that will form part of the new Local Plan for Elmbridge and develop the vision for future development across the Borough.

1.1.2 EBC faces the challenge of meeting the need for new development within a constrained land supply inclusive of areas already identified to be at risk of river (fluvial) flooding associated with a number of different watercourses including the Rivers Thames, Mole, Ember, Rythe and Wey. Furthermore, there is the potential risk arising from more localised flooding from surface water generated by heavy rainfall, elevated groundwater, existing drainage systems as well as artificial sources, including several reservoirs.

1.2 Approach to Flood Risk Management

1.2.1 The National Planning Policy Framework[1] (NPPF) and associated Planning Practice Guidance[2] (PPG) for Flood Risk and Coastal Change emphasise the active role LPAs such as EBC should take to ensure that flood risk is assessed, avoided, and managed effectively and sustainably throughout all stages of the planning process. The overall approach for the consideration of flood risk set out in Section 1 of the PPG[2] can be summarised as follows:

1.2.2 This has implications for LPAs and developers as described below.

Assess Flood Risk

1.2.3 The NPPF[1] outlines that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and LPAs should use the findings to inform strategic land use planning. Figure 1-1 overleaf, reproduced from the PPG[2], illustrates how flood risk should be considered in the preparation of the Local Plan by EBC.

1.2.4 For sites in areas at risk of flooding, or with an area of 1 hectare or greater, developers must undertake a site-specific Flood Risk Assessment (FRA) to accompany planning applications (or prior approval for certain types of permitted development).

Avoid Flood Risk

1.2.5 EBC should apply the sequential approach to site selection so that development is, as far as reasonably possible, located where the risk of flooding from all sources is lowest, taking account of climate change and the vulnerability of future users to flood risk.

1.2.6 In plan-making this involves applying the Sequential Test, and where necessary the Exception Test to Local Plans, as described in Figure 1-1.

1.2.7 In decision-taking this involves applying the Sequential Test and if necessary, the Exception Test for specific development proposals.

[1] National Planning Policy Framework (2023) https://www.gov.uk/guidance/national-planning-policy-framework
[2] Planning Practice Guidance (2022) https://www.gov.uk/government/collections/planning-practice-guidance

Control Flood Risk

1.2.8 EBC and developers can investigate measures to control the risk of flooding affecting the site. Early discussions with relevant flood risk management authorities, and reference to programmes of flood and coastal erosion risk management schemes will help to identify such opportunities.

1.2.9 EBC and developers should seek flood risk management opportunities (e.g. safeguarding land), and to reduce the causes and impacts of flooding (e.g. through the use of sustainable drainage systems).

Mitigate Flood Risk

1.2.10 After applying measures to avoid and control the risk of flooding, the next step is to mitigate flooding. In accordance with paragraph 173(b) of the NPPF, development should only be allowed in areas at risk of flooding where it can be demonstrated that development is appropriately flood resistant and resilient, such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment. Passive flood resilience and resistance measures should be prioritised over active measures as they are likely to be more effective and more reliable.

Manage Residual Risk

1.2.11 EBC and developers should consider further management measures to deal with any residual risk remaining after avoidance, control and mitigation have been utilised. Residual risks will need to be safely managed to ensure people are not exposed to hazardous flooding. LPAs and developers should provide safe access routes and consider whether adequate flood warning would be available to people using the development.

1.2.12 In accordance with the PPG, measures to manage residual risk need to be considered early in the design process to ensure that they can be complimentary to other design requirements such as catering for the needs of the elderly or those with lesser mobility.

1.3 Purpose of the SFRA

1.3.1 The purpose of this SFRA is to collate and present the most up to date flood risk information for use by EBC to inform the preparation of the Elmbridge Local Plan and prudent decision-making by Development Management officers on a day-to-day basis.

1.3.2 In order to achieve this, the SFRA will:

- Refine information on the areas that may flood taking into account all sources of flooding and the impacts of climate change.
- Inform the Sustainability Appraisal process, so that flood risk is fully taken into account at the plan making stage.
- Inform the application of the Sequential and, if necessary, Exception Tests in the allocation of future development sites, as required by the NPPF[1], and planning application process.
- Identify the requirements for site-specific FRAs.
- Inform the preparation of flood risk policy and guidance.
- Determine the acceptability of flood risk in relation to emergency planning capability; and,
- Consider opportunities to reduce flood risk to existing communities and developments through better management of surface water, provision for conveyance and storage for flood water.

1.3.3 This document forms a Level 1 SFRA which has been carried out to support the completion of the Sequential Test by EBC and inform the allocation of sites within the Local Plan. Documents recording the application of the Sequential Test will be published as a separate document on the Council's website. Should the Sequential Test indicate that land outside flood risk areas cannot appropriately accommodate all necessary development; a further Level 2 SFRA will be undertaken to consider the detailed nature of flood risk within each Flood Zone and support the application of the Exception Test.

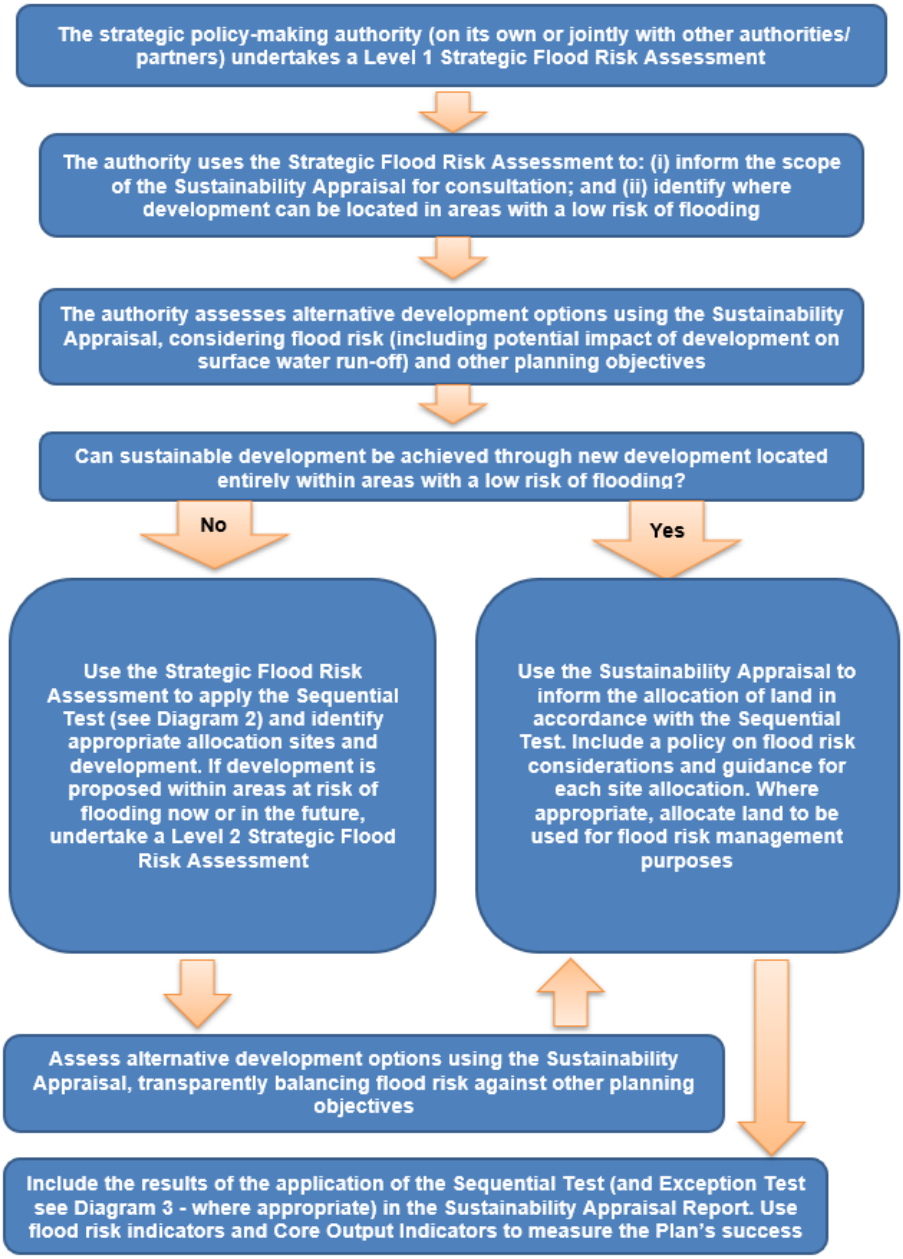


Figure 1-1 Taking flood risk into account in the preparation of a Local Plan (PPG[2] for Flood Risk and Coastal Change, Diagram 1)

1.4 Flood Risk Policy and Guidance

1.4.1 There is an established body of policy and guidance documents which are of particular importance when considering development and flood risk. These are identified in Table 1-1.

Table 1-1 Flood Risk Policy and Guidance Documents

Policy Documents	Location
National Planning Policy Framework	https://www.gov.uk/guidance/national-planning-policy-framework
Elmbridge Core Strategy Policy CS26: Flooding	https://www.elmbridge.gov.uk/planning/planning-permission-and-applications/planning-policy-and-guidance/core-strategy
Elmbridge Development Management Plan – DM6: Landscape and Trees; DM13: Riverside development and uses	https://www.elmbridge.gov.uk/planning/planning-permission-and-applications/planning-policy-and-guidance/development-management
Guidance Documents	
Planning Policy Guidance – Flood Risk and Coastal Change	https://www.gov.uk/guidance/flood-risk-and-coastal-change
Environment Agency Standing Advice	https://www.gov.uk/guidance/flood-risk-assessment-standing-advice
Flood risk assessments: climate change allowances	https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances
How to prepare a strategic flood risk assessment	https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment
Local Documents and Strategies	
Flood Risk Supplementary Planning Document and supporting documents	https://www.elmbridge.gov.uk/planning/planning-permission-and-applications/planning-policy-and-guidance/flood-risk
Thames Catchment Flood Management Plan	https://www.gov.uk/government/publications/thames-catchment-flood-management-plan
Surrey County Council (SCC) Local Flood Risk Management Strategy	https://www.surreycc.gov.uk/community/emergency-planning-and-community-safety/flooding/more-about-flooding/surrey-local-flood-risk-management-strategy
EBC Multi-Agency Flood Plan	EBC internal document.
SCC Preliminary Flood Risk Assessment (PFRA) and PFRA Addendum	https://www.surreycc.gov.uk/community/emergency-planning-and-community-safety/flooding/more-about-flooding/the-preliminary-flood-risk-assessment
Surrey County Council Sustainable Drainage Systems (SuDS) planning advice	https://www.surreycc.gov.uk/community/emergency-planning-and-community-safety/flooding/more-about-flooding/suds-drainage

1.5 User Guide

1.5.1 It is anticipated that the SFRA will have a number of end users, with slightly different requirements. For example, strategic planners who may be developing policies, undertaking the Sequential Test and allocating sites; development management officers, emergency planners, and those preparing site specific FRAs. Table 1-2 provides a user guide to summarise the content of the SFRA.

Table 1-2 SFRA Structure

SFRA Section	
Section 2: Methodology	Identifies the datasets and methodologies applied within the SFRA for assessing flood risk.
Section 3: Assessing flood risk in Elmbridge BC	Provides an overview of the different sources of flooding, cumulative impacts of development on flood risk and cross boundary considerations.
Section 4: Avoiding flood risk – Applying the Sequential Test	Provides details of how the Sequential Test should be applied at the Local Plan stage, and for individual planning applications, as well as information on the Exception Test.
Section 5: Measures to control and mitigate flood risk	Identifies existing measures in place to control flooding such as existing flood risk management infrastructure, flood storage areas, and flood alleviation schemes. Identifies opportunities that should be considered when developing strategic plans, and as part of site specific FRAs for future development, to control and mitigate the risk of flooding, such as safeguarding of land for future flood risk management, surface water management measures, property resilience measures.
Section 6: Measures to manage residual risk	Provides an assessment of the risk of tidal flooding from overtopping or breach in the defences, as well as measures to manage residual risks such as flood warning, emergency planning, provision of safe access/escape and places of safety.
Section 7: Preparing a site-specific FRA	Provides details on when FRAs are required, what they should address and where to go for pre application advice.
Section 8: Next steps	Summary of next steps for Elmbridge BC.
Appendix A Mapping	Elmbridge BC wide mapping of datasets identified in Section 2.
Appendix B Settlement Area Schedules	A strategic assessment of the flood risk from all sources has been undertaken for each of the eight Settlement Areas in the Borough.
Appendix C Summary of the SFRA recommendations	Recommendations for Elmbridge BC to take forward in their Local Plan preparation are provided throughout the SFRA. This Appendix provides a list of all the recommendations in one location.

Strategic Planning and Policy

1.5.2 The chief purpose of the SFRA for EBC, in accordance with the NPPF[1], is to provide a strategic overview of flood risk within the Borough to enable effective risk-based strategic planning for the future through the preparation of the Local Plan.

1.5.3 As part of the SFRA, a number of policy recommendations and development management measures have been made throughout Sections 4, 5, 6 and 7 for consideration by Elmbridge BC as they develop their Local Plan.

Applying the Sequential Test

1.5.4 The NPPF[1] sets strict tests to protect people and property from flooding which all LPAs are expected to follow. The aim of the Sequential Test under the NPPF[1] is to steer new development to areas with the lowest probability of flooding. Section 3 provides the data required to undertake the Sequential

Test and Section 4 provides specific guidance on applying both the Sequential and, where appropriate, Exception Tests.

Emergency Planning

1.5.5 EBC is a Category 1 Responder under the Civil Contingencies Act 2004[3] and therefore has a responsibility, along with other organisations, for developing emergency plans, contingency plans and business continuity plans to help reduce, control or ease the effects of an emergency.

1.5.6 The complex nature of flooding and the consequences that arise require a comprehensive and often sustained response from a wide range of organisations, and as such EBC has prepared a Multi-Agency Flood Plan[4] (MAFP) to allow all responding parties to work together on an agreed coordinated response to severe flooding.

1.5.7 The SFRA deliverables can be used by the EBC Emergency Planning team as a useful resource providing up to date information about flood risk. The SFRA should be reviewed by the team to ensure that the findings are incorporated into their understanding of flood risk and future revisions of the MAFP.

Preparing Site-specific Flood Risk Assessments

1.5.8 The SFRA can provide a useful starting point to the preparation of site-specific FRAs for individual development sites as follows:

- Section 3 provides an overview of the key issues within the Borough in relation to flood risk.
- Section 4 provides guidance on the application of the Sequential Test for sites that have not yet been tested by the LPA, as well as details on when the Exception Test is required, and how to apply it.
- Sections 5 and 6 provide details of measures that may need to be implemented to control, manage and mitigate flood risk, and,
- Section 7 provides specific guidance for preparing site specific FRAs in accordance with the checklist presented in the PPG Flood Risk and Coastal Change.

1.5.9 The Settlement Area schedules in Appendix B provide an overview of the key issues within each Settlement Area and set the tone for the approach to flood risk management required by EBC.

Assessing Planning Applications

1.5.10 Planning and development officers who are reviewing FRAs as part of the planning application process should consult Section 3 of the SFRA to provide the background for flood risk in the area relating to the planning application and Appendix B for a particular Settlement Area. Section 7 builds on the guidance presented in the PPG[2] and Environment Agency Standing Advice and can be used by those assessing applications as a checklist for issues that need to be addressed as part of site-specific FRAs.

1.6 Monitoring and Update

1.6.1 This SFRA has been developed building heavily upon existing knowledge with respect to flood risk within the Borough. The Environment Agency review and update the Flood Map for Planning (Rivers and Sea)[5] on a quarterly basis and a rolling programme of detailed flood risk mapping is underway.

1.6.2 New information may influence future development management decisions within these areas. Therefore, it is important that the SFRA is adopted as a ‘living’ document and is reviewed regularly in light of emerging policy directives, flood risk datasets and an improving understanding of flood risk within the Borough.

[3] His Majesty's Stationery Office (HMSO), 2004, *Civil Contingencies Act 2004*.
[4] EBC, 2014, *Multi-Agency Flood Plan, Internal Document, Living Draft*.
[5] Refer to Section 3.2 for further detail.

2. Methodology

2.1 Overview

2.1.1 Under Section 14 of the NPPF[1], the risk of flooding from all sources must be considered as part of an SFRA, including flooding from rivers (fluvial), the sea, land (overland flow and surface water), groundwater, sewers and artificial sources.

2.1.2 The methodology for the appraisal of flood risk from these sources is outlined below. Section 2.2 describes the approach to consultation and identifies the stakeholder organisations that have been involved. Section 2.3 provides a description of the datasets used to assess the risk of flooding from each source.

2.2 Consultation

Duty to Cooperate

2.2.1 Under the Localism Act 2011[6], there is now a legal duty on LPAs to co-operate with one another, County Councils and other Prescribed Bodies to maximise the effectiveness within which certain activities are undertaken as far as they relate to a 'strategic matter'.

2.2.2 In complying with the duty to cooperate, Government Guidance recommends that LPAs 'scope' the strategic matters of Local Plan documents at the beginning of the preparation process taking account of each matters 'functional geography' and identify those LPAs and Prescribed Bodies that need to be constructively and actively engaged.

2.2.3 The Council prepared a Strategic Environmental Assessment and Sustainability Appraisal Scoping Report (2020)[7] as part of the background work required in preparing the Local Plan which updates the Scoping Report from 2016[8]. Flood risk is identified as a strategic matter and specific engagement activities are proposed with a number of adjoining LPAs and Prescribed Bodies both in relation to the preparation of the SFRA and the Local Plan. Before commencing work on the SFRA, EBC also explored the potential for undertaking the work jointly with adjoining Boroughs.

2.3 Data Collection

2.3.1 The following information and datasets have been made available by the stakeholder organisations and used to inform the assessment of flood risk from each of the sources.

[6] HMSO, 2011, *Localism Act 2011.* http://www.legislation.gov.uk/ukpga/2011/20/contents/enacted
[7] EBC, 2020, *Strategic Environmental Assessment and Sustainability Appraisal 2020 Scoping Report* https://www.elmbridge.gov.uk/sites/default/files/2023-05/Strategic%20Environmental%20Assessment%20and%20Sustainability%20Appraisal%20-%20Scoping%20Report%202020.pdf
[8] EBC, 2016, *Elmbridge Local Plan: Duty to Cooperate Scoping Statement* https://www.elmbridge.gov.uk/sites/default/files/2023-05/Duty%20to%20Cooperate%20Scoping%20Statement.pdf

Table 2-1 Datasets obtained to inform the SFRA

Name	Description	Type	Source	SFRA Map
LiDAR Topographic DTM	Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground. The Digital Terrain Model (DTM) is produced from the last return LiDAR signal and surface objects are removed (such as buildings, vegetation) to provide a ground surface model. The data covering Elmbridge has a spatial resolution of 1m.	ASCII	Defra Data Services Platform	Appendix A Figure 1
Detailed River Network	Spatial dataset showing Main Rivers and smaller watercourses.	GIS Shapefile	Environment Agency	Appendix A Figure 1,5
Flood Map for Planning (Rivers and Sea) Flood Zone 2	The Environment Agency's best estimate of the areas of land at risk of flooding, from rivers or the sea with a 1 in 1000 (0.1%) chance of flooding each year, when the presence of flood defences is ignored.	GIS Shapefile	Defra Data Services Platform	Appendix A Figure 5
Flood Map for Planning (Rivers and Sea) Flood Zone 3	The Environment Agency's best estimate of the areas of land at risk of flooding, when the presence of flood defences is ignored, and covers land with a 1 in 100 (1%) or greater chance of flooding each year from Rivers; or with a 1 in 200 (0.5%) or greater chance of flooding each year from the Sea.	GIS Shapefile	Defra Data Services Platform	Appendix A Figure 5
Risk of Flooding from Surface Water flood extents (3.3% AEP, 1% AEP, 0.1% AEP)	GIS layers showing the extent of flooding from surface water that could result from a flood with a 3.3% (1 in 30 year), 1% (1 in 100 year) and 0.1% (1 in 1000 year) chance of happening in any given year. This is not suitable for identifying whether an individual property will flood but is useful to identify areas susceptible to surface water flooding and key flow paths.	GIS Shapefile	Defra Data Services Platform	Appendix A Figure 10
Bedrock and superficial geology	Generalised digital geological map data based on British Geological Survey's (BGS) published poster maps of the UK.	GIS Shapefile	British Geological Society	Appendix A Figures 2 and 3
Susceptibility to Groundwater Flooding	GIS layer identifying where there is potential for groundwater flooding to occur based on geological and hydrogeological information. The map shows the following information: limited potential for groundwater flooding to occur, potential for groundwater flooding of property situated below ground level, potential for groundwater flooding to occur at surface.	GIS Shapefile	British Geological Society	Appendix A Figure 11
Infiltration SuDS Suitability dataset	Dataset which gives a preliminary indication of the suitability of the ground for infiltration SuDS. These are drainage systems that allow surface water to infiltrate to the ground, such as soakaways, infiltration basins, infiltration trenches and permeable pavements. The mapping allows consideration of subsurface permeability, depth to groundwater, presence of geological floodplain deposits, presence of artificial ground, ground stability, potential for pollutant attenuation, and the Environment Agency's source protection zones.	GIS Shapefile	British Geological Society	Appendix A Figure 15
Historic Flood Map / Recorded Flood Outlines	GIS layer showing areas of land that have previously been subject to flooding from sea, river or groundwater in line with criteria set by the Environment Agency. This excludes flooding from surface water, except in areas where it is impossible to determine whether the source is fluvial or surface water, but the dominant source is fluvial.	GIS Shapefile	Defra Data Services Platform	Appendix A Figure 9
Surrey County Council 'Wetspots' Dataset	GIS layer showing the location of a reported, recurring flood incident which is unlikely to be solved through SCC'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.	GIS Shapefile	Surrey County Council	Appendix A Figure 10
Lead Local Flood Authority Records	SCC has provided a 'Property Flood Roads' dataset indicating road locations along which internal, external or unknown property flooding has been reported to SCC. An Indicative Historic Flooding Incidents dataset has also been provided showing indicative flood locations by road.	GIS Shapefile	Surrey County Council	Appendix A Figure 9

Name	Description	Type	Source	SFRA Map
Catchment Action Plans	SCC has provided a 'Catchment Action Plan' dataset indicating locations and assets in the study area and planned actions to reduce flood risk. These locations are discussed in the relevant sections of this report. Refer to Section 3.1.	GIS Shapefile	Surrey County Council	N/A
Priority Flood Areas	SCC has provided a 'Priority Flood Area' dataset indicating locations at risk of flooding in the study area, prioritised as medium or high status. This dataset has been provided for information and has been assessed in the Level 2 Site Assessment Database. In line with the license, this dataset has not been mapped in the Level 1 or Level 2 SFRA.	GIS Shapefile	Surrey County Council	N/A
Highways Drainage Ditches	Spatial dataset detailing highways drainage ditches in the study area that are maintained by SCC in their role as Highways Authority.	GIS Shapefile	Surrey County Council	Appendix A Figure 5, 9
Sewer Flooding Records	Records of internal and external sewer flooding incidents within the last 5 years reported by Thames Water within 4-digit postcode areas. It should be noted that records only appear on the register where they have been reported to Thames Water Utilities Limited (TWUL), and as such they may not include all instances of sewer flooding.	Excel Spreadsheet	Thames Water	Appendix A Figure 12
Postcode Boundary	GIS layer of post code areas. Used to map the Thames Water sewer flooding records which are reported by 4-digit post code area.	GIS Shapefile	EBC	Appendix A Figure 12
Reduction in Risk of Flooding from Rivers and Sea due to Defences	A spatial dataset that indicates where areas have reduced flood risk from rivers and sea due to the presence of flood defences. The dataset has been created to help initiate conversations about the impact flood defences have on the risk of flooding from the rivers and sea, and as a prompt to find out more about the flood defences in a particular area of interest. It does not replace any local, more detailed information.	GIS Shapefile	Defra Data Services Platform	Appendix A Figure 5
Flood Map for Planning (rivers and sea) Flood Storage Areas	Areas that act as a balancing reservoir, storage basin or balancing pond. There are no Flood Storage Areas located within the Elmbridge Borough boundary.	GIS Shapefile	Defra Data Services Platform	Appendix A Figure 5
Risk of Flooding from Reservoirs[9]	Flood extents for all large[10] raised reservoirs in the event that they were to fail and release the water held on a "dry day" when local rivers are at normal levels, and on a "wet day" when local rivers had already overflowed their banks.	GIS Shapefile	Defra Data Services Platform	Appendix A Figure 13
Flood Warning Areas[11]	Geographical areas where flooding is expected to occur and where the Environment Agency provide a Flood Warning Service. They generally contain properties that are expected to flood from rivers or the sea and, in some areas, from groundwater.	GIS Shapefile	Defra Data Services Platform	Appendix A Figure 16
Working with natural processes datasets	A series of spatial datasets identifying best estimate of locations in the country where natural flood management methods can be applied, such as: floodplain woodland planting potential, riparian woodland planting potential, wider catchment woodland, floodplain reconnection potential, runoff attenuation features. Refer to Section 5.3.	GIS Shapefile	Defra Data Services Platform	Appendix A Figure 14
Spatial Flood Defence Layer	Shows flood defences currently owned, managed, or inspected by the Environment Agency. Typically, these are earth banks, stone and concrete walls, or sheet-piling that is used to prevent or control the extent of flooding.	GIS Shapefile	Defra Data Services Platform	Appendix A Figure 4
Emergency Rest Centres	The rest centres with the Borough which are designated in the Multi-Agency Flood Plan.	GIS Shapefile	EBC	Appendix A Figure 16

[9] Environment Agency, Long term flood risk map for England https://flood-warning-information.service.gov.uk/long-term-flood-risk/
[10] A large reservoir is one that holds over 25,000 cubic metres of water, equivalent to approximately 10 Olympic sized swimming pools.
[11] Environment Agency, Flood Warning Service https://www.gov.uk/sign-up-for-flood-warnings

Hydraulic Modelling Studies

2.3.2 Table 2-2 provides a summary of the hydraulic modelling studies that have been undertaken on behalf of the Environment Agency for the Main Rivers in Elmbridge and used to inform the Flood Map for Planning[12] (Rivers and Sea). The type of model (1D or 2D) is also specified, along with the corresponding available outputs for each model.

Table 2-2 Hydraulic Models received and used to inform the SFRA.

Model	Details	SFRA Figure
River Thames	The Environment Agency's latest model of the Lower Thames was primarily developed by JBA Consulting between 2013 and 2020. The model development is recorded in the *Lower Thames, Jubilee River and River Ash Modelling Study (2020)*[13], referred to as the Thames: Hurley to Teddington model. WSP Binnies have been undertaking flood modelling of the Lower Thames since 2014 as part of their involvement in the River Thames Scheme (RTS). As part of this work, modifications and improvements have been made to the Lower Thames model. This includes the latest set of Lower Thames model runs in 2021-2022. The study area for this set of results is the River Thames and its floodplain from Datchet to Teddington. These model outputs are based on the river as it is now, without the RTS included. The modelling undertaken is documented in the Lower Thames Flood Modelling Report[14]. Referred to as the **Thames: Datchet to Teddington 2023** (Modelling of the RTS design development is reported separately). It is noted that the intention is that the WSP Binnies report supplements the JBA Modelling Report, rather than repeating the content contained within it and therefore both are referenced in this SFRA Report. The two modelling reports (by JBA Consulting and WSP Binnies) should be read in conjunction to gain a full understanding of the latest Lower Thames flood model. Modelling has been undertaken for events where the River Thames represents the main source of flooding (Thames dominated) and, conversely, when the tributaries are the key source of flooding (Tributary dominated). The following scenarios were undertaken for both the Thames dominated and Tributary dominated models: • **Defended scenarios** for the following Annual Exceedance Probability (AEP) events: 50%,20%, 10%, 5%, 3.33%, 2%, 1.33%, 1%, 0.5% and 0.1%. The 3.3% AEP flood extents have been used as the starting point from which to delineate Flood Zone 3b Functional Floodplain for Elmbridge BC, as mapped in Appendix A Figure 1 and the site assessments in Appendix B. • **Climate change scenarios**: Increases in peak flows of 10%, 20%, 25%, 35% and 81% have been applied to the defended 1% AEP modelled event. **Table 3-4 identifies that the peak river flow climate change allowances for the Maidenhead and Sunbury management catchment for 2080s, are 35% (central), 47% (higher central) and 81% (upper end). The available 1% AEP plus 35% allowance flood extent has been used for the central allowance. There is no appropriate dataset available for the higher central allowance (47%) therefore the upper end has been used as a conservative approach (81%).** • **Undefended scenarios** for the 1% and 0.1% AEP events (to inform the development of Flood Zones 3 and 2 respectively on the Flood Map for Planning (Rivers and Sea)).	Appendix A Figure 7 and Figure 8
Lower Wey	Capita AECOM, River Wey Flood Alleviation Schemes Lower Wey (Byfleet/Weybridge) Baseline Modelling Report[15] (2019). The Lower Wey model extends from Guildford to the confluence with the Thames at Weybridge. The model is a 1D-2D linked model. The following scenarios were undertaken: • **Defended scenarios** for the following AEP events: 20%, 5%. 3.33%, 2%, 1.33%, 1%, 0.5% and 0.1%. • **Climate change scenarios**: 10%, 15%, 25%, 35% and 70% increases in peak flows applied to the defended 1% AEP modelled event. **These correlate well with the 2080s peak river flow climate change allowances in the guidance (Table 3-4) for the 2080s, which are 24% (central), 36% (higher central) and 71% (upper end) for the Wey management catchment.** • **Undefended scenarios** for the 1% and 0.1% AEP events (to inform the development of Flood Zones 3 and 2 respectively on the Flood Map for Planning (Rivers and Sea).	Appendix A Figure 6

[12] Flood Map for Planning https://flood-map-for-planning.service.gov.uk/
[13] JBA Consulting, July 2020, Lower Thames, Jubilee River and River Ash Modelling Study. *(Referred to as the Thames: Hurley to Teddington model).*
[14] WSP Binnies, November 2023, Lower Thames Flood Modelling Report. *("Thames: Datchet to Teddington" model).*
[15] Capita AECOM, September 2019, River Wey Flood Alleviation Schemes: Lower Wey (Byfleet/Weybridge) Baseline Modelling Report

Model	Details	SFRA Figure
Lower Mole (Esher railway bridge to confluence with Thames at Molesey)	Halcrow Group Ltd, Environment Agency Thames Region, (March 2009) Lower Mole Flood Risk Study Final Study Report[16]. The catchment area covers four main rivers: the Lower Mole, Ember, Dead River and the Leathe. The model is a 1D-2D linked model. The following scenarios were undertaken: • **Defended scenarios** for the following AEP events: 20%, 5%, 1.33%, 1%, 0.5% and 0.1% • **Climate change scenarios**: a 20% increase in peak flows applied to the defended 1% AEP modelled event. **Table 3-4 identifies that the peak river flow climate change allowances for the Mole management catchment for 2080s, are 12% (central), 20% (higher central) and 40% (upper end). The available 1% AEP plus 20% allowance flood extent has been used as a conservative outline for the central allowance (12%) within this SFRA.** • **Undefended scenarios** for the 1%, 0.5% and 0.1% AEP events. The 1% and 0.1% AEP events have been used to inform the development of Flood Zones 3 and 2 respectively on the Flood Map for Planning (Rivers and Sea).	Appendix A Figure 6
Middle Mole (From Sidlow in Reigate to Esher railway bridge)	CH2M, (April 2018) Leatherhead & Middle Mole Flood Alleviation Scheme[17]. The model covers the Middle Mole and twelve of its tributaries. The model is a 1D-2D linked model. The following scenarios were undertaken: • **Defended scenarios** for the following AEP events: 50%, 20%, 5%, 3.33%, 2%, 1.33%, 1% and 0.1%. • **Climate change scenarios**: 25%, 35% and 70% increases in peak flows applied to the defended 1% AEP modelled event. **Table 3-4 identifies that the peak river flow climate change allowances for the Mole management catchment for 2080s, are 12% (central), 20% (higher central) and 40% (upper end). The available 25% scenario from this modelling study has been used as a conservative outline for both the central allowance (12%) and higher central allowance (20%).** • **Undefended scenarios** for the 5%, 1%, 1%+25% climate change, 1%+35% climate change, 1%+70% climate change and 0.1% AEP events. The 1% and 0.1% AEP events have been used to inform the development of Flood Zones 3 and 2 respectively on the Flood Map for Planning (Rivers and Sea).	Appendix A Figure 6
Dead River	JBA Consulting, Environment Agency Thames Region (April 2013) Dead River and Surbiton Stream Flood Risk Mapping Study[18]. Additional climate change scenario runs were performed in 2017[19]. The model is a 1D-2D linked model. The following outputs are available: • **Defended scenarios** for the following AEP events: 20%, 5%, 2%, 1.33%, 1%, 0.5%, 0.4% and 0.1%. • **Climate change scenarios**: a 20% increase in peak flows applied to the defended 1% AEP modelled event as agreed with an Environment Agency Project Manager in 2013. The 25%, 35% and 70% increases in peak flows applied to the defended 1% AEP modelled event as agreed with the Environment Agency in 2017. **Table 3-4 identifies that the peak river flow climate change allowances for the Mole management catchment for 2080s, are 12% (central), 20% (higher central) and 40% (upper end). The 20% allowance has been used as a conservative outline for the central allowance (12%) within this SFRA.** • **Undefended scenarios** for the 5%, 1% and 0.1% AEP events (to inform the development of Flood Zones 3 and 2 respectively on the Flood Map for Planning (Rivers and Sea).	Appendix A Figure 6
River Rythe	Jackson Hyder, Environment Agency (April 2016) Environment Agency River Rythe Modelling Report[20]. The model is a 1D-2D linked model and includes the River Rythe and an unnamed tributary. No formal raised defences were identified within the study area and therefore all scenarios have been classed as undefended. The following outputs are available: • **Scenarios for the following AEP events**: 50%, 20%, 10%, 5%, 3.33%, 2%, 1.33%, 1%, and 0.1%. • **Climate change scenarios**: a 20% increase in peak flows applied to the 1% AEP modelled event. **Table 3-4 identifies that the peak river flow climate change allowances for the Mole management catchment for 2080s, are 12% (central), 20% (higher central) and 40% (upper end). The 1% AEP plus 20% allowance has been used as a conservative outline for the central allowance (12%) within this SFRA.**	Appendix A Figure 6

2.3.3 Section 11.8 of the WSP Binnies Lower Thames Modelling Report provides a discussion of the results from the Lower Thames modelling with regard to the risk of flooding on the Lower River Mole. The Lower Mole defences are thought to provide a high standard of protection, so the model results have

[16] Halcrow Group Limited, March 2009, Lower Mole Flood Risk Study
[17] CH2M, October 2018, Leatherhead and Middle Mole Flood Alleviation Scheme
[18] JBA, April 2013, Dead River and Surbiton Stream FRM Study.
[19] JBA, July 2017, Dead River Climate Change Modelling Technical Note.
[20] JacksonHyder, April 2016, River Rythe Modelling Report.

been questioned when flooding is shown. Improvements have been made to the model which partly addresses this, but some queries remain. Section 11.8 of the modelling report discusses this aspect further and concludes that, on detailed inspection of the model results and given the high confidence in the standard of protection afforded by the Lower Mole defences, the approach used to set the model inflows is leading to an overly conservative approach and an overestimation of flooding from the Mole.

2.3.4 As noted on page 88 of the Report, a meeting was held between technical experts from the Environment Agency, WSP Binnies and JBA. The following approach was agreed:

- For *River Thames dominated floods*, the predicted flood extents for the River Mole from the 2021 model will not be used **upstream of the A309 Hampton Court Way Road**. Results downstream of this road are primarily due to flooding from the River Thames, whereas upstream flooding is primarily from the River Mole (and River Ember). The approach used to set the model inflows is leading to an overly conservative approach and an overestimation of flooding from the Mole. (This approach is consistent with what was agreed for the JBA 2019 model[13]).
- For *River Thames tributary dominated floods*, the model predictions are reasonable and can be used unchanged. These represent the best estimate of flood risk on the Lower Mole **between Island Barn and Hampton Court Way**. The rest of the Lower Mole is best represented by the Lower Mole model.

2.3.5 As a result, both the Lower Thames (*Thames dominated*) and Lower Thames (*Tributary dominated*) results have been modelled within this SFRA.

- Lower Thames (*Thames Dominated*) – relevant for sites along the Thames frontage and on the River Mole downstream of the A309.
- Lower Thames (*Tributary Dominated*) – relevant for sites along the River Mole between Island Barn and Hampton Court Way.
- Lower Mole – for sites along the River Mole upstream of Island Barn.

2.3.6 The Environment Agency have provided a shapefile highlighting which model or models should be used in the Lower Mole/Thames area. This has been used within the Level 2 SFRA to confirm which model(s) have been used to assess each site.

3. Assessing Flood Risk

3.1 Overview

3.1.1 Using the datasets identified in Section 2, this Section provides a strategic assessment of flood risk across the Borough from each source. Schedules presenting this information specific to each of the 8 Settlement Areas in Elmbridge are included in Appendix B.

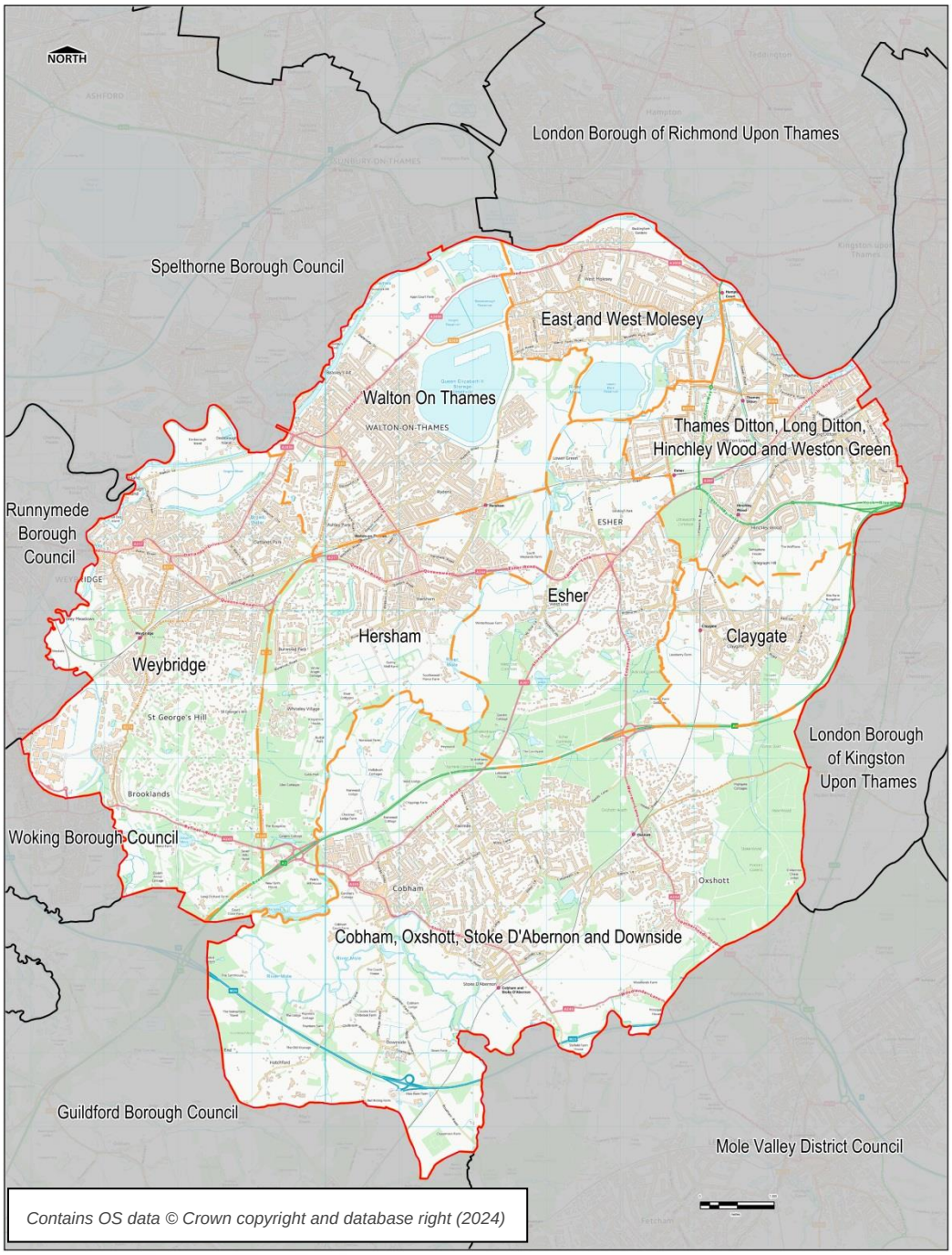


Figure 3-1 Elmbridge BC Settlement Areas

Local Area

3.1.2 Elmbridge covers an area of approximately 96km^2 and contains 8 Settlement Areas as identified in Figure 3-1 which are used for planning purposes. There are 2 Main Settlement Areas, Weybridge and

Walton-on-Thames, located in the west and north of the Borough respectively; 4 Suburban Settlement Areas of Esher; Hersham; Thames Ditton, Long Ditton, Hinchley Wood and Weston Green; and East and West Molesey; the Suburban Village of Claygate in the east of the Borough; and the Service Centre and Rural Fringe of Cobham, Oxshott, Stoke D'Abernon and Downside in the south.

Character

3.1.3 Elmbridge is a Surrey Borough located in the south east region, immediately to the south west of London. Much of the urban area in the north of the Borough is a continuation of the built-up area of suburban London linking through to more rural areas in the south. Elmbridge is bordered to the north by the River Thames and the administrative areas of the Spelthorne Borough and the Royal Borough of Richmond upon Thames; to the east by the London Borough of Kingston upon Thames; to the south by Mole Valley District and Guildford Borough; and to the west by Woking and Runnymede Boroughs.

3.1.4 Elmbridge has a unique position as a highly desirable area as a result of its location as a Surrey Borough in close proximity to London and its high-quality environment. As a result of good accessibility by rail and road to Central London, and within easy reach of Heathrow and Gatwick Airports, the M25 and the M3, land values are high and development pressure intense.

Topography

3.1.5 **Appendix A Figure 1** shows the topography of the Borough. The River Thames flows eastwards along the northern edge of the Borough where the land is low lying at levels of approximately 5-10m Above Ordnance Datum (AOD). The northern half of the Borough is largely low lying and flat and levels gradually rise to 20-30m AOD towards the settlements of Hersham, Esher and Claygate. As the name suggests, the area of St George's Hill in Weybridge is at a higher elevation, but the west of the Borough drops down again to the floodplain of the River Wey (10-20m AOD). Levels rise again in the south east of the Borough up to approximately 60-70m AOD towards the urban area of Oxshott and the surrounding rural land that drains into the River Rythe.

Appendix A Figure 1 – Topography

Geology

3.1.6 The geology of the Borough comprises a covering of superficial deposits over approximately 50% of the area. This is mainly in the northern parts of the Borough and a stretch running along the line of the River Ember and the River Mole to the south. There are also two small, isolated areas of superficial deposits around the Weybridge/Hersham and Cobham settlement areas.

3.1.7 The superficial deposits in the area include Quaternary age River Terrace Deposits, Alluvium and Head. The main gravels terraces are the Kempton Park Gravels Formation and Taplow Gravels Formation in the northern part of the Borough and Main River valleys. The two isolated areas of gravels are Lynch Hill Gravel Formation (in Weybridge/Hersham) and Boyn Hill Gravel Formation (in Cobham) where both active and restored gravel pits exist.

3.1.8 The bedrock geologies include Eocene age Bagshot Formation, Claygate Member (upper part of London Clay Formation) and the rest of London Clay Formation. These are the oldest rocks found in the Borough at outcrop. The youngest rocks are the small, isolated patches of Camberley Sand Formation and Windlesham Formation, found mainly in the Weybridge area around St George's Hill.

3.1.9 The London Clay comprises clayey silt beds grading to silty fine-grained sand, this is found beneath the superficial deposits in the northern part of the Borough and at the surface along the western and southern parts of the Borough. The upper sandier part of the London Clay Formation is known as the Claygate Member to distinguish its coarser-grained nature. This is present in the central part of the Borough and along the western side of the Borough. In the Weybridge, Hersham, Cobham and Esher settlement areas, the Claygate Member is overlain by Bagshot Formation. This formation is characterised by fine grained yellow orange, brown quartz sand with frequent clay laminations, some silt layers, and flint pebble beds in the upper horizons.

3.1.10 In general, most of bedrock within the Borough is flat lying and there are few faults identified at the surface.

Appendix A Figure 2 – Bedrock Geology
Appendix A Figure 3 – Superficial Geology

Hydrogeology

3.1.11 Aquifers are defined as layers of permeable rock or unconsolidated material (sand, gravel, silt etc.) capable of storing and transporting large quantities of water. The understanding of the behaviour and location of aquifers is important as they can provide an indication of the potential for groundwater flooding.

3.1.12 The bedrock underlying the western part of the Borough including Weybridge, Hersham and Cobham is designated a Secondary A aquifer. This is defined by the Environment Agency as a "*permeable layer capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers*". The remainder of the Borough to the east is designated unproductive strata which is defined as "*rock strata with low permeability that has negligible significance for water supply or river base flow*".

3.1.13 The superficial deposits present along the corridor of the River Wey, River Thames and River Mole are classified as Principal and Secondary A aquifer. According to Environment Agency definitions, a principal aquifer is defined as having "*intergranular permeability, which can provide a high level of water storage, and support water supply and/ or river base flow on a strategic scale*".

3.1.14 The Environment Agency defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. There is only one small area defined as a SPZ in the Borough which is Desborough Island adjacent to the River Thames to the north of Weybridge.

Main Rivers

3.1.15 The Environment Agency's 'Detailed River Network' dataset has been used to identify watercourses in the study area, along with their designation (i.e., Main River or Ordinary Watercourse).

Appendix A Figure 1 – Topography, Watercourses, Waterbodies

3.1.16 There are five Main Rivers present within the Borough.

- The **River Wey** flows north along the western edge of the Borough. The catchment of the Wey lies within Hampshire and Surrey and has a total area of approximately 904 km^2. It falls approximately 190m in level and is approximately 104 km in length from its source in Hampshire to the confluence with the River Thames near Weybridge urban centre. The Lower Wey is navigable from its confluence with the River Thames up to Godalming. The river includes a number of navigation channels separate from the Main River, with water levels regulated by structures such as locks and weirs. Through the urban area of Weybridge, the natural channels have been engineered and canalised to varying degrees[21].
- The **River Mole** and its tributaries have a catchment of approximately 487km^2.
    - The River Mole rises in the North Sussex Hills near Rusper and flows into the River Thames at Molesey, near Hampton Court.
    - The Middle Mole extends from where the Salford Stream tributary meets the River Mole, just upstream of Sidlow Bridge in the Reigate and Banstead District, to the Esher Railway Bridge. The catchment of the Middle Mole covers approximately 270km^2.
    - The Lower Mole extends from Esher Railway Bridge downstream to its confluence with the River Thames at Molesey, near Hampton Court. The catchment covers an area of approximately 11km^2. The Lower Mole has been extensively modified by the construction of the Lower Mole Flood Alleviation Scheme between 1977 and 1991. The Dead River is the main tributary of the Lower Mole.

[21] Mott MacDonald, Environment Agency Thames Region (December 2009) *Lower Wey Remodelling and ABD Flood Mapping Study, Hydrology Report.*

- The **River Ember** is a channel of the River Mole which flows around the east of Island Barn Reservoir before flowing northeast, parallel to the Lower Mole channel towards their confluence with the River Thames, just south of Hampton Court Bridge.

- The **Dead River** flows in a north-easterly direction from Walton-on-Thames, round the Queen Elizabeth II Storage Reservoir and through West Molesey, where it joins the River Mole. The Dead River is the only significant tributary of the Lower Mole. The Dead River drains a catchment of approximately 5km^2, 50% of which is urbanised. It has one small tributary in the upper reaches, which is approximately 0.25km long.
- The **River Rythe** rises near Oxshott, in the Prince's Coverts woodland and flows northwards, through Claygate and along the edge of Hinchley Wood. The river then follows the Portsmouth Road towards Thames Ditton, and runs into the River Thames near Ferry Road, forming the boundary between Kingston and Thames Ditton. The River Rythe drains a total catchment area of approximately 19km^2, 50% of which is urbanised.
- The **Lower Thames** flows along the northern boundary of the Borough between Weybridge and Thames Ditton. The Lower Thames floodplain is relatively broad and flat and the river itself contains several islands. The normal tidal limit of the River Thames occurs at Teddington Weir, approximately 5km downstream from Thames Ditton (TQ 1675 7149), but on a high tide, the tidal influence can extend as far back upriver as Molesey Weir.

Ordinary Watercourses

3.1.17 The Environment Agency's 'Detailed River Network' dataset has been used to identify Ordinary Watercourses in the study area.

Appendix A Figure 1 – Topography, Watercourses, Waterbodies

3.1.18 As well as Main Rivers there are a number of smaller Ordinary Watercourses[22] in the Borough, which form tributaries of the Main Rivers. These are smaller streams, ditches and drainage channels, the majority of which are open channel. There are some small sections of culverted watercourse around Stoke D'Abernon in the south of the Borough. **Appendix A Figure 1 and 5** also identify highways drainage ditches that are maintained by SCC.

3.1.19 The responsibility for the maintenance of these Ordinary Watercourses falls to riparian owners who own the land on either bank. EBC is only responsible for Ordinary Watercourses where land on either bank is in Council ownership or where historical agreements have been made.

3.1.20 The SCC Catchment Action Plan dataset details a SCC run riparian owner and maintenance campaign through Surrey Prepared[23] in the following locations: Oxshott Heath, Dead River south of Island Farm Road, Walton Lane and Dorney Grove in Weybridge, Hinchley Wood, Blundell Lane in Cobham, West End in Esher and Esher Common. SCC have also taken watercourse enforcement action at Downside Road, Cobham.

3.2 Flooding from Rivers

Flood Map for Planning (Rivers and Sea)

3.2.1 Flooding from rivers occurs when water levels rise higher than bank levels causing floodwater to spill across adjacent land (floodplain). The risk of flooding is a function of the probability that a flood will occur and the consequence to the community or receptor as a direct result of flooding.

3.2.2 The NPPF[1] seeks to assess the probability of flooding from rivers by categorising areas within the fluvial floodplain into zones of low, medium and high probability, as defined in Table 3-1 and presented on the Flood Map for Planning (Rivers and Sea)[12] available on the Environment Agency website. These Flood Zones have been presented in **Appendix A Figure 5.**

[22] This includes "all rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows" according to the Land Drainage Act 1991.
[23] Surrey Prepared https://www.surreycc.gov.uk/community/emergency-planning-and-community-safety/emergency-planning/prepare-for-emergencies/welcome-to-surrey-prepared

Appendix A Figure 5 – Flood Zones

Table 3-1 Flood Zones (PPG Flood Risk and Coastal Change Table 1)

Flood Zone	Flood Zone Definition for River Flooding	Probability of Flooding
Flood Zone 1	Land having a less than 1 in 1,000 probability of river or sea flooding each year (0.1% AEP). Shown as clear on the Flood Map – all land outside Flood Zones 2 and 3.	Low
Flood Zone 2	Land having between a 1 in 100 and 1 in 1,000 probability of river flooding each year (between 1% and 0.1% AEP); or land having between a 1 in 200 and 1 in 1,000 probability of sea flooding (between 0.5% and 0.1% AEP)	Medium
Flood Zone 3a	Land having a 1 in 100 or greater probability of river flooding each year (greater than 1% AEP); or land having a 1 in 200 or greater probability of sea flooding (greater than 0.5% AEP).	High
Flood Zone 3b	Land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: • Land having an annual probability of 1 in 30 (greater than 3.3% AEP) of flooding, with existing flood risk management features and structures operating effectively, • Land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). LPAs should define Flood Zone 3b within their SFRA in agreement with the Environment Agency. It is not separately distinguished from Flood Zone 3a on the Flood Map for Planning (Rivers and Sea).	Functional Floodplain

3.2.3 A large proportion of the Borough is located in areas that have a Medium and High probability of flooding from rivers (i.e. Flood Zones 2 and 3). The floodplain of the Lower Thames affects the northern and north east fringe of the Borough, including Walton, Molesey and Thames Ditton. The normal tidal limit of the River Thames occurs at Teddington Weir, approximately 5km downstream from Thames Ditton, but on a high tide, the tidal influence can extend as far back upriver as Molesey Weir.

3.2.4 Weybridge and the western edge of the Borough are within the floodplain of the River Wey. The River Mole and the River Rythe flow northwards through the Borough and the floodplains associated with these watercourses affect the settlements of Cobham, Stoke D'Abernon, Downside, Esher, Claygate, West End, Hersham, Walton and Molesey.

3.2.5 Across Elmbridge:

- **78%** (75km^2) is defined as **Flood Zone 1 Low Probability** of flooding.
- **11%** (10.5km^2) is defined as **Flood Zone 2 Medium Probability** of flooding.
- **2%** (2km^2) is defined as **Flood Zone 3a High Probability** of flooding.
- **9%** (8.5km^2) is defined as **Flood Zone 3b (Developed or Undeveloped areas)**.

Flood Zone 3b Functional Floodplain

3.2.6 The Functional Floodplain is defined in the PPG[2] as '*land where water has to flow or be stored in times of flood*'. The Functional Floodplain (also referred to as Flood Zone 3b), is not separately distinguished from Flood Zone 3a on the Flood Map for Planning. Rather the SFRA is the place where LPAs should identify areas of Functional Floodplain in discussion with the Environment Agency.

3.2.7 The PPG[2] states that the identification of Functional Floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. However, it should include the normal form of the river channel and land that would flood with an annual probability of 1 in 30 (greater than 3.3% AEP), with existing flood risk management features and structures operating effectively. Flood Zone 3b is also defined in the PPG by land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).

3.2.8 Within the mapped extents, where it can be demonstrated that existing infrastructure or solid buildings that resist water ingress are not providing a flood storage function, these are not included within the definition of Flood Zone 3b Functional Floodplain and the associated planning requirements do not apply.

3.2.9 Land with a 1 in 30 (3.3% AEP) annual probability of flooding associated with the Lower Wey, Middle Mole, Lower Thames (Thames Dominated), Lower Thames (Tributary Dominated) and River Rythe has been used by EBC as a starting point for defining the Functional Floodplain. As the 1 in 30 (3.3% AEP) annual probability flood outline was not available for the Lower Mole or Dead River, a conservative approach was used with the 1 in 75 (1.33% AEP) and 1 in 50 (2% AEP) respectively as shown in Table 3-2.

Table 3-2 Annual probability of flooding used to define Flood Zone 3b Functional Floodplain

Model		Annual Probability of flooding
Lower Thames	Thames Dominated	1 in 30 (3.3% AEP)
	Tributary Dominated	1 in 30 (3.3% AEP)
Lower Wey		1 in 30 (3.3% AEP)
Lower Mole		1 in 75 (1.33% AEP)
Middle Mole		1 in 30 (3.3% AEP)
Dead River		1 in 50 (2% AEP)
River Rythe		1 in 30 (3.3% AEP)

Appendix A Figure 6 – Maximum Flood Extents – Dead River, Mole, Rythe, Wey
Appendix A Figure 7 – Maximum Flood Extents – Lower Thames: Thames Dominated
Appendix A Figure 8 – Maximum Flood Extents – Lower Thames: Tributary Dominated

3.2.10 For watercourses where the 1 in 30 year, or a suitable equivalent dataset, is not available, Flood Zone 3a should be used until further detailed information is known. As specified in the SFRA guidance[24], where required, site-specific flood risk assessments or a Level 2 SFRA should be used to determine whether a site is affected by functional floodplain.

Undeveloped and Developed Areas in Flood Zone 3b

3.2.11 Within the Flood Zone 3b outline, undeveloped areas, where water has to flow or be stored in times of flood, are defined as Functional Floodplain and protected from non-compatible development[25].

3.2.12 In Elmbridge there are some areas within the modelled flood extents used to inform Flood Zone 3b (as set out in Table 3-2) that are already developed and are prevented from flooding by the presence of existing infrastructure or solid buildings. Whilst these areas will be subject to frequent flooding, it may not be practical to refuse all future development. As such, and in accordance with the PPG[2], existing building footprints, where they can be demonstrated to exclude floodwater, will not be defined as Functional Floodplain. The land surrounding these buildings are important flow paths and flood storage areas and properties within these areas will be subject to frequent flooding; therefore, care must be given to the future sustainability of such development.

3.2.13 The approach to development within these areas recognises the importance of pragmatic planning solutions that will not unnecessarily 'blight' areas of existing development, the importance of the undeveloped land surrounding them and the potential opportunities to reinstate areas which can operate as Functional Floodplain through redevelopment to provide space for floodwater and reduce risk to new and existing development. Refer to Section 5.3 for further information.

[24] Environment Agency, March 2022, How to prepare a strategic flood risk assessment https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment
[25] As defined in PPG Table 2 Flood risk vulnerability and flood zone 'incompatibility. Reproduced in Table 4-2.

Thames Catchment Flood Management Plan (CFMP)

3.2.14 The CFMP[26] provides an overview of the flood risk in the Thames catchment and sets out the preferred plan for sustainable flood risk management over the next 50 to 100 years. It identifies flood risk management policies to assist all key decision makers in the catchment including LPAs who can use the plan to inform spatial planning activities and emergency planning. The CFMP sets out the preferred policy for different sub-areas of the catchment that have been identified by their physical characteristics. There are 4 areas that cover the Borough, and these are described further in Table 3-3.

Table 3-3 Catchment Flood Management Plan

Lower Thames and Byfleet & Weybridge – 'Heavily populated floodplain'.

Preferred Policy P5 'Areas of moderate to high flood risk where we can generally take further action to reduce flood risk'.

Environment Agency's Proposed Actions:

- *We will deliver the actions recommended in Flood Risk Management Strategies for the Wey and Lower Thames once they are approved.*
- *In the short-term, we will encourage partners to develop policies, strategies and initiatives to increase the resistance and resilience of all new development at risk of flooding. We will also look at protecting land that may be needed to manage flood risk in the future, and work with partners to identify opportunities for this and to recreate river corridors in urban areas.*
- *In the longer-term, we need land and property owners to adapt the urban environment to be more flood resilient. This includes the refurbishment of existing buildings to increase resilience and resistance to flooding.*

We need to promote the management of flood consequences. By working with our partners, we will improve public awareness and local emergency planning, for example identifying critical infrastructure at risk and producing community flood plans.

Lower Mole – 'Places with significant flood defences'.

Preferred Policy P3 'Areas of low to moderate flood risk where we are generally managing existing flood risk effectively'.

Environment Agency's Proposed Actions:

- *We will continue to maintain the Lower Mole and Maidenhead Windsor and Eton Flood Alleviation Schemes.*
- *We will work closely with Local Authorities to ensure that we are well prepared to respond to the consequences of flooding from other sources and extreme events.*
- *We will work with our partners to ensure that any future development in these areas results in a reduction in the overall flood risk.*

We will continue to make sure the recommendations in Strategic Flood Risk Assessments and Local Development Framework policies create the potential to reduce flood risk through adaptation of places at risk and retaining open spaces in the floodplain.

Middle Mole – 'Chalk and downland catchments'.

Preferred Policy P3 Areas of low to moderate flood risk where we are generally managing existing flood risk effectively

Environment Agency's Proposed Actions:

- *We want to maintain the existing capacity of the river systems in developed areas to reduce the risk of flooding from more frequent events. We will work with our partners to identify opportunities to make the existing systems more efficient (for example, where there are significant restrictions to flow from undersized culverts or bridges).*
- *We will work with Local Planning Authorities to retain the remaining floodplain for uses that are compatible with flood risk management and put in place polices that lead to long-term adaptation of urban environments in flood risk areas.*

We will continue to increase public awareness, including encouraging people to sign-up for the free Floodline Warnings Direct service.

Climate Change

3.2.15 A considerable amount of research is being carried out worldwide in an endeavour to quantify the impacts that climate change is likely to have on flooding in future years. Climate change may increase peak rainfall intensity and river flow, which could result in more frequent and severe flood events.

[26] Environment Agency (2009) Thames Catchment Flood Management Plan https://www.gov.uk/government/publications/thames-catchment-flood-management-plan

Climate change is perceived to represent an increasing risk to low lying areas of England, and it is anticipated that the frequency and severity of flooding will change measurably within our lifetime.

3.2.16 The Environment Agency's online guidance 'Flood risk assessments: climate change allowances'[27] sets out the climate change allowances for peak river flows for specific 'management catchments' and provides advice on applying climate change projections when preparing FRAs. The allowances for the management catchments of relevance to Borough are set out in Table 3-4. SFRAs should consider the central and higher central allowances (shaded in grey).

Table 3-4 Peak river flow allowances for management catchments in Elmbridge (1961 to 1990 baseline)

Management Catchment	Allowance Category	Total potential change anticipated for the '2020's (2015 to 2039)	Total potential change anticipated for the '2050's (2040 to 2069)	Total potential change anticipated for the '2080's (2070 to 2125)
Maidenhead and Sunbury	Upper (95th)	32%	45%	81%
	Higher (70th)	19%	25%	47%
	Central (50th)	14%	17%	35%
Mole	Upper (95th)	27%	26%	40%
	Higher (70th)	16%	12%	20%
	Central (50th)	11%	6%	12%
Wey and tributaries	Upper (95th)	28%	36%	71%
	Higher (70th)	15%	17%	36%
	Central (50th)	10%	9%	24%

3.2.17 In order to determine which range of allowance should be assessed for a proposed development or plan, the Flood Zone and vulnerability classification should be considered, as set out below. Section 4.2. provides more details on the flood risk vulnerability classification as set out in Annex 3[28] of the NPPF.

3.2.18 In Flood Zone 2 or 3a

- Essential Infrastructure – use the Higher Central allowance.
- Highly Vulnerable – use the Central allowance (development not permitted in Flood Zone 3a).
- More Vulnerable – use the Central allowance.
- Less Vulnerable – use the Central allowance.
- Water Compatible – use the Central allowance.

3.2.19 In Flood Zone 3b

- Essential Infrastructure – use the Higher Central allowance.
- Highly Vulnerable – development should not be permitted.
- More Vulnerable – development should not be permitted.
- Less Vulnerable – development should not be permitted.
- Water Compatible – use the Central allowance.

3.2.20 The peak river flow allowances should be applied to all developments and allocations. This includes locations that are currently in Flood Zone 1 but might be in Flood Zone 2 or 3 in the future.

[27] Environment Agency (published 2016 and updated May 2022) Flood risk assessments: climate change allowances. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances
[28] National Planning Policy Framework (2023) Annex 3: Flood risk vulnerability classification https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification

3.2.21 If EBC considers a development to be appropriate, even though it will not follow the Flood Zone compatibility categories for Flood Zones 2, 3a or 3b, the Higher Central climate change allowance should be used. Where it is appropriate to apply a Credible Maximum Scenario[29], the Upper End allowance should be used.

3.2.22 The lifetime of the development should also be considered when determining which future climate change allowance time period should be used. The lifetime of a proposed development should be judged based on the characteristics of the development. In the case of residential developments, a minimum lifetime of 100 years should be taken when selecting climate change allowance percentages. For other types of development, the applicant should assess how long they anticipate the development to be in place and justify the lifetime of the development. A minimum of a 75-year lifetime should be used for non-residential developments.

3.2.23 For the purposes of strategic planning, the '2070 to 2115' allowances in Table 3-4 should be used.

3.2.24 As part of the more recent hydraulic modelling studies for the fluvial watercourses in the Borough, simulations have been run for the 1 in 100 year (1% AEP) event, including the implications of climate change based on these allowances. It should be noted that whilst the modelling of the AEP events to generate the NPPF Flood Zones (and Flood Map for Planning) do not account for the presence of flood defences, the simulations including an allowance for climate change do include the presence of existing flood defences. These simulations are available for the Upper End climate change allowance, which includes the Lower Wey, Middle Mole and Dead River. The most extreme climate change scenario (1% AEP plus 70% climate change) has been mapped for these watercourses in **Appendix A Figure 6**. These simulations are also available for the Lower Thames (Thames dominated and Tributary dominated) models with the most extreme climate change scenario of 1% AEP plus 81% mapped in **Appendix A Figure 7** (Thames dominated) and **Appendix A Figure 8** (Tributary dominated).

3.2.25 Updated climate change allowances are not available for the Lower Mole and River Rythe. The available climate change modelled extents for these watercourses are the 1% AEP plus 20%. These have been mapped in **Appendix A Figure 6.**

Appendix A Figure 6 – Maximum Flood Extents – Dead River, Mole, Rythe, Wey
Appendix A Figure 7 – Maximum Flood Extents – Lower Thames: Thames Dominated
Appendix A Figure 8 – Maximum Flood Extents – Lower Thames: Tributary Dominated

3.2.26 The results of the hydraulic modelling studies for the Main Rivers suggest that climate change will not markedly increase the extent of river flooding within most areas of the Borough. However there are a few places where the extent of flooding is noticeably increased, including flooding from the Lower Thames in West Molesey and Thames Ditton; flooding from the Dead River in Walton on Thames and West Molesey; flooding from the Lower Mole in Lower Green; flooding from the Middle Mole in the east of Hersham, near Willow Tree Farm, to the west of Cobham Park and near Stoke D'Abernon; flooding associated with the River Wey close to the Brooklands Industrial Estate and north of Bull Dog Island, and flooding from the River Rythe south of the railway line and at Littleworth Common.

3.2.27 The Brooklands Industrial Estate is an area of importance for SCC and EBC and is part of the Surrey Place Ambition[30].

3.2.28 It is important to note that these areas, as well as those areas that are *currently* at risk of flooding may be susceptible to more frequent, more severe flooding in future years. It is essential therefore that the development control process (influencing the design of future development within the Borough) carefully mitigates against the potential impact that climate change may have upon the risk of flooding to property.

3.2.29 For this reason, all of the development management recommendations set out in Sections 5 and 6 require all floor levels, access routes, drainage systems and flood mitigation measures to be designed

[29] If you develop NSIPs you may need to assess the flood risk from a credible maximum climate change scenario. Nationally significant infrastructure projects (NSIPs) are major infrastructure projects such as new harbours, roads, power stations and power lines.
[30] SCC (2023) Surrey's 2050 Place Ambition, A Collective Vision for Place Leadership, Infrastructure and Good Growth. Version 2 – 2023 https://www.surreycc.gov.uk/__data/assets/pdf_file/0003/354504/Surrey-Place-Ambition-Version-2-2023.pdf

with an allowance for climate change; and the potential impact that climate change may have over the lifetime of a proposed development should be considered as part of a site-specific FRA. This provides a robust and sustainable approach to the potential impacts that climate change may have upon the Borough over the next 100 years, ensuring that future development is considered in light of the possible increases in flood risk over time.

Historic Flooding

3.2.30 Elmbridge Borough has a long history of flooding from the rivers present within its study area, as described below.

3.2.31 Lower Wey: Flooding in the Lower Wey catchment has been reported as early as the late 1800s. Notable flooding occurrences within the catchment have been reported in 1900, 1947, 1968, 1979, 1985, 1987, 1990, 2000, 2003, 2006, 2007 and 2008 and 2014. The flooding occurrence in the Lower Wey is influenced by the geology, and the rapid rate of urbanisation within the study area[31].

3.2.32 Lower Thames: Since 1947 there have been relatively few large flood events in the Lower Thames catchment. Recent events of note occurred in September 1968, (although this was confined mainly to the River Mole and the River Wey), June 1971 and November 1974. In the 1990s there were few large out-of-bank flood events. The largest recent flood events occurred in January 2003 and in January-February 2014. Other smaller floods occurred in February 1990, December 1992, January 1994, December 1996, November-December 2000[32] and January 2024.

3.2.33 Middle Mole: Flooding has been reported historically from the Middle Mole and the residential areas of Cobham and Esher have a history of repeated flooding. The following occurrences have been recorded[33]:

- March 1947: Severe flooding caused by heavy rain falling onto the snow that had blighted much of the country throughout the bitter winter of 1947. This caused disastrous flooding for the towns near the River Thames.
- September 1968: Widely accepted to have been the worst ever recorded in this area with disastrous consequences in the Mole catchment. Flooding followed the wettest September on record in which parts of the county received a third of their annual rainfall. This was compounded by torrential rain over the weekend of the 14th - 15th September which caused flooding problems made worse by the saturated soil. The event hit the towns of Esher and Molesey in the Lower Mole valley badly. In this area the flood was presumed to be a 1 in 200 year (0.5% AEP) event. Further upstream the damage was also considerable; several bridges were destroyed including Downside Bridge at Cobham and Boxhill Bridge near Dorking.
- January 1980: Reported to be the worst flood since 1968 and described as an emergency which lasted 24 hours before the flood waters in the River Wey at Guildford and the River Mole in Dorking returned to normal.
- February 1990: The Surrey Advertiser stated that '*Two men died, thousands of families suffered damage to cars and property"* as a result of torrential rain and storm force winds.
- October 1993: Flood levels on the road into Brockham rose to their highest level since December 1979 and the road at Borough Bridge was closed. Floods also affected Dorking and Betchworth.
- December 1994: An overnight deluge caused the River Mole to rise by 3 m and flood Mill Road in Cobham. Recorded as the second largest in terms of flow at both Castle Mill and Esher Gauging stations.
- Autumn 2000: The worst floods since the 1968 event; reported as the wettest autumn on record in the UK and many rivers in Surrey burst their banks. Gauging stations on the River Mole recorded the highest flows since 1968; with the flow at Esher reaching 115 m^3/s. Extensive areas of rural land in Elmbridge were affected.
- December 2013: During the severe weather experienced in December 2013, the Middle Mole burst its banks at Cobham, resulting in flooding of the rural floodplain and adjacent properties.

[31] Mott MacDonald, Environment Agency Thames Region (December 2009) Lower Wey Remodelling Flood Study, Modelling Report.
[32] PBA, Jacobs, Atkins, Environment Agency Thames Region (November 2007) Lower Thames Flood Risk Mapping Project TH724 Hydraulic Modelling Report Issue No. 5.1.
[33] Mott MacDonald, Environment Agency Thames Region, (December 2007) Middle Mole Flood Mapping Study Final Report.

- December 2019: The Middle Mole burst its banks with flooding in Cobham Town Centre and Mill Road.
- February 2020: Flooding of Cobham resulting in the High Street being cornered off and the A245 flooded.
- November 2023: During Storm Ciarán, the Middle Mole burst its banks at Cobham, resulting in localised flooding.
- January 2024: The Middle Mole burst its banks at Cobham. Painshill Landscape Gardens was closed due to the flooding.

3.2.34 Lower Mole: Since the completion of the Lower Mole Flood Alleviation Scheme in 1991 there have been no out-of-bank flood events on the Lower Mole or River Ember[34].

3.2.35 Dead River: The Environment Agency, EBC or SCC has no records of any flood events on the Dead River.

3.2.36 River Rythe: SCC publish Flood Investigation Reports for significant flood events in the County. A report was published in March 2017 for Hengest Avenue[35] which flooded on June 22nd and 23rd in 2016. From midday on 22nd June to 23.00 on 23rd June an average of 60mm of rain fell in a 4km^2 catchment centred on Hinchley Wood. The majority of this rainfall accumulation occurred during the main rainfall event from 21:00 on the 22nd of June to 02:30 on the 23rd of June. Localised flooding occurred in the Hengest Avenue and Clay Lane area of Hinchley Wood where 10 properties were internally flooded. The rainfall resulted in flooding of the watercourses in the Hengest Avenue area where capacity of the watercourses was reached resulting in flooding of roads and property.

3.2.37 The Environment Agency has provided a GIS layer of the Recorded Flood Outlines dataset which shows the extent of fluvial flooding that has been experienced and the date the flood event occurred.

3.2.38 SCC has provided a ‘Property Flood Roads’ dataset indicating road locations along which internal, external or unknown property flooding has been reported to SCC. This data is mapped in **Appendix A Figure 9**.

Appendix A Figure 9 - Historic Records of Flooding

Flood Defences

3.2.39 Flood defences are typically raised structures that alter natural flow patterns and prevent floodwater from entering property in times of flooding. They are generally categorised as either ‘formal’ or ‘informal’ defences. A ‘formal’ flood defence is a structure that is maintained by its respective owner, regardless of whether it is owned by the Environment Agency. An ‘informal’ flood defence is a structure that has often not been specifically built to retain floodwater and is not maintained for this specific purpose. Boundary walls and industrial buildings situated immediately adjacent to rivers often act as informal flood defences.

3.2.40 The Environment Agency Asset Information Management System (AIMS) contains details of flood defence assets associated with Main Rivers. This information is presented in **Appendix A Figure 4**.

Appendix A Figure 4 - Spatial Flood Defences

3.2.41 Formal raised flood defences have been identified in consultation with the Environment Agency. The defences identified are located on the Lower Mole and the Middle Mole. The main formal raised defences are as follows:

- Raised embankment along the River Ember between Esher Road, Molesey and West End.
- Raised flood wall along the northern bank of the River Mole at Esher Road, Hersham.
- Raised flood wall along both banks of the River Ember/River Mole from Esher Road, Molesey to Hampton Court.
- Sections of raised flood wall at West End, Esher.

[34] Halcrow Group Ltd, Environment Agency Thames Region, (March 2009) Lower Mole Flood Risk Study Final Study Report.
[35] Surrey County Council (2017) Section 19 Flood Investigation Report: Hengest Avenue, March 2017.

3.2.42 No informal raised flood defences in the form of boundary walls and/or existing buildings, providing protection from flooding, have been identified in the Borough. It is recognised however that infrastructure, including for example road and/or rail embankments, may alter the flow of floodwater throughout the Borough. For the purposes of the SFRA process, these have not been assessed as 'informal' defences. This is because the height and breadth of the embankments are such that the likelihood of a sudden catastrophic failure of the structure (i.e. potentially posing a risk to life) is virtually negligible.

Temporary Defences

3.2.43 Three temporary defence systems have previously been in place in the Borough. These have been reviewed over the last few years, and status of each at the time of reporting is provided below:

- **Thames Ditton:** The temporary flood barrier plan for Thames Ditton remains under review. Until this review is completed the barrier cannot be deployed during a flood. The Environment Agency have completed river (fluvial) flood modelling to determine flood risk benefits. The modelling does not show adverse consequences of barrier deployment. The review for a temporary flood barrier alignment in Thames Ditton will now be progressing to the next stage.
- **Walton Lane, Weybridge:** A review was carried out by the Environment Agency in 2022 of the safety of their temporary barrier plans. The review concluded that the temporary barrier plan for Walton Lane "*is not viable or safe for the public, our partners and our staff*". The Environment Agency will therefore no longer deploy a barrier at Walton Lane, Weybridge.
- **Wey Road, Weybridge:** A review was carried out by the Environment Agency in 2022 of the safety of their temporary barrier plans. Flood modelling shows that a barrier deployment on Wey Road would increase flood risk to other properties. The Environment Agency have examined whether risk to these properties can be reduce through other measures but found that this is not viable due to the depth of floodwater and extent of the increases in risk. A temporary flood barrier in this location would also impact on access to a significant number of properties in a vulnerable community at Wey Meadows. The decision has therefore been made not to deploy the barrier during a flood.

Flood Risk Management Schemes

3.2.44 The Environment Agency Asset Information Management System (AIMS) contains details of flood defence assets associated with Main Rivers. This information is presented in **Appendix A Figure 4**. This dataset shows that the majority of the watercourses are not formally defended but may be informally protected by high ground on either side of the watercourse.

Appendix A Figure 4 - Spatial Flood Defences

Sanway-Byfleet Proposed Flood Alleviation Scheme

3.2.45 The Environment Agency, along with key professional partners, is developing a scheme to reduce flood risk within Byfleet and Weybridge. The Environment Agency are concentrating on the Sanway area of Byfleet with new flood defences, storage areas for displaced flood water and environmental and community enhancements. For more information about the scheme consult: https://consult.environment-agency.gov.uk/thames/sanway-byfleet-flood-alleviation-scheme/

3.2.46 The proposed Sanway-Byfleet Flood Alleviation Scheme (FAS) aims to better protect up to 236 properties in the Sanway area from flooding from the River Wey. This scheme is designed to provide a standard of protection of 1 in 100 (1% AEP) chance of flooding in any given year and takes into account the effects of climate change. The current flood defence proposals include:

- A sheet pile flood wall from the M25 to the southern end of Sanway Road.
- An earth embankment flood defence between the southern end of Sanway Road and Summer Close.
- Three compensatory floodplain storage areas.
- A normally dry overflow channel west of the M25 between the Broad Ditch and the River Wey; and,

- Improvements to surface water drainage pipes that run underneath the flood defences - to ensure flood water cannot bypass the defences through these pipes - opportunities to reduce surface water flood risk will be developed in the next stage of the project.

3.2.47 Most of the scheme lies within the Woking Borough Council area, with some works within Guildford Borough Council. No works are proposed within the Elmbridge BC area and modelling has shown the scheme will not cause any detrimental impact within the Borough or elsewhere.

3.2.48 The Environment Agency now have approval of the preferred option for the scheme and are moving to the next stage which is detailed design and planning permission.

Lower Mole Flood Alleviation Scheme

3.2.49 The Lower Mole FAS was constructed in response to the 1968 flood event, when up to 10,000 properties along the River Mole were subject to flooding. The FAS has been operational since the early 1980's and offers protection to several thousand houses along the lower reach of the River Mole.

3.2.50 The FAS is considered to have a standard of protection in excess of the 1 in 100 year (1% AEP) event. Formal flood defences, including earth embankments and concrete flood walls are present along both banks of the River Mole from West End in Esher downstream to the confluence with the River Thames, and form part of the Lower Mole FAS. The Flood Map for Planning[12] (Rivers and Sea) shows that these defences generate a Reduction in Risk of Flooding from Rivers and Sea due to Defences for Flood Zone 3 in the Esher and Hersham Settlement Areas. These areas are also shown in **Appendix A Figure 5**.

Appendix A Figure 5 – Flood Zones

3.2.51 In 2017, the Environment Agency completed an Asset Management Plan (AMP) for the Lower Mole FAS. The AMP collated existing information on the condition of the range of assets that constitute the FAS. In addition, further inspections of the assets were undertaken where information was not available at that time or the information available required updating.

3.2.52 The reporting from the AMP set out details of future interventions to sustain the current standard of protection offered by the FAS for the next 100 years. In addition, the AMP also highlighted the value of investigating alternative options to sustain the current standard of protection offered by the FAS into the future. This led to the commencement of the Lower Mole FAS Refurbishment project to investigate a wide range of options for the future of the FAS.

3.2.53 The business case for the Refurbishment project is currently being progressed. Once the project reaches the stage where a decision can be made on which option to take forward for the future of the FAS, works are expected to take a number of years to design in detail and then implement and complete.

Dead River

3.2.54 The Environment Agency has undertaken an Initial Assessment (IA) for the Dead River catchment to identify possible strategic flood risk reduction options along this watercourse. This project is still at a very early stage, and no specific locations have been identified for any flood risk reduction works. The next stages of this project will involve engagement with other Risk Management Authorities (RMAs) in order to develop an understanding of the risk of flooding from multiple sources, and to work in partnership with others to bring forward any feasible options for further appraisal.

River Rythe

3.2.55 The Environment Agency has undertaken an IA for the River Rythe catchment to identify possible strategic flood risk reduction options along this watercourse. This project is still at a very early stage, and no specific locations have been identified for any flood risk reduction works. The next stages of this project will involve engagement with other RMAs in order to develop an understanding of the risk of flooding from multiple sources, and to work in partnership with others to bring forward any feasible options for further appraisal.

River Mole

3.2.56 The Catchment Action Plan dataset indicates the Environment Agency has undertaken an Initial Assessment (IA) for the Cobham, Stoke D'Abernon catchment to look at the main river flooding mechanisms along this watercourse. Currently, no further information is available for the project.

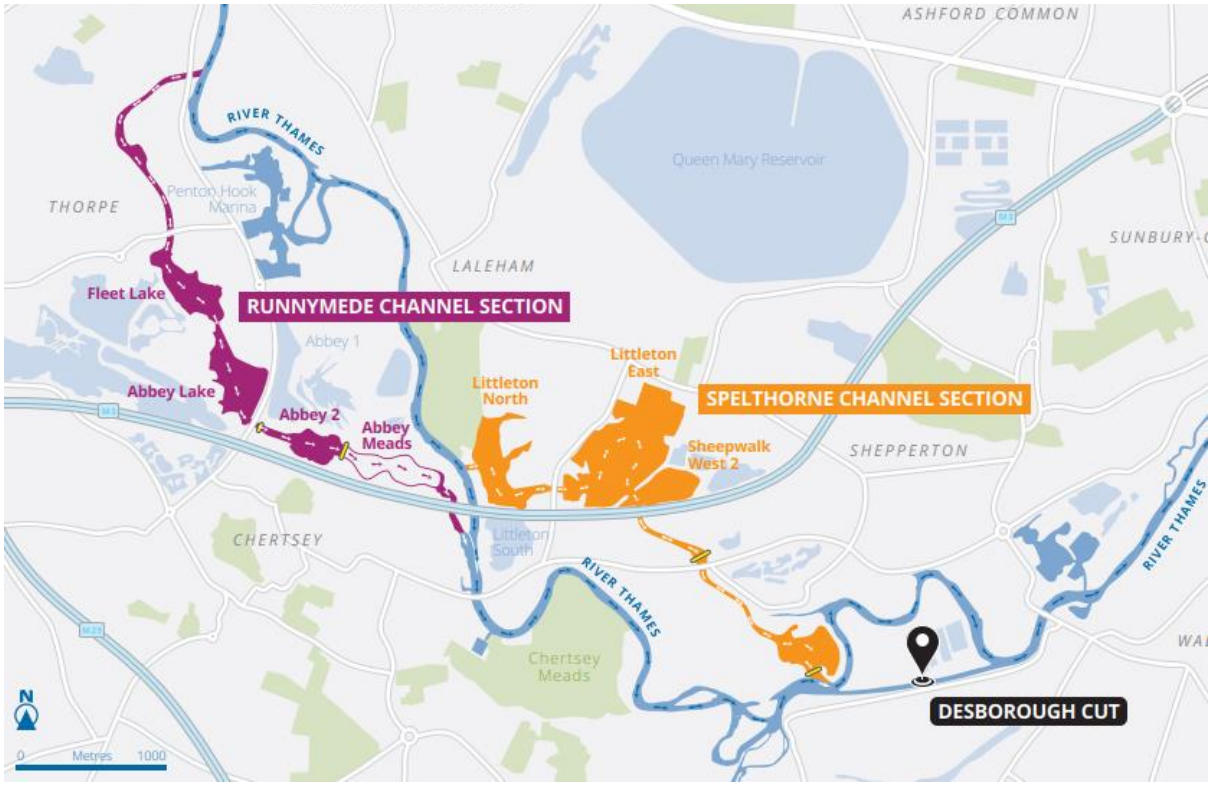
River Thames Scheme

3.2.57 The River Thames Scheme covers an area from Egham to Teddington. The scheme will create two sections of new river channel: the Runnymede Channel Section and Spelthorne Channel Section. These two sections, totalling 5 miles (8.5km) will act as new flow routes for excess water when water levels in the River Thames rise too high. Improvements will be made to the weirs at Sunbury, Molesey and Teddington to increase the amount of flow that can pass through. It is also proposed to lower the riverbed level downstream of the Desborough Cut.

3.2.58 The goals of the River Thames Scheme[36] are to:

- reduce the risk of flooding for dwellings, businesses and infrastructure,
- improve access to quality green open spaces, connection with wildlife and more sustainable travel network,
- create a network of high quality habitat and achieve biodiversity net gain,
- facilitate sustainable and inclusive economic growth,
- enable delivery and design that contribute to Environment Agency, Surrey County Council and partner climate goals relating to carbon use.

Figure 3-2 River Thames Scheme



Source: https://www.riverthamesscheme.org.uk/scheme/the-channel-sections

3.2.59 The project will be delivered in partnership by the Environment Agency and Surrey County Council. The present value (PV) cost is £346 million including a 48% contingency and the benefit-cost-ratio (BCR) is 7.97. The scheme will reduce flood risk to 11,000 properties and infrastructure and avoid £2.7 billion of PV damage over 100 years

[36] https://www.riverthamesscheme.org.uk/

3.2.60 All communities between Egham and Teddington will benefit from the River Thames Scheme. This includes the communities downstream of the flood channel, as the weir modifications will reduce water levels between Walton Bridge and Teddington. The degree of benefit will vary along the length of the river. As the flood risk cannot be eliminated completely, some households benefiting from the scheme are also being offered property level products. These products will help to make homes more resistant to flooding. Overall, the River Thames Scheme will significantly reduce the likelihood of flooding for the 15,000 properties at a time when climate change is predicted to increase flood risk.

3.2.61 Within Elmbridge the main benefit of the scheme will be through the upgrades to the Sunbury and Molesey Weirs. Modifications to Sunbury Weir and Desborough Cut will fully mitigate the increase in flow due to the channel operation, and also provide some small scale reduction in the water levels in flood conditions after the channels are built and in operation. Once the scheme is completed, the additional gates proposed at Sunbury weir and the widened Desborough Cut will allow greater flow (up to 4%) through them and reduce the upriver water levels. The capacity improvements to the weirs and Desborough Cut will result in an overall small reduction in flood water levels all the way through the lower reaches of the River Thames, from Walton Bridge to Teddington.

3.2.62 Modifications to Sunbury weir and Desborough Cut will fully mitigate the increase in flow due to the channel operation, and also provide some small scale reduction in the water levels in flood conditions after the channels are built and in operation. Once the scheme is completed, the additional gates proposed at Sunbury weir and the widened Desborough Cut will allow greater flow (up to 4%) through them and reduce the upriver water levels. The capacity improvements to the weirs and Desborough Cut will result in an overall small reduction in flood water levels all the way through the lower reaches of the River Thames, from Walton Bridge to Teddington.

3.2.63 As part of the scheme the Environment Agency has identified approximately 1600 properties that would remain with a flood risk of 1 in 40 years or greater once the flood channel has been constructed. Properties that remain at this higher risk of flooding may be offered Property Level Products to help make their homes more resistant to flooding.

River Thames Scheme Flood Modelling Report

3.2.64 Section 28 of the River Thames Scheme Flood Modelling Report[37] provides a discussion of the impact of the RTS on flood levels along the Thames during different AEP flood events. Figure 3-3 (Figure 28.8 extracted from the RTS Report) provides an overview of the impact of the RTS during the 3.3% AEP modelled event, which is used to delineate Flood Zone 3b Functional Floodplain. The map shows that flood levels will decrease along Walton Lane, as well as adjacent to the River Thames in Hurst Park and Thames Ditton.

3.2.65 Figure 3-4 (Figure 28.10 extracted from the RTS Report) provides an overview of the impact of the RTS during the design flood event (1% AEP including 35% climate change allowance). This shows reductions in flood extent through Hurst Park and Thames Ditton, and reductions in flood extent in East Molesey.

[37] Galliford Binnies (GB), September 2023. River Thames Scheme Flood Modelling Report P04.

Figure 3-3 Impact of the River Thames Scheme (3.3% AEP)

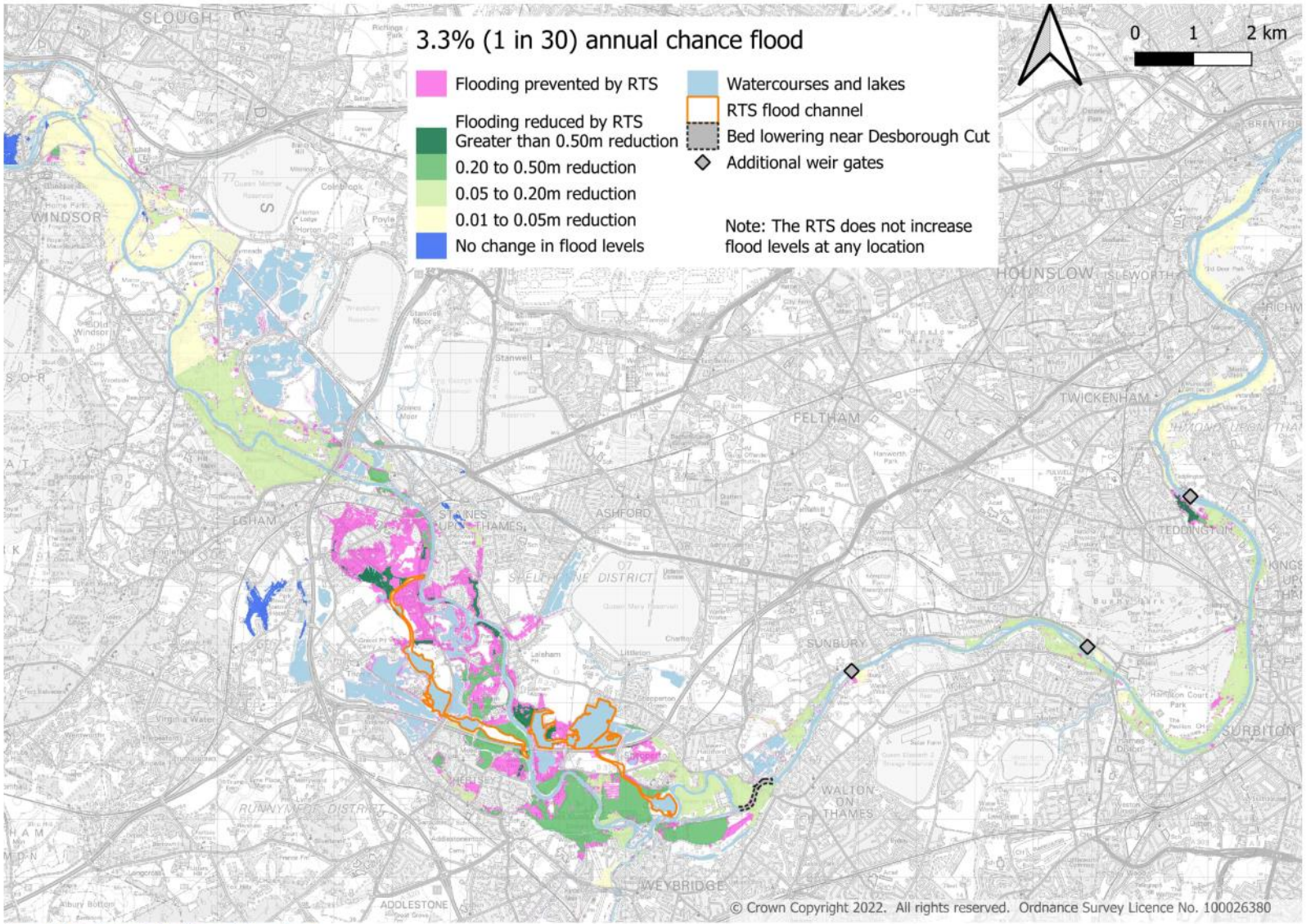


Figure 28.8 Flood extent in 1 in 30 annual chance flood

Figure 3-4 Impact of the River Thames Scheme (1% AEP plus 35%)

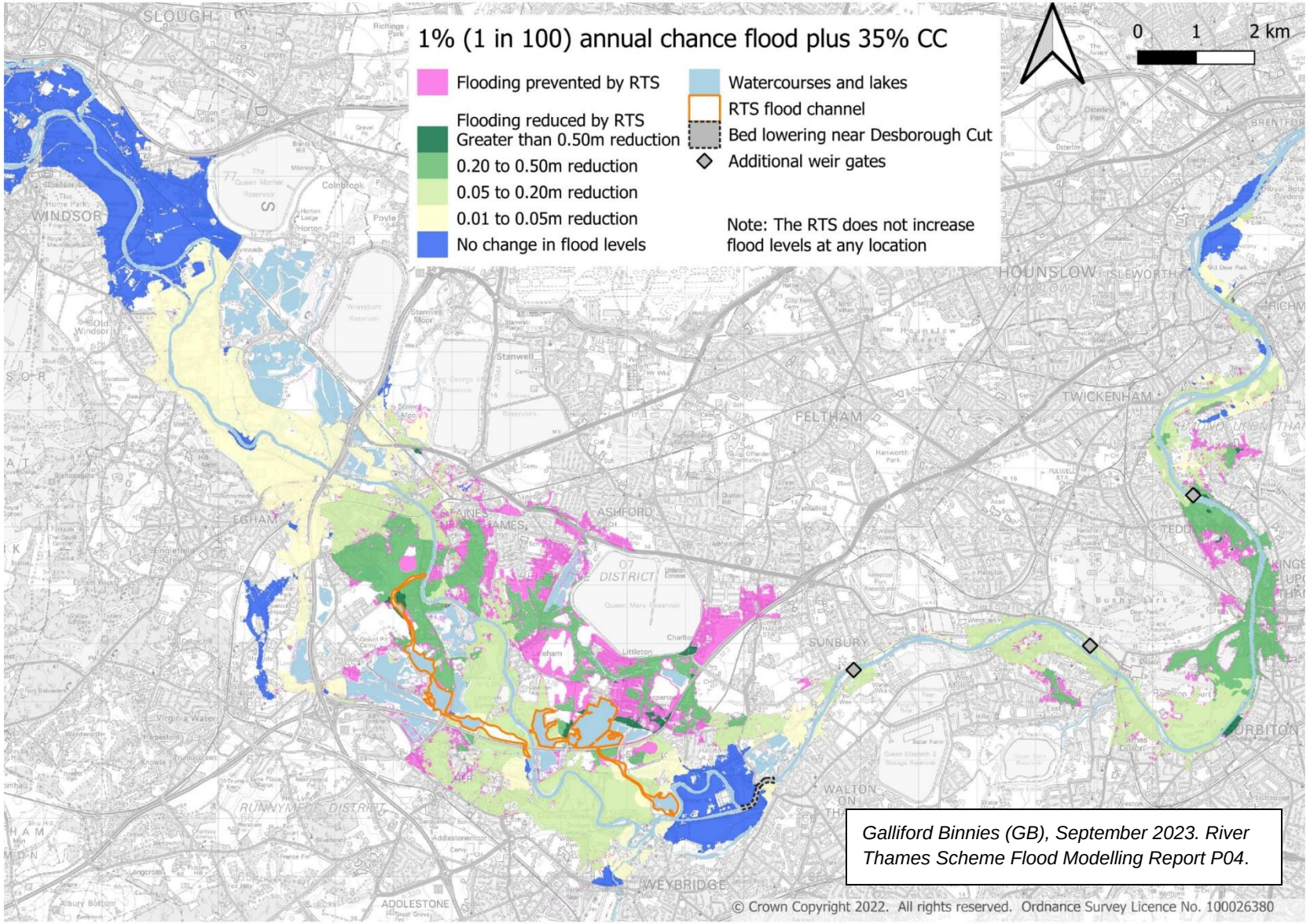


Figure 28.10 Flood extent in 1 in 100 annual chance flood plus 35% climate change allowance

Residual Risk

3.2.66 It is important to recognise that the risk of flooding from the rivers in Elmbridge can never be fully mitigated, and there will always be a residual risk of flooding that will remain after measures have been implemented to protect an area or a particular site from flooding. This residual risk is associated with a number of potential risk factors including (but not limited to):

- a flooding event that exceeds that for which the flood risk management measures have been designed e.g. overtopping of flood defences, or flood levels above designed finished floor levels,
- the structural deterioration of flood defence structures (including informal structures acting as a flood defence) over time, or a breach in the flood defences and/or
- general uncertainties inherent in the prediction of flooding.

3.2.67 The modelling of flood flows and flood levels is not an exact science; therefore, there are inherent uncertainties in the prediction of flood levels used in the assessment of flood risk. Whilst the NPPF Flood Zones provide a relatively robust depiction of flood risk for specific conditions, all modelling requires the making of core assumptions and the use of empirical estimations relating to (for example) rainfall distribution and catchment response.

3.2.68 Although there are a number of raised defences in Elmbridge BC as outlined previously, that may be formally maintained, it is important to reiterate that the risk of flooding can never be fully removed. There will always be a residual risk of flooding, due to (for example) a more extreme event, changing climatic conditions, a structural failure of the constructed flood defence system or flooding behind the defences due to local runoff or groundwater. It is incumbent on both the Elmbridge BC, SCC and developers to ensure that the level and integrity of defence provided within developing areas can be assured for the lifetime of the development. Residual flood risk needs to be assessed by developers so the risk to developments can be safely managed, including designing developments located behind flood defences to avoid internal flooding from residual risk from flood risk management infrastructure wherever possible, and ensuring people are not exposed to hazardous flooding, irrespective of the development's vulnerability classification.

3.2.69 Steps should be taken to manage these residual risks through the use of flood warning and evacuation procedures, as described in Section 6.

3.3 Flooding from Surface Water

3.3.1 Overland flow and surface water flooding typically arise following periods of intense rainfall, often of short duration, which is unable to soak into the ground or enter drainage systems. It can run quickly off land and result in localised flooding. This occurs most commonly in urban areas where water is unable to enter the ground due to the presence of impermeable surfaces.

Risk of Flooding from Surface Water

3.3.2 The Environment Agency has undertaken modelling of surface water flood risk at a national scale and produced mapping identifying those areas at risk of surface water flooding during three annual exceedance probability events: 1 in 30 year (3.33% AEP) (High Risk), 1 in 100 year (1% AEP) (Medium Risk) and 1 in 1,000 year (0.1% AEP) (Low Risk)[38]. The latest version of the mapping is referred to as the Risk of Flooding from Surface Water (RoFSW) and the extents have been made available to EBC as GIS layers. The RoFSW extents are presented in **Appendix A Figure 10**.

Appendix A Figure 10 - Risk of Flooding from Surface Water

3.3.3 The RoFSW provides all relevant stakeholders access to information on surface water flood risk which is consistent across England and Wales. The modelling will help the Environment Agency to take a strategic overview of flooding and assist SCC in their duties relating to management of surface water

[38] https://www.gov.uk/government/publications/flood-risk-maps-for-surface-water-how-to-use-the-map

flood risk. For the purposes of this SFRA, the mapping allows EBC an improved understanding of areas within the Borough which may have a surface water flood risk.

3.3.4 The modelling represents a significant improvement on previous mapping, namely the Flood Map for Surface Water (FMfSW) (2010) and the Areas Susceptible to Surface Water Flooding (AStSWF) (2009), for example:

- Increased model resolution to 2m grid,
- Representation of buildings and flow routes along roads and manual editing of the model for structural features such as flyovers,
- Use of a range of storm scenarios, and
- Incorporation of appropriate local mapping, knowledge and flood incident records.

3.3.5 However, it should be noted that this national mapping has the following limitations:

- Use of a single drainage rate for all urban areas,
- It does not show the susceptibility of individual properties to surface water flooding,
- The mapping has significant limitations for use in flat catchments,
- No explicit modelling of the interaction between the surface water network, sewer systems and watercourses,
- In several areas, modelling has not been validated due to a lack of surface water flood records, and,
- As with all models, the RoFSW is affected by a lack of, or inaccuracies, in available data.

3.3.6 The RoFSW mapping for the EBC study area, presented in **Appendix A Figure 10,** illustrates that the risk of surface water flooding is widespread throughout the Borough, primarily along, but not exclusively limited to, road networks. It should be noted that these maps are based on topography and their accuracy is not as robust as fluvial flood maps. They can, however, be used to identify general flow routes.

3.3.7 The RoFSW dataset provides a picture of surface water flooding across the Borough and identifies that incidents are widespread across most part of the Borough. The following areas are shown to be at particular risk, although this list is by no means exhaustive.

- Surface water flood risk in Thames Ditton is highlighted in the PFRA[39], where there are also a number of SCC wetspots.
- Ponding of surface water along the low-lying floodplain of the Middle Mole, including areas such as Cobham Park.
- Flooding along the roads sloping down from Fairmile towards Cobham and Stoke D'Abernon and the residential areas at the bottom of this high ground.
- Flooding in Weybridge town centre including the recreation ground and playing fields.
- Ponding of surface water along Brooklands Road, Locke King Road and The Heights to the south of Weybridge town centre.
- Surface water flooding in the residential area around Burwood Park and Hersham.
- Ponding along the roads and residential areas of West and East Molesey.
- Ponding along the River Rythe floodplain at Littleworth Common, Hare Lane Green and Arbrook House in Esher.
- Ponding of surface water adjacent to the railway embankments in Long Ditton and Hinchley Wood; and
- Extensive surface water flooding in Walton-on-Thames along the roads and residential area to the south and south west of the Queen Elizabeth II Reservoir.

[39] Surrey County Council (2011) Preliminary Flood Risk Assessment

3.3.8 It is noted that there is not currently a Surface Water Management Plan available for the EBC study area.

Historic Records

3.3.9 In their role as the LLFA, SCC has duties to record and investigate flood incidents relating to local sources of flooding, namely flooding from surface water, groundwater and Ordinary Watercourses. SCC has provided several GIS layers to inform the SFRA that relate to past flood events. These datasets are presented spatially in **Appendix A Figure 9 and 10**. A summary of each dataset as provided below:

- **Property Flood Roads** dataset indicating road locations along which internal, external, or unknown property flooding has been reported to SCC.
- **Historical Flooding Incidents**: indicative road locations along which a flood event has occurred that has been investigated by SCC and a Section 19 Flood Investigation Report has been prepared.
- **SCC Wetspots**: 'Wetspot' is a term used by SCC as the LLFA to describe the location of a surface water flooding incident that has been reported. The Wetspot database is continually updated to produce a comprehensive map and record of all the identified wetspots in Surrey. Information from Surrey RMAs informs the database. SCC currently prioritises capital works at wetspots throughout the county based on several factors. These factors include safety, property flooding, disruption to crucial services, social and economic impact and duration of flooding. Details of these specific factors have not been supplied for the purposes of the SFRA. 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; and
    - Dormant - The wetspot has no recorded instances of flooding within the last two years and is being kept for information only.

3.3.10 SCC publish Flood Investigation Reports for significant flood events in the County. A report was published in October 2015 for Elmbridge[40] which reported flooding in the Claygate area on the Woodstock Road in Winter 2013/2014. As this area is not at risk of fluvial flooding, this was reported to be most likely from highway drainage or surface water.

3.3.11 According to historic records provided by the Highways Agency, during two incidents in December 2012 and December 2013, traffic was diverted off the A3 via the M25 roundabout and back on due to surface water on the carriageways. In two incidents in January 2014 and February 2014 flooding occurred on the A3 as a result of an overflowing lake on Surrey Wildlife Trust property adjacent to the A3 during an extended period of wet weather. All of these incidents were confined to the Highways Agency network.

3.3.12 SCC records indicate Esher Road roundabout as an area at risk of flooding from both surface water and the River Mole and hold records of Sheath Lane and neighbouring roads flooding in Oxshott in August 2016 and 2023.

Climate Change

3.3.13 The Environment Agency's online guidance 'Flood risk assessments: climate change allowances'[27] sets out the climate change allowances for peak rainfall intensity allowances for specific 'management catchments' and provides advice on applying climate change projections when preparing flood risk

[40] Surrey County Council (2015) Section 19 Flood Investigation Report: Elmbridge, October 2015.

assessments. The allowances for the management catchments of relevance to Elmbridge are set out in Table 3-5 and Table 3-6.

Table 3-5 Peak rainfall intensity climate change allowances 3.3% annual exceedance rainfall event

Management Catchment	Allowance category	Total potential change anticipated for '2050s' (up to 2060)	Total potential change anticipated for '2070s' (2061 to 2125)
Wey and tributaries Management Catchment	Central (50th)	20%	25%
	Upper end (95th)	35%	35%
Mole Management Catchment	Central (50th)	20%	20%
	Upper end (95th)	35%	35%
Maidenhead and Sunbury Management Catchment	Central (50th)	20%	25%
	Upper end (95th)	35%	35%

Table 3-6 Peak rainfall intensity climate change allowances 1% annual exceedance rainfall event

Management Catchment	Allowance category	Total potential change anticipated for '2050s' (up to 2060)	Total potential change anticipated for '2070s' (2061 to 2125)
Wey and tributaries Management Catchment	Central (50th)	20%	25%
	Upper end (95th)	40%	45%
Mole Management Catchment	Central (50th)	20%	25%
	Upper end (95th)	40%	40%
Maidenhead and Sunbury Management Catchment	Central (50th)	20%	25%
	Upper end (95th)	40%	40%

3.3.14 The RoFSW does not include a specific scenario to determine the impact of climate change on the risk of surface water flooding. However, a range of three annual probability events have been undertaken, 3.3%, 1% and 0.1% AEP, and therefore it is possible to use with caution the 0.1% AEP outline as a substitute dataset to provide an indication of the implications of climate change.

3.4 Flooding from Groundwater

3.4.1 Groundwater flooding usually occurs in low lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather. Low lying areas may be more susceptible to groundwater flooding because the water table is usually at a much shallower depth and groundwater paths tend to travel from high to low ground.

3.4.2 There are many mechanisms of groundwater flooding which are linked to high groundwater levels and can be broadly classified as:

- Direct contribution to channel flow – where the river channel intersects the water table and groundwater enters the streambed increasing water levels and causing flooding,
- Springs erupting at the surface,
- Inundation of drainage infrastructure – where the infrastructure has eroded over time, and,
- Inundation of low-lying property (basements).

3.4.3 The main impacts of groundwater flooding are:

- Flooding of basements of buildings below ground level – this can range from seepage of small volumes of water through walls and temporary loss of services to larger volumes of water, catastrophic loss of belongings and failure of structural integrity,
- Overflowing of sewers and drains – surcharging of drainage networks can lead to overland flows causing localised damage to property. Sewer surcharging can lead to inundation of property by polluted water. However, it is difficult to differentiate between groundwater flooding and other sources (e.g. 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,
- Inundation of roads, commercial, residential and amenity areas – inundation of hard-standing areas can lead to structural damage and the disruption of commercial activity, and,
- Flooding of ground floors of buildings above ground level – can result in structural damage. In addition, a groundwater flood event will typically have a long duration (compared to other flood sources), adding to the disruptive nature of the flood event.

3.4.4 Reference to the BGS ‘Susceptibility to Groundwater Flooding’ dataset in **Appendix A Figure 11** identifies areas where geological conditions could enable groundwater flooding to occur at the surface or groundwater flooding of property situated below ground level

Appendix A Figure 11 - Susceptibility to Groundwater Flooding

3.4.5 In broad terms there is limited potential for groundwater flooding in the central and western part of the Borough which includes the area to the south of Weybridge, the southern area of Esher and to the north of Cobham. The potential for groundwater flooding is greater in Stoke D’Abernon, Hersham, Walton-on-Thames, Thames Ditton and East and West Molesey where the underlying geological conditions are more permeable.

3.5 Flooding from Sewers

3.5.1 During heavy rainfall, flooding from the sewer system may occur if:

1) The rainfall event exceeds the capacity of the sewer system/drainage system:

3.5.2 Sewer systems are typically designed and constructed to accommodate rainfall events with an annual probability of 1 in 30 (3.3% AEP) or greater. Therefore, rainfall events with an annual probability less than 1 in 30 (3.3% AEP) would be expected to result in surcharging of some of the sewer system. While Thames Water Utilities Limited (TWUL), as the sewerage undertaker for EBC, recognise the impact that more extreme rainfall events may have, it is not cost beneficial to construct sewers that could accommodate every extreme rainfall event.

2. The system becomes blocked by debris or sediment:

3.5.3 Over time there is potential that road gullies and drains become blocked from fallen leaves, build-up of sediment and debris (e.g. litter).

3. The system surcharges due to high water levels in receiving watercourses:

3.5.4 Within the study area there is potential for surface water outlets to become submerged due to high river levels. When this happens, water is unable to discharge. Once storage capacity within the sewer system itself is exceeded, the water will overflow into streets and potentially into houses. Where the local area is served by ‘combined’ sewers i.e. containing both foul and storm water, if rainfall entering

the sewer exceeds the capacity of the combined sewer and storm overflows are blocked by high water levels in receiving watercourses, surcharging and surface flooding may again occur but in this instance, floodwaters will contain untreated sewage.

Appendix A Figure 12 - Sewer Flood Records by Postcode

3.5.5 TWUL has provided an extract from their register of flooded properties for the study area. This shows properties that have been affected by sewer flooding (as reported to TWUL) within the last 5 years. Due to data protection requirements, this data has not been provided at the individual property level; rather the register comprises the number of properties within 3 or 4 digit postcode areas that have experienced flooding, either internally or externally, over the last 5 years. It should be noted that it is likely that there have also been unreported sewer flooding incidents in this area over this time period.

3.5.6 TWUL Sewer Flood records, presented in **Appendix A Figure 12**, indicate that the majority of the sewer flooding events have taken place in the Walton on Thames (KT12), Cobham (KT11) and Weybridge (KT12) areas.

3.5.7 SCC also have records of blockages and obstructions in the TWUL system at Downside Road, Cobham and reported that TWUL will be carrying out maintenance in this area.

3.6 Flooding from Reservoirs

3.6.1 There are four large water supply reservoirs present within the Borough, the Queen Elizabeth II Storage Reservoir, Beesborough Reservoir and Knight Reservoir all located within Walton-on-Thames, and Island Barn Reservoir in East and West Molesey. In addition, the Queen Mary Reservoir is located in neighbouring Spelthorne Borough to the north of EBC. TWUL is responsible for the management of these reservoirs and ensuring all required safety standards are met.

3.6.2 The Environment Agency dataset 'Risk of Flooding from Reservoirs' identifies areas that could be flooded if a large[41] reservoir was to fail and release the water it holds (**Appendix A Figure 13**).

3.6.3 The mapping shows the part of the Borough to the north of the railway line to be at risk from the five reservoirs identified above, including Walton-on-Thames, East and West Molesey and Thames Ditton, during a 'dry day' when river levels are normal. During a 'wet day' when there is also flooding from rivers, the flood extents increase. Additional areas at risk during a 'wet day' include Brooklands, areas along the River Mole at Hersham, West End, Willow Tree Farm and Norward Farm, Cobham Park and Stoke D'Abernon.

Appendix A Figure 13 - Risk of Flooding from Reservoirs

3.6.4 The failure of a reservoir has the potential to cause catastrophic damage due to the sudden release of large volumes of water. The PPG[2] encourages LPAs to identify any impounded reservoirs and evaluate how they might modify the existing flood risk in the event of a flood in the catchment it is located within, and / or whether emergency draw-down of the reservoir will add to the extent of flooding.

3.6.5 Reservoirs in the UK have an extremely good safety record. The Environment Agency is the enforcement authority for the Reservoirs Act 1975 in England and Wales. All large reservoirs must be inspected and supervised by reservoir panel engineers. It is assumed that these reservoirs are regularly inspected, and essential safety work is carried out. These reservoirs therefore present a minimal risk.

3.6.6 EBC is responsible for working with members of the Local Resilience Forum (LRF) to develop emergency plans for reservoir flooding and ensuring communities are well prepared.

[41] A large reservoir is one that holds over 25,000 cubic metres of water, equivalent to approximately 10 Olympic sized swimming pools.

3.7 Cumulative impact of development on flood risk

3.7.1 The NPPF states that strategic policies should be informed by a strategic flood risk assessment, and should consider cumulative impacts in, or affecting, local areas susceptible to flooding (paragraph 160).

3.7.2 When allocating land for development consideration should be given to the potential cumulative impact on flood risk with a catchment. Development increases the impermeable area within a catchment, which, if not effectively managed, can cause increased rates and volumes of surface water runoff and changes to floodplain storage, thereby resulting in increased flood risk further downstream. Whilst individual development with appropriate site mitigation measures should not result in measurable local effects with respect to hydrology and flood risk, the cumulative effect of multiple development may be more severe at downstream locations in the catchment.

3.7.3 Locations where there are existing flood risk issues will be particularly sensitive to cumulative effects. For Elmbridge this is considered to include the following locations:

- Areas of functional floodplain, where increases in built footprint could result in increase in flood risk to neighbouring properties.
- Areas at medium to high risk of flooding from surface water, as described in Section 3.3.7.

3.7.4 In these areas it is recommended that EBC consider specific policies or guidance for new development to help reduce the cumulative impact, and where possible, identify opportunities for new development to provide cumulative betterment with respect to flood risk. This may be achieved through implementing the types of measures recommended in Section 5.

3.8 Cross Boundary Considerations

3.8.1 Elmbridge is bordered to the north by the River Thames and the administrative areas of the Spelthorne Borough and the Royal Borough of Richmond upon Thames; to the east by the London Borough of Kingston upon Thames; to the south by Mole Valley District and Guildford Borough; and to the west by Woking and Runnymede Boroughs.

3.8.2 The River Mole flows through Mole Valley District before entering Elmbridge. The River Wey flows through Guildford and Woking before entering Elmbridge.

3.8.3 The ROFSW mapping shows flows from Leatherhead, Bookham and Effingham towards Downside and Stoke D’Abernon.

3.8.4 Where there are cross boundary flows, communication between LPAs is of high importance to ensure action in one does not negatively impact upon another

4. Avoiding Flood Risk

4.1 Sequential Approach

4.1.1 This Section guides the application of the Sequential Test and Exception Test in the Plan-making and planning application processes. Not all development will be required to undergo these tests, as described below, but may still be required to undertake a site-specific FRA, guidance about which is included in Section 7.

4.1.2 The sequential approach is a decision-making tool designed to select sites so that development is, as far as reasonably possible, located where the risk of flooding from all sources is lowest, taking account of climate change and the vulnerability of future users to flood risk. This will help avoid the development of sites that are inappropriate on flood risk grounds. The subsequent application of the Exception Test, where required, will ensure that new developments in flood risk areas will only occur where flood risk is clearly outweighed by other sustainability and safety drivers.

4.1.3 The sequential approach can be applied at all levels and scales of the planning process, both between and within Flood Zones. All opportunities to locate new developments (except Water Compatible) in reasonably available areas of little or no flood risk should be explored, prior to any decision to locate them in areas of higher risk.

4.1.4 It is noted that, as set out in Table 2 of the PPG[2], reproduced in Table 4-1, some development types are not permitted in certain Flood Zones regardless of the findings of the Sequential Test.

4.2 Applying the Sequential Test for the Local Plan

4.2.1 Figure 4-1 illustrates the approach for applying the Sequential Test that EBC should adopt in the allocation of sites as part of the preparation of the Local Plan. The Sequential Test should be undertaken by EBC and accurately documented to ensure decision processes are consistent and transparent.

4.2.2 The Sequential Test requires an understanding of the risk of flooding in the study area from all sources (as provided within this SFRA) and the vulnerability classification of the proposed developments as defined in the PPG are presented in Table 4-1.

4.2.3 All sources must be considered when planning for new development including flooding from land or surface water runoff; groundwater; sewers; and artificial sources. If a location is recorded as having experienced repeated flooding from the same source this should be acknowledged within the Sequential Test.

4.2.4 Sites should be identified as at low/medium/high risk considering all sources of flooding. It is noted that the definition is not synonymous with the Flood Zones on the Flood Map for Planning, as these are defined by the probability of flooding. It is also noted that a site may be defined as high risk due to one source of flooding, even though the risk from all other sources of flooding is low.

4.2.5 The Sequential Test needs to be applied to the whole LPA area to increase the possibilities of delivering development not exposed to flood risk, both now and in the future. When preparing a Local Plan, the LPA should demonstrate that a range of site allocations have been considered, using the SFRA to apply the Sequential and Exception Tests where necessary.

4.2.6 Where it is not possible to locate development in low-risk areas, the Sequential Test should go on to compare sites within medium risk areas and only where there are no sites in low and medium risk areas, should high-risk areas be considered.

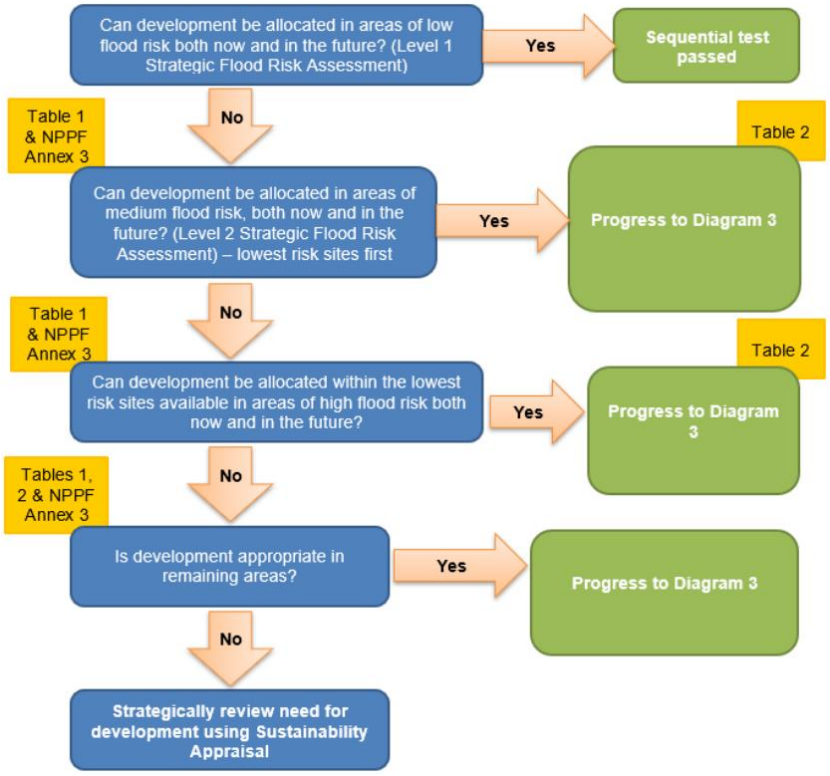


Figure 4-1 Applying the sequential test in the preparation of a Local Plan (PPG Diagram 2)

Table 4-1 Flood Risk Vulnerability Classification (NPPF Annex 3)

Vulnerability Classification	Development Uses
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 infrastructure for electricity supply including generation, storage and distribution systems; including electricity generating power stations, grid and primary substations storage; and water treatment works that need to remain operational in times of flood. Wind turbines. Solar farms.
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. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure'.)
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.

Vulnerability Classification	Development Uses
	Land and buildings used for agriculture and forestry. Waste treatment (except landfill* 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. Car parks.
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.

4.2.7 The NPPF indicates suitability of a development based on its vulnerability and location within a fluvial Flood Zone as set out in Table 4-2. However, the vulnerability classification of types of development is still relevant in considering flood risk from other sources. For example, a basement dwelling will still be more vulnerable to surface water flooding than an office development.

Table 4-2 Flood Risk Vulnerability and Flood Zone 'Incompatibility' (PPG Table 2)

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	**1**	✓	✓	✓	✓	✓
	2	✓	✓	Exception Test Required	✓	✓
	3a †	Exception Test Required †	✓	✗	Exception Test Required	✓
	3b *	Exception Test Required *	✓*	✗	✗	✗

✓ – Exception Test is not required ✗ – 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 (Functional Floodplain) Essential Infrastructure that has passed the Exception Test, and Water-Compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood.
- result in no net loss of floodplain storage. and
- not impede water flows and not increase flood risk elsewhere.

Recommended stages for LPA application of the Sequential Test

4.2.8 The recommended steps in undertaking the Sequential Test are detailed below. To assist with the application of the Sequential Test, a site assessment database has been developed for EBC, containing sites that may be proposed for allocation within the emerging New Local Plan. Each site is assessed based on the information and datasets within this SFRA. This provides a useful tool to

enable EBC to apply a sequential approach to the selection of sites, considering all sources of flooding now and in the future. This database can be used by EBC when applying the steps below:

1. Identify the site location and boundary.
2. Assign potential developments with a vulnerability classification (Table 4-1). Where development is mixed, the development should be assigned the highest vulnerability class of the developments proposed.
3. The design life of the development should be considered with respect to climate change:
    - 100 years for residential developments; and
    - A minimum of 75 years for commercial / industrial developments, or other time horizon specific to the non-residential use proposed.
4. Identify the risk of flooding from all sources, both now and in the future, using the SFRA.
5. Identify any existing flood defences serving the potential development sites. (However, it should be noted that for the purposes of the Sequential Test, the risk of flooding ignoring defences should be used).
6. Use this information to rank the sites from lowest to greatest risk of flooding from all sources. This is likely to be an iterative process, and the LPA will need to consider the relative risk posed by different sources of flood risk.
7. Steer development towards those sites at lowest risk, prior to the consideration of sites at greater risk.
8. Document the decision making process to demonstrate how sites are considered to have 'passed' the Sequential Test.
9. For sites that are deemed to have passed the Sequential Test, determine whether the Exception Test also needs to be applied, by referring to Table 3 of the PPG. (Reproduced in Table 4-2).

4.2.9 Where the development is Highly Vulnerable, More Vulnerable, Less Vulnerable or Essential Infrastructure and a site is found to be impacted by a recurrent flood source (other than tidal or fluvial), the site and flood sources should be investigated further regardless of any requirement of the Exception Test.

Approach for Ranking Sites

4.2.10 As noted above, using the information within this SFRA, a site assessment database has been developed for EBC, containing potential development sites that are under consideration within the Local Plan. Each site is assessed based on the information and datasets within this SFRA and an approach established to rank the sites to reflect the level of risk from all sources.

4.2.11 As noted in the Strategic flood risk assessment good practice guide[42], there is no specified approach in existing guidance of how to apply this ranking, and it is therefore for the LPA undertaking the process to decide. There are different approaches because there is variation between the different sources of flooding which means that they cannot also be considered 'equivalent'. For example, in terms of:

- the **impact of the flooding** from each source (for example, the risks from reservoir flooding and surface water flooding are different in terms of likelihood and resulting flood depths and damage);
- the **reliability of the data** used to assess the risk (for example, hydraulic modelling undertaken to determine the risk of river and sea flooding is more detailed and reliable than national or regional scale mapping of groundwater flood risk based on a high level understanding of geology);
- the **perceived ease with which each source can be managed** (for example, there is a perception that in some situations, flooding from one particular source may be easier to

[42] Environment Agency, ADEPT, CIWEM, Strategic flood risk assessments: A good practice guide. https://www.adeptnet.org.uk/strategic-flood-risk-assessment-good-practice-guide

manage and therefore doesn't need so much weight given to it during site selection and strategic planning).

4.2.12 For EBC, the ranking displayed in Table 4-3 was applied. All the sites are assessed within the database based on all sources of flooding, however in the overall scoring applied, scores 1-5 initially relate to the risk of flooding from rivers. These sites may also be at risk of surface water and/or groundwater flooding, and this is clearly visible when viewing the results in the database. However, in order to establish a simple ranking that enables the application of the sequential approach, it was considered appropriate to screen the sites based on the flood zones because:

- It was considered the source of greater risk posed to the sites, and
- It is the source of flood risk for which the datasets are more accurate (i.e. hydraulic modelling).

4.2.13 EBC have used this approach as a tool for applying the sequential approach to the sites under consideration.

Table 4-3 Approach to ranking sites based on risk of flooding

Score	Criteria
1	Part of the site is within Flood Zone 3b associated with the Dead River, Lower Mole, Middle Mole, Lower Wey, Lower Thames or Rythe
2	More than 50% of the site is defined as Flood Zone 3a
3	Less than 50% of the site is defined as Flood Zone 3a
4	More than 50% of the site is defined as Flood Zone 2
5	Less than 50% of the site is defined as Flood Zone 2
6	The site is located within a High Priority Flood Area
7	The site is located within a Medium Priority Flood Area
8	The site is defined as Flood Zone 1 and intersects an area at high risk of flooding from surface water and/or intersects an area that has the potential for groundwater flooding to occur at surface and/or lies within a Postcode Area with 30 or more DG5 sewer flood records.
9	The site is defined as Flood Zone 1 and intersects an area at medium risk of flooding from surface water and/or intersects an area that has the potential for groundwater flooding of property situated below ground level and/or lies within a Postcode Area with 20 or more DG5 sewer flood records.
10	The site is defined as Flood Zone 1 and intersects an area at low risk of flooding from surface water and/or intersects an area that has limited potential for groundwater flooding to occur and/or lies within a Postcode Area with 10 or more DG5 sewer flood records.
11	The site is defined as Flood Zone 1 and is at risk of reservoir flooding in the event of a failure or a breach on a wet or dry day or lies within a Postcode Area with 5 or more DG5 sewer flood records.
12	The site is defined as Flood Zone 1 and is not shown to be at risk of any flooding.

4.3 Applying the Sequential Test for Planning Applications

4.3.1 It is necessary to undertake a Sequential Test for a planning application if both of the following apply:

- The proposed development is in Flood Zone 2 or 3.
- A Sequential Test has not already been done for a development of the type you plan to carry out on your proposed site (check with EBC).

4.3.2 The Sequential Test should be applied to 'Major'[43] and 'Non-major development'[44] proposed in areas at risk of flooding. The Environment Agency publication 'Demonstrating the Flood Risk Sequential Test for Planning Applications[45]' sets out the procedure for applying the Sequential Test to individual applications as follows:

- Identify the geographical area of search over which the test is to be applied; this could be the Borough area, or a specific catchment if this is appropriate and justification is provided (e.g. school catchment area or the need for affordable housing within a specific area). For individual planning applications subject to the Sequential Test, the area to apply the test will be defined by local circumstances relating to the catchment area for the type of development proposed. For nationally or regionally important infrastructure the area of search to which the Sequential Test could be applied will be wider than the LPA boundary.
- Identify the source of 'reasonably available' alternative sites; usually drawn from evidence base / background documents produced to inform the Local Plan. The definition of 'reasonably available sites' is defined within the PPG[2] as sites in a suitable location for the type of development with a reasonable prospect that the site is available to be developed at the point in time envisaged.
- State the method used for comparing flood risk between sites; for example, the Environment Agency Flood Map for Planning, the SFRA mapping, site-specific FRAs if appropriate, other mapping of flood sources.
- Apply the Sequential Test; systematically consider each of the available sites, indicate whether the flood risk is higher or lower than the application site, state whether the alternative option being considered is allocated in the Local Plan, identify the capacity of each alternative site, and detail any constraints to the delivery of the alternative site(s).
- Conclude whether there are any reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.
- Where necessary, as indicated by Table 4-2, apply the Exception Test.
- Apply the Sequential approach to locating development within the site.

4.3.3 It should be noted that it is for EBC, taking advice from the Environment Agency as appropriate, to consider the extent to which Sequential Test considerations have been satisfied, taking into account the particular circumstances in any given case. The developer should justify with evidence what area of search has been used when making the application.

4.3.4 Ultimately, after applying the Sequential Test, EBC needs to be satisfied in all cases that the proposed development would be safe and not lead to increased flood risk elsewhere. This needs to be demonstrated within an FRA (see Section 7) and is necessary regardless of whether the Exception Test is required.

Recommendation 4-1 *It is recommended that EBC keep an up-to-date register of 'reasonably available' sites, clearly ranked in flood risk preference, and prepare guidance on the appropriate area of search for common development types.*

Sequential Test Exemptions

4.3.5 It should be noted that the Sequential Test does not need to be applied in the following circumstances:

- Individual developments proposed on sites which have been allocated in development plans through the Sequential Test.

[43] 'Major' development defined by the Town and Country Planning Order 2015 as development involving any of the following: the winning and working of materials or the use of land for mineral-working deposits; waste development; provision of dwelling houses where the number of houses to be provided is 10 or more or development is to be carried out on a site having an area of 0.5 hectares or more; the provision of a building or buildings where the floor space is 1000 square metres or development carried out on a site having an area of 1 hectare or more.
[44] 'Non major development' is any development falling below the 'Major' thresholds but excluding minor development.
[45] Environment Agency (2012) Demonstrating the flood risk Sequential Test for Planning Applications, Version 3.1. Available from: http://www.gwfoe.org.uk/wp-content/uploads/2014/01/EA-Sequential-Test-Process-v3.1-April-2012.pdf
https://www.gov.uk/guidance/flood-risk-assessment-the-sequential-test-for-applicants

- Minor development, which is defined in the NPPF[1] as:
    - minor non-residential extensions: industrial / commercial / leisure etc. extensions with a footprint <250m^2.
    - alterations: development that does not 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 additional to physical extensions 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.
- Change of Use applications, unless it is for a change of use of land to a caravan, camping or chalet site, or to a mobile home site or park home site.
- Development proposals in Flood Zone 1 (land with a low probability of flooding from rivers or the sea) unless the SFRA, or other more recent information, indicates there may be flooding issues now or in the future (for example, through the impact of climate change).
- Redevelopment of existing properties (e.g. replacement dwellings), provided they do not increase the number of dwellings in an area of flood risk (i.e. replacing a single dwelling with an apartment block).

4.4 Exception Test

4.4.1 Following the application of the Sequential Test it may be concluded that there are no reasonable available alternative sites in areas of lower risk, and in some cases the Exception Test may be required. Figure 4-2 shows the decision-making process and Table 4-1 identifies when the Exception Test is required, based on the Flood Zone and the vulnerability classification of the proposed development. The Exception Test should only be applied as set out in Figure 4-2 i.e. only if the Sequential Test has shown that there are no reasonably available, lower-risk sites, suitable for the proposed development, to which the development could be steered.

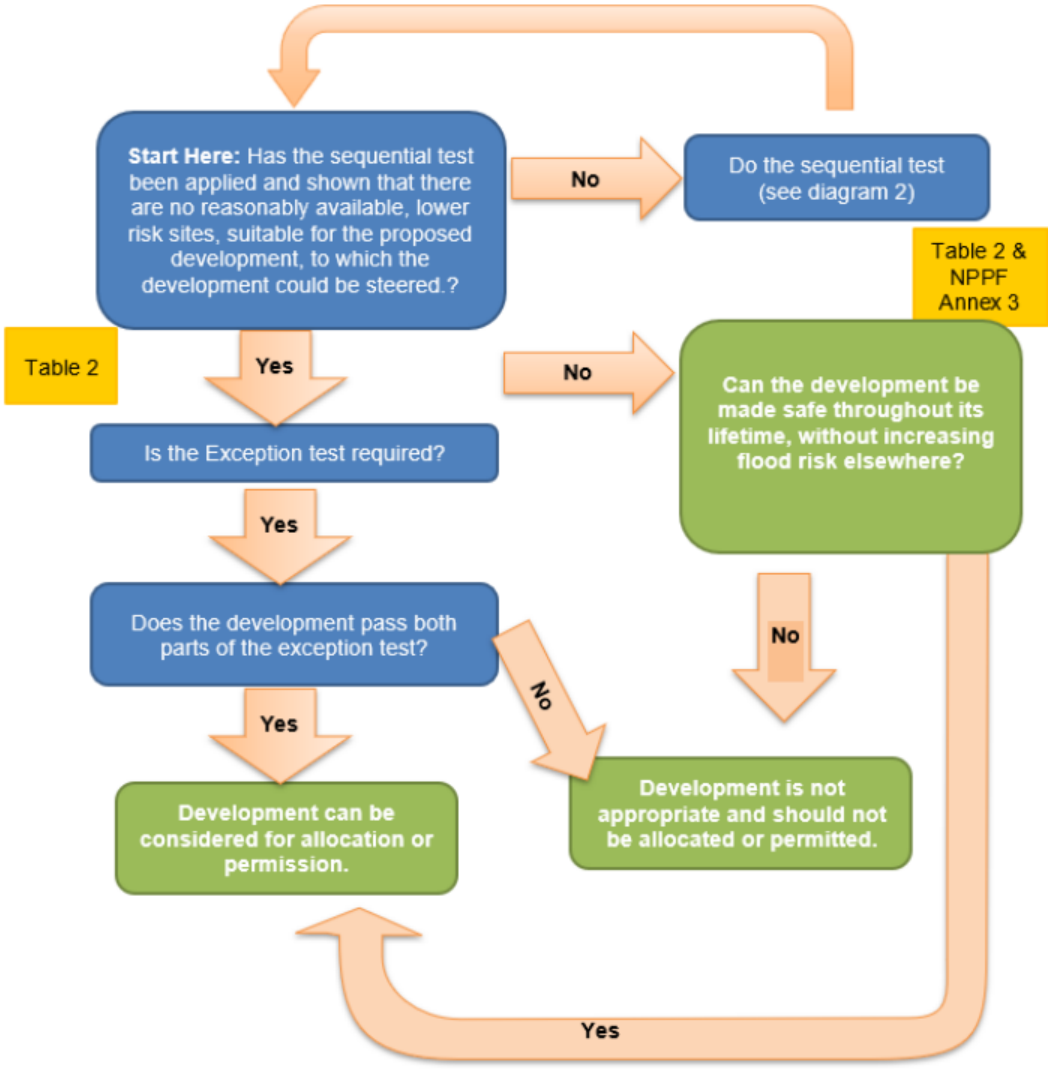


Figure 4-2 Application of the Exception Test in the preparation of a Local Plan (PPG Diagram 3)

4.4.2 For the Exception Test to be passed:

- Part 1 - It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by the SFRA where one has been prepared; and
- Part 2 - A site-specific FRA 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. If the risk of flooding is not reduced overall, the FRA must also demonstrate why measures to reduce flood risk overall have not been secured, for example if such measures cannot be identified or are unfeasible.

4.4.3 Both elements of the Exception Test will have to be passed for development to be allocated or permitted.

4.4.4 In order to satisfy the first part of the Exception Test, the objectives of the Sustainability Appraisal (SA) can be used to assess each potential development site. The Strategic Environmental Assessment and Sustainability Appraisal Scoping Report[7] includes a series of sustainability objectives which allow quantification of the sustainable development of a potential development site (Table 4-4).

4.4.5 With respect to the second part of the Exception Test, there are a number of ways a new development can be made safe:

- Avoiding flood risk by not developing in areas at risk of flooding.

- Substituting higher vulnerability land uses for lower vulnerability uses in higher flood risk locations and locating higher vulnerability uses in areas of lower risk on a strategic scale, or on a site basis.
- Providing adequate flood risk management infrastructure which will be maintained for the lifetime of the development.
- Mitigating the potential impacts of flooding through design and resilient construction.
- Managing the remaining residual risk through flood warning and emergency planning measures. appropriate evacuation procedures and flood response infrastructure are in place to manage the residual risk associated with an extreme flood event.

4.4.6 Consideration must also be made to ensure that the risk of flooding elsewhere is not increased and where possible is reduced.

4.4.7 Further guidance on how development could satisfy the second part of the Exception Test is provided in Sections 5 and 6.

Table 4-4 EBC Sustainability Appraisal Framework Objectives (2020)

Sustainability Appraisal Objective	
1.	To provide sufficient housing to enable people to live in a home suitable to their needs and which they can afford
2.	To facilitate the improved health and wellbeing of the whole population
3.	To conserve and enhance, archaeological, historic, and cultural assets and their settings
4.	To reduce the need to travel, encourage sustainable transport options and improve accessibility to all services and facilities
5.	To make the best use of previously developed land and existing buildings
6.	To support economic growth, which is inclusive, innovative, and sustainable
7.	To provide for employment opportunities to meet the needs of the local economy
8	To reduce greenhouse gas emissions and move to a low carbon economy
9.	To use natural resources prudently
10	To adapt to the changing climate
11.	To reduce flood risk
12.	To improve the water quality of rivers and groundwater and maintain an adequate supply of water
13.	To reduce land contamination and safeguard soil quality and quantity
14.	To ensure air quality continues to improve and noise and light pollution are reduced
15.	To protect and enhance landscape character

5. Measures to Control and Mitigate Flood Risk

5.1 Overview

5.1.1 The NPPF appreciates that it may not always be possible to avoid locating development in areas at risk of flooding. This Section provides guidance on the range of measures that could be considered in order to manage and mitigate flood risk. These measures should be considered when preparing a site-specific FRA, as described in Section 7.

5.1.2 It is essential that the development management process influencing the design of future development within the Borough carefully mitigates the potential impact that climate change may have upon the risk of flooding. As a result, mitigation measures should be designed with an allowance for climate change over the lifetime of the proposed development as follows:

- 100 years for residential developments; and
- 75 years for commercial / industrial developments, or other time horizon specific to the non-residential use proposed.

5.2 Development Layout and Sequential Approach

Recommendation 5-1 *A sequential approach to site planning should be applied within new development sites. Location of development must take account of the vulnerability of users.*

5.2.1 Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development. Most large development proposals include a variety of land uses of varying vulnerability to flooding. The sequential approach should be applied *within* development sites to locate the most vulnerable elements of a development in the lowest risk areas (considering all sources of flooding) e.g. residential elements should be restricted to areas at lower probability of flooding whereas parking, open space or proposed landscaped areas can be placed on lower ground with a higher probability of flooding. Table 2 in the PPG, reproduced in Table 4-2, provides the incompatibility matrix and determines which types of development are appropriate in areas of flood risk.

5.3 Safeguarding land for flood risk management

Riverside Development

Recommendation 5-2 *Safeguard an 8-metre-wide undeveloped buffer strip alongside Main Rivers and prioritise opportunities for riverside restoration. Safeguard a 5-metre-wide buffer strip alongside Ordinary Watercourses. Prioritise opportunities to de-culvert watercourses. New development within 8m of a Main River or Ordinary Watercourse will require consent from either the Environment Agency or SCC (as LLFA) respectively.*

5.3.1 The Environment Agency would seek an 8-metre-wide undeveloped buffer strip alongside fluvial Main Rivers for maintenance purposes and would also ask developers to explore opportunities for riverside restoration as part of any development. SCC would seek a 5-metre-wide undeveloped buffer strip to be retained alongside Ordinary Watercourses.

5.3.2 The Environmental Permitting Regulations 2016 require a Flood Risk Activity Permit (FRAP) to be obtained for works on or near a Main River, on or near a flood defence structure, or in a floodplain. Applicants should review the Environment Agency flood risk activities: environmental permit information[46] to determine if a permit is required.

[46] Flood risk activities: environmental permits. https://www.gov.uk/guidance/flood-risk-activities-environmental-permits

5.3.3 Flood Risk Permits assess the methodology of undertaking the works whilst planning assesses the principle of those works. For further information or advice, applicants and developers should contact the Environment Agency enquiries@environment-agency.gov.uk.

5.3.4 Responsibility for the consenting of works by third parties on Ordinary watercourses, under Section 23 of the Land Drainage Act 1991 (as amended by the Flood and Water Management Act 2010), lies with the LLFA. SCC is responsible for the consenting of works to Ordinary Watercourses and has powers to enforce un-consented and non-compliant works. This includes any works (including temporary) that affect flow within the channel (such as in channel structures or diversion of watercourses). Enquiries and applications for Ordinary Watercourse consent should be sent to suds@surreycc.gov.uk. Further information can be found on the SCC website[47].

5.3.5 Consent will be refused if the works would result in an increase in flood risk, a prevention of operational access to the watercourse and/ or an unacceptable risk to nature conservation[48].

Flood Zone 3b Functional Floodplain

Recommendation 5-3 *Safeguard Flood Zone 3b Functional Floodplain for flood storage.*

Undeveloped land

5.3.6 The Functional Floodplain is defined by EBC, in Table 3-2 of this SFRA and presented in **Appendix A Figure 5**, comprises **undeveloped land** within the flood outline. This includes Ditton Field, Desborough Island and Hurst Meadows adjacent to the River Thames; land south of the River Thames at Desborough Island and south of Sunbury Lock; Bull Dog Island and Trinity Island; land to the south of Brooklands adjacent to the River Wey; land to the south of Wey Meadows and the relatively wide floodplain of the Middle Mole which comprises rural land. Areas along the River Rythe include land to the to the south of the A3 at Oxshott, land to the west of Claygate Train Station and Littleworth Common.

Appendix A Figure 5 – Flood Zones

5.3.7 These areas should be safeguarded from any development. Where Water Compatible or Essential Infrastructure cannot be located elsewhere, the development must:

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

Developed land

5.3.8 Within the Functional Floodplain flood outline (**Appendix A Figure 5**) there are areas of existing development which are prevented from flooding by the presence of existing infrastructure or solid buildings. In these **developed areas**, existing building footprints, where it can be demonstrated that they exclude floodwater, will not be defined as Functional Floodplain and the planning requirements associated with Flood Zone 3b will not apply.

5.3.9 These areas include:

- Wey Road, Dorney Road and Round Oak Road, Weybridge.
- Walton Lane, Weybridge.
- Wey Meadows, Weybridge.
- Brooklands Road, Weybridge.
- Wheatley's Eyot and Beasley's Ait, Walton-on-Thames.
- Shaw Drive, Walton-on-Thames.
- Ash Estates including The Crescent and Felix Lane, Walton-on-Thames.
- Molesey Road, Walton-on-Thames.

[47] https://www.surreycc.gov.uk/people-and-community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/ordinary-watercourse-consents
[48] Surrey County Council (2017) Surrey County Council Local Flood Risk Management Strategy. https://www.surreycc.gov.uk/people-and-community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/surrey-local-flood-risk-management-strategy

- Braycourt Avenue, Cottimore Lane, Cottimore Crescent, Florence Road, Hillary Crecent, Stuart Avenue Regency Gardens, Ambleside Avenue, Walton Oak Primary School, Walton-on-Thames.
- King George Avenue, Wolsey Drive, Holly Avenue and Rydens Road, Walton-on-Thames.
- Monks Avenue, Knights Close, Ivydene and The Dene, East and West Molesey.
- Molesey Avenue and Armfield Close, East and West Molesey.
- Walton Road, Central Avenue, Dunstable Road and Minster Gardens, East and West Molesey.
- Molesey Road, Pool Road, Brokenhurst, Nydene and Bishop Fox Way, West Moseley.
- A3050, Hampton Court Cresent, The Riverside, East and West Molesey.
- Graburn Way, Hurst Road, Riverbank and Feltham Avenue, East Moseley.
- Summer Road, Aragon Avenue, Queens Road, Alexandra Road, River Bank, Riversdale Road, Thames Side and Ferry Road, Thames Ditton.
- Thames Ditton Island, Thames Ditton.
- Station Road and Winston Drive, Stoke D'Abernon.
- Chelsea FC Cobham Training Ground on Stoke Lane, Stoke D'Abernon.
- Prince's Drive, Birds Hill Drive, Montrose Gardens and Fairoak Lane, Stoke D'Abernon.
- Heathside and Medina Avenue, Esher.
- Couchmore Avenue, Montgomery Avenue, Esher.
- Rythe Road, Esher.

5.3.10 The land surrounding these buildings provide important flow paths and flood storage areas and properties within these areas will be subject to frequent flooding; therefore, care must be given to the future sustainability of such development.

5.3.11 Where redevelopment is proposed in **developed areas**, schemes should not increase the vulnerability classification of the site. All schemes must result in a net reduction in flood risk and ensure that floodplain storage and flow routes are not affected. This can be achieved through a combination of on and off-site measures including:

- Reducing the land use vulnerability.
- Seeking opportunities to ensure there is no increase or achieve a reduction in the number of people at risk (e.g. avoiding conversions and rebuilds of properties that result in an increase in the number of residential dwellings).
- Maintaining or reducing built footprint.
- Raising finished floor levels.
- Reducing surface water runoff rates and volumes from the site.
- Increasing floodplain storage capacity and creating space for flooding to occur by restoring functional floodplain.
- Reducing impedance to floodwater flow and restoring flood flow paths.
- Incorporating flood resilient and/or resistance measures.
- Ensuring development remains safe for users in time of flood (this may refer to the timely evacuation of properties prior to the onset of flooding in accordance with an individual Emergency Flood Plan for the site).

5.3.12 Proposals for the change of use or conversion to a use with a higher vulnerability classification should not be permitted.

5.3.13 Basement, basement extensions or conversions of basements to a higher vulnerability classification should not be permitted.

5.3.14 Where minor development is proposed, schemes should not affect floodplain storage or flow routes through the incorporation of raised finished floor levels and where possible, the provision of direct or indirect floodplain compensation, flood resilience measures and the removal of other non-floodable structures or replacement of impermeable surfaces with permeable.

5.3.15 The consideration of whether a site is 'developed' or 'undeveloped' will be considered on a case-by-case basis as part of the planning application process, having regard to the presence of existing buildings on the site and the existing routing of floodwater through the site during times of flood.

Green Infrastructure

Recommendation 5-4 *Safeguard land likely to be needed for green infrastructure. Use the SFRA to inform the ongoing development of the EBC Green and Blue Infrastructure Study.*

5.3.16 Green Infrastructure (GI) is a strategically planned and managed network of natural and semi-natural green (land) and blue (water) spaces that intersperse and connect urban centres, suburbs, and rural fringe, consisting of:

- Open spaces e.g. parks, woodland, nature reserves and lakes.
- Linkages e.g. river corridors, canals, pathways, cycle routes and greenways.
- Networks of 'urban green' e.g. private gardens, street trees, verges, and green roofs.

5.3.17 The identification and planning of GI are critical to sustainable growth and flood risk management. GI can provide a wide range of ecosystem services, including climate mitigation and adaptation, and is central to climate change action. GI also provides additional green spaces for storm flows, freeing up water storage capacity in existing infrastructure and reducing the risk of damage to urban property, particularly in city centres and vulnerable urban regeneration areas. Additionally, GI can improve accessibility to waterways and water quality, supporting regeneration and improving opportunity for leisure, economic activity, and biodiversity.

5.3.18 EBC have undertaken a Green and Blue Infrastructure Study[49] to support the delivery of the Local Plan. The Study should draw on information within this SFRA to continue to develop the understanding of the green and blue infrastructure network and opportunities to expand and develop the network.

Flood storage

Recommendation 5-5 *Identify opportunities for additional flood storage.*

5.3.19 Flood Storage Areas (FSAs) are natural or man-made areas that temporarily fill with water during periods of high river levels, retaining a volume of water which is released back into the watercourse after the peak river flows have passed. There are two main reasons for providing temporary detention of floodwater:

- To compensate for the effects of catchment urbanisation, and
- To reduce flows passed downriver and mitigate downstream flooding.

5.3.20 Providing flood storage within a development area or further upstream of a development can manage and control the risk of flooding. In some cases, it can provide sufficient flood protection on its own; in other cases, it may be chosen in conjunction with other measures. The advantage of flood storage is that the flood alleviation benefit generally extends further downstream, whereas other methods tend to benefit only the local area and may increase the flood risk downstream.

5.3.21 Further guidance on flood storage is provided within Chapter 10 of the Environment Agency's Fluvial Design Guide[50].

5.3.22 SCC have indicated that the Environment Agency and EBC are to carry out a review of the potential basin area to increase flood storage capacity at the Desborough Island flood storage area. EBC are also investigating possible attenuation options to increase the capacity of the existing system at Cobham Park.

Natural Flood Management

5.3.23 Natural flood management (NFM) involves techniques that aim to work with natural hydrological and morphological processes, features, and characteristics to manage the sources and pathways of flood waters. Techniques include the restoration, enhancement and alteration of natural features and

[49] Elmbridge Borough Council Green and Blue Infrastructure Study, May 2022. https://www.elmbridge.gov.uk/sites/default/files/2023-05/Green%20and%20Blue%20Infrastructure%20Study%202022.pdf
[50] Environment Agency, Fluvial Design Guidance Chapter 10 https://assets.publishing.service.gov.uk/media/60549b7a8fa8f545cf209a29/FDG_chapter_10_-_Flood_storage_works.pdf

characteristics, but exclude traditional flood defence engineering that works against or disrupts these natural processes.

5.3.24 The contribution NFM techniques can make to reduce the causes and impacts of flooding will vary greatly from case to case. In some cases, they may be capable of comprehensively addressing flood risk to a site on their own, but in many cases, they will need to be used in a complementary way alongside more conventional flood risk management techniques such as engineered defences. NFM techniques can also contribute to the delivery of biodiversity and environmental net gains and support the implementation of River Basin Management Plans (RBMPs) and the public body duty to have regard to them.

5.3.25 SCC has identified potential for NFM in the Catchment Action Plans on Esher Common, near Stoke Wood in Oxshott and near Sheath Lane, Oxshott.

5.3.26 There are a number of opportunities available to reduce the causes and impacts of flooding through Working with Natural Processes (WWNP)[51]. This involves implementing measures that help to protect, restore, and emulate the natural functions of catchments, floodplains, rivers, and the coast. WWNP takes many forms and can be applied in urban and rural areas, and on rivers, estuaries, and coasts.

5.3.27 As part of a research project undertaken by the Environment Agency and Flood and Coastal Risk Management Research and Development Programme, a series of spatial datasets have been generated for these natural processes[52], identifying their best estimate of locations in the country where the methods can be applied.

Table 5-1 Description of WWNP datasets

Natural Process	Benefits	Most Effective Conditions	Notes
Floodplain Woodland Planting Potential	Slows floodwaters and increases water depth on the floodplain. Reduces flood peaks, delays flood peak timing and desynchronises flood peaks. Enhances sediment deposition on the floodplain.	Middle and lower river reaches of middle to large catchments.	Based upon Flood Zone 2. Information is largely based on modelled data and open constraints data and is indicative rather than specific.
Riparian Woodland Planting Potential (woodlands on land immediately adjoining a watercourse)	Slows flood flows. Reduces sediment delivery to the watercourse. Reduces bankside erosion. Creates below ground storage.	At the river reach scale in middle and upper catchments.	Based upon a 50m buffer of available OS Open Data river networks. Information is largely based on open data and is indicative rather than specific.
Wider Catchment Woodland	Intercepts, slows, stores and filters water. Reduces flood peaks, flood flows and frequency.	Small events on small catchments – extent of reduction decreases as flood magnitude increases.	Based upon the 1:50k BGS geology survey and relies upon identifying drift and bedrock geologies that are characteristic of slowly permeable soils. Information is largely based on the 100m gridded version of BGS data and open constraints data and is indicative rather than specific.
Floodplain Reconnection Potential (reconnecting watercourses and floodplains)	Encourages more regular floodplain inundation and flood water storage. Decreases the magnitude of flood peaks and reduces downstream flood depths.	High frequency, low return period floods.	Designed to support signposting of areas where there is currently poor connectivity such that flood waters are constrained to the channel and flood waves may therefore propagate downstream rapidly. Based upon the Risk of Flooding from Rivers and Seas probability maps and identifies areas of low and very low probability that are close to a watercourse, but do not contain residential property or key services (may

[51] Environment Agency and Flood and Coastal Risk Management R&D Programme. (2021) Working with Natural Processes to Reduce Flood Risk. Available from: https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/working-with-natural-processes-to-reduce-flood-risk?web=1&wdLOR=c56AD7DAC-BB7B-471B-94B4-B5C5B91DEEE4

[52] Working with Natural Processes datasets https://environment.data.gov.uk/searchresults;query=wwnp;searchtype=All;page=1;pagesize=20;orderby=Relevancy

Natural Process	Benefits	Most Effective Conditions	Notes
			contain non-residential property – important to consider).
Runoff Attenuation Features (3.3% AEP and 1% AEP) (includes swales, ponds and sediments traps)	Delays and flattens the hydrograph and reduces peak flow locally for small flood events.	A cluster of features working as a network throughout the landscape.	Based upon the RoFSW datasets and identifies areas of high flow accumulations for the 3.3% AEP and 1% AEP surface water maps. The areas of ponding or accumulation are between 100 and 5000 metres squared and have been tagged where they fall on an area of slope steeper than 6% as gully blocking opportunities

5.3.28 Defra have produced a Woodland Constraints dataset[52] which refines potential locations for WWNP, taking into account roads, rail, urban areas, existing woodland, peat, and water bodies.

5.3.29 The WWNP data does not provide information on design, which may need to consider issues such as drain-down between flood events. It is important to note that land ownership and change to flood risk have not been considered. Locations identified may have more recent building or land use than available data indicates.

Appendix A Figure 14 - Working With Natural Processes

5.3.30 **Appendix A Figure 14** provides information from the Environment Agency's 'Working with Natural Processes – Evidence Directory[52]' about where these measures could be applied. This map shows that although there are a lot of existing woodland constraints within the Borough, there are also a wide range of opportunities to implement natural processes to alleviate flooding. There are potential opportunities for floodplain woodland planting and riparian woodland planting near Hersham, Cobham and Stoke D'Abernon, near the River Mole, with some small areas of floodplain reconnection potential. Wider catchment woodland potential is mapped to the south of the River Mole at Cobham and south of Fairmile Park. Towards the north of the Borough, between the Dead River and the River Ember, some wider catchment woodland opportunities, riparian and floodplain woodland planting potential and floodplain reconnection potential are presented on the map. There are also potential opportunities to the east of the Borough with some wider catchment woodland opportunities, riparian woodland planting potential and floodplain reconnection potential.

Recommendation 5-6 *Extend and enhance existing Green Infrastructure (GI) in the Borough including the implementation of floodplain and riparian woodland planting schemes. Land that is likely to be needed for natural flood management should be safeguarded. Consideration should also be given to any necessary access to that land, and any additional land which may be needed temporarily during construction.*

5.3.31 The mapping in **Appendix A Figure 14** should be used by EBC to support future blue and green infrastructure planning.

5.4 Sustainable Drainage Systems

Recommendation 5-7 *Peak runoff rate from development sites must be as close as reasonably practicable to the greenfield run runoff rate from the same rainfall event.*

Recommendation 5-8 *Surface water should be managed and discharged from the site in accordance with the drainage hierarchy.*

Recommendation 5-9 *Opportunities should be taken to use a range of sustainable surface water management techniques which not only contribute to a reduction in discharge rates from the site, but provide amenity, biodiversity and water quality improvements and contribute to mitigating climate change by considering both drought and flood conditions.*

5.4.1 It should be noted that Schedule 3 to the Flood and Water Management Act 2010 is due to be implemented during 2024 and developments will need to comply with Schedule 3 once in place. Schedule 3 provides a framework for the approval and adoption of drainage systems, a SuDS approval body within unitary and county councils, and national standards on the design, construction, operation, and maintenance of sustainable drainage systems for the lifetime of the development.

5.4.2 The layout and function of drainage systems needs to be considered at the start of the design process for new development, as integration with road networks and other infrastructure can maximise the availability of developable land. This should ideally be achieved by incorporating SuDS.

5.4.3 SuDS are designed to control surface water run off close to where it falls, combining a mixture of built and nature-based techniques to mimic natural drainage as closely as possible, and accounting for the predicted impacts of climate change. Where possible, SuDS solutions for a site should seek to provide benefits for:

- Water quantity (reduce flood risk to the site and neighbouring areas).
- Water quality (reduce pollution).
- Biodiversity (wildlife), and,
- Amenity (landscape).

5.4.4 SuDS are typically softer engineering solutions inspired by natural drainage processes such as ponds and swales which manage water as close to its source as possible. Wherever possible, a SuDS technique should seek to contribute to each of the four goals identified below in Paragraph 5.4.7.

5.4.5 The layout and function of drainage systems needs to be considered at the start of the design process for new development, as integration with road networks and other infrastructure can maximise the availability of developable land. This should ideally be achieved by incorporating (SuDS).

5.4.6 Generally, the aim should be to discharge surface water run-off as high up the following hierarchy of drainage options as reasonably practicable in accordance with the Building Regulations 2010 Drainage and Waste Disposal Approved Document H[53].

- Into the ground (infiltration).
- To a surface water body.
- To a surface water sewer, highway drain, or another drainage system, or
- To a combined sewer

5.4.7 SuDS techniques can be used to reduce the rate and volume and improve the water quality of surface water discharges from sites to the receiving environment (i.e. natural watercourse or public sewer etc.). The CIRIA SuDS Manual[54] C753 identified several processes that can be used to manage and control runoff from developed areas. Each option can provide opportunities for storm water control, flood risk management, water conservation and groundwater recharge.

- **Infiltration**: the soaking of water into the ground. This is the most desirable solution as it mimics the natural hydrological process. The rate of infiltration will vary with soil type and condition, the antecedent conditions and with time. The process can be used to recharge groundwater sources and feed baseflows of local watercourses, but where groundwater sources are vulnerable or there is risk of contamination, infiltration techniques are not suitable.
- **Detention/Attenuation**: the slowing down of surface flows before their transfer downstream, usually achieved by creating a storage volume and a constrained outlet. In general, though the storage will enable a reduction in the peak rate of runoff, the total volume will remain the same, just occurring over a longer duration.
- **Conveyance**: the transfer of surface runoff from one place to another, e.g. through open channels, pipes, and trenches.
- **Water Harvesting**: the direct capture and use of runoff on site, e.g. for domestic use (flushing toilets) or irrigation of urban landscapes. The ability of these systems to perform a flood risk management function will be dependent on their scale, and whether there will be a suitable amount of storage always available in the event of a flood.

As part of any SuDS scheme, consideration should be given to the long-term maintenance of the SuDS to ensure that it remains functional for the lifetime of the development.

[53] Drainage and waste disposal: Approved document H. Building Regulations in England for foul water drainage and disposal. Available from: Drainage and waste disposal: Approved Document H - GOV.UK (www.gov.uk)
[54] CIRIA C753 SuDS Manual. Available from: https://www.susdrain.org/resources/SuDS_Manual.html

5.4.8 Table 5-2 has been reproduced from the SuDS Manual[54] and outlines typical SuDS techniques.

5.4.9 Adoption arrangements for SuDS schemes should be considered for the lifetime of the development. As the LPA, EBC will need to consider whether the proposed standard of construction would facilitate adoption and maintenance by an appropriate body such as the water and sewerage company under the Ofwat-approved Sewerage Sector Guidance[55].

5.4.10 The application of SuDS is not limited to a single technique per site. Often a successful SuDS solution will utilise a combination of techniques, providing flood risk, pollution and landscape/wildlife benefits. In addition, SuDS can be employed on a strategic scale, for example with a number of sites contributing to large scale jointly funded and managed SuDS. It should be noted, each development site must offset its own increase in runoff and attenuation cannot be "traded" between developments.

Suitability for Infiltration SuDS

5.4.11 The use of infiltration techniques is highly dependent on the underlying ground conditions. As part of this SFRA, the detailed BGS Infiltration SuDS[56] map has been used to provide an indication of the suitability of using infiltration SuDS techniques across the Borough using the following categories:

- Highly compatible: The subsurface is likely to be suitable for free-draining infiltration SuDS.
- Probably compatible for infiltration SuDS: The subsurface is probably suitable for infiltration SuDS, although design may be influenced by the ground conditions.
- Opportunities for bespoke infiltration SuDS: The subsurface is potentially suitable for infiltration SuDS although the design will be influenced by the ground conditions.
- Very significant constraints are indicated: There is a very significant potential for one or more geohazards associated with infiltration.

5.4.12 **Appendix A Figure 11** shows that there are significant constraints indicated for infiltration SuDS due to the underlying soils and geology in Walton-on-Thames, Thames Ditton, land adjacent to the River Mole in Cobham, and land to the north east of Weybridge. Flow attenuation of surface water released into a waterbody, or a sewer could be considered for locations where infiltration is not suitable.

5.4.13 Detention measures are not constrained by geology, though in areas of permeable geology, there will also be a degree of infiltration of runoff taking place.

5.4.14 Areas which are highly compatible for infiltration SuDS include parts of Esher, Fairmile, Oxshott, land to the east of Brooklands, and the area surrounding Weybridge to the east.

Appendix A Figure 11 - BGS Infiltration SuDS

Table 5-2 Typical SuDS Components

Technique	Description	Conveyance	Detention	Infiltration	Harvesting
Pervious Surfaces	Pervious surfaces allow rainwater to infiltrate through the surface into an underlying storage layer, where water is stored before infiltration to the ground, reuse, or release to surface water.		Y	Y	*
Filter Drains	Linear drains/trenches filled with a permeable material, often with perforated pipe in the base of the trench. Surface water from the edge of paved areas flows into the trenches, is filtered, and conveyed to other parts of the site.	Y	Y		
Filter Strips	Vegetated strips of gently sloping ground designed to drain water evenly from impermeable areas and filter out silt and particulates.	*	*	*	

[55] Sector Guidance in relation to the adoption of sewerage assets by sewerage companies in England. Version 2.2. 29 June 2022
[56] British Geological Survey Infiltration SuDS map

Swales	Shallow vegetated channels that conduct and/or retain water and can permit infiltration when unlined.	Y	Y	*	
Ponds	Depressions used for storing and treating water.		Y	*	Y
Wetlands	As ponds, but the runoff flows slowly but continuously through aquatic vegetation that attenuates and filters the flow. Shallower than ponds. Based on geology these measures can also incorporate some degree of infiltration.	*	Y	*	Y
Detention Basin	Dry depressions designed to store water for a specified retention time.		Y		
Soakaways	Sub-surface structures that store and dispose of water via infiltration.			Y	
Infiltration Trenches	As filter drains but allowing infiltration through trench base and sides.	*	Y	Y	
Infiltration Basins	Depressions that store and dispose of water via infiltration.		Y	Y	
Green Roofs	Green roofs are systems which cover a building's roof with vegetation. They are laid over a drainage layer, with other layers providing protection, waterproofing and insulation. It is noted that the use of brown/green roofs should be for betterment purposes and not to be counted towards the provision of on-site storage for surface water. This is because the hydraulic performance during extreme events is similar to a standard roof (CIRIA C753).		Y		
Rainwater Harvesting	Storage and use of rainwater for non-potable uses within a building, e.g. toilet flushing. It is noted that storage in these types of systems is not usually considered to count towards the provision of on-site storage for surface water balancing because, given the sporadic nature of the use of harvested water, it cannot be guaranteed that the tanks are available to provide sufficient attenuation for the storm event.	*	*	*	Y

Technical standards and supporting guidance

5.4.15 A set of non-statutory Technical Standards[57] have been published, to be used in conjunction with supporting guidance in the PPG, which set the requirements for the design, construction, maintenance, and operation of SuDS.

5.4.16 The Technical Standards that are of chief concern in relation to the consideration of flood risk to and from development relating to peak flow control and volume control are presented below:

Peak flow control

5.4.17 **S2** For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year (100% AEP) rainfall event and the 1 in 100 year (1% AEP) rainfall event should never exceed the peak greenfield runoff rate for the same event.

5.4.18 **S3** For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year (100% AEP) rainfall event and the 1 in 100 year (1% AEP) rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event but should never exceed the rate of discharge from the development prior to redevelopment for that event.

Volume control

5.4.19 **S4** 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 (1% AEP), 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.

5.4.20 **S5** 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 (1% AEP), 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.

[57] DEFRA. (2015) Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems. Available from : https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards

5.4.21 **S6** Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

Flood risk within the development

5.4.22 **S7** The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year (3.3% AEP) rainfall event.

5.4.23 **S8** The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year (1% AEP) rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.

5.4.24 **S9** The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year (1% AEP) rainfall event are managed in exceedance routes that minimise the risks to people and property.

5.4.25 All major development[43] should include provision for SuDS and, as the LLFA, SCC is a statutory consultee on surface water management drainage issues for all such major developments. In partnership with the 11 LPAs in Surrey, SCC has set out clear advice and guidance documents on their website[58]. This includes a 'Surface Water Drainage Summary Pro-forma' which should be completed in full and accompany the submitted drainage statement and supporting evidence. This must be cross-referenced within an FRA where appropriate.

5.4..25.1 Applicants are strongly encouraged to discuss their proposals with SCC at the pre-application stage. A request can be made via suds@surreycc.gov.uk.

5.4.26 For smaller schemes located within Flood Zone 2 and Flood Zone 3, SuDS will need to be addressed as part of an FRA and will be assessed by EBC.

5.5 Flood Routing

Recommendation 5-10 *New development should not adversely affect flood routing and thereby increase flood risk elsewhere.*

5.5.1 Opportunities should be sought within the site design to make space for water, such as:

- Removing boundary walls or replacing with other boundary treatments such as hedges, post and rail fencing or hit and miss fencing (i.e. vertical slats fixed alternately on each side of horizontal posts).
- Considering alternatives to solid wooden gates or ensuring that there is a gap beneath the gates to allow the passage of floodwater.
- Create under-croft car parks or consider reducing ground floor footprint and creating an open area under the building to allow flood water storage.
- Where proposals entail floodable garages or outbuildings, consider designing a proportion of the external walls to be committed to free flow of floodwater.

5.5.2 In order to demonstrate that 'flood risk is not increased elsewhere', development in the floodplain will need to prove that flood routing is not adversely affected by the development, for example, giving rise to backwater affects or diverting floodwaters onto other properties.

5.5.3 Potential overland flow paths should be determined, and appropriate solutions proposed to minimise the impact of the development, for example, by configuring road and building layouts to preserve existing flow paths and improve flood routing whilst ensuring that flows are not diverted towards other properties elsewhere.

[58]SCC SuDS Planning Advice. https://www.surreycc.gov.uk/people-and-community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/suds-planning-advice

5.5.4 Careful consideration should be given to the use of fences and landscaping walls to prevent causing obstruction to flow routes and increasing the risk of flooding to the site or neighbouring areas.

5.6 Flood Compensation Storage

Recommendation 5-11 *Development should not result in a net loss of flood storage capacity with respect to the 1% AEP modelled flood extent including climate change. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage.*

5.6.1 Where proposed development results in a change in building footprint, land raising or other structures such as bunds, the developer must ensure that it does not impact upon the ability of the floodplain to store water and should seek opportunities to provide betterment with respect to floodplain storage.

5.6.2 Similarly, where ground levels are elevated to raise the development out of the floodplain, compensatory floodplain storage within areas that currently lie outside the floodplain must be provided to ensure that the total volume of the floodplain storage is not reduced.

5.6.3 As depicted in Figure 5-1, floodplain compensation must be provided on a level for level, volume for volume basis. In order to demonstrate a scheme is level for level up to the 1 in 100 year (1% AEP) flood level including an allowance for climate change, there must be some land available outside of the 1 in 100 year (1% AEP) including climate change extent. Where land is not within the site boundary, it must be in the immediate vicinity, in the applicant's ownership and hydrologically linked to the site. Level for level compensation schemes provide a direct replacement for the lost storage volume. Direct or 'level for level' compensation is the replacement of volumes lost from the floodplain through development with new floodplain volume, by reducing nearby ground levels. The compensatory volume must, as a minimum, be at the same level (within reasonable working limits) as the lost storage. Typically slices of compensatory storage are either 100mm or 200mm. When designing a scheme flood water must be able to flow in and out and must not pond. An FRA must demonstrate that there is no loss of flood storage capacity and include details of an appropriate maintenance regime to ensure mitigation continues to function for the life of the development. Guidance on how to address floodplain compensation is provided in Appendix A3 of the CIRIA Publication C624[59].

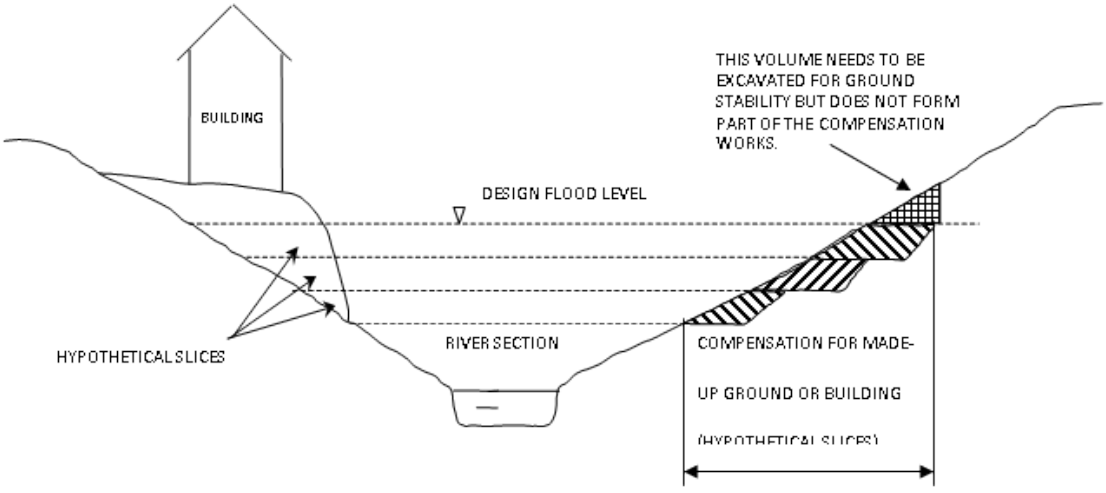


Figure 5-1 Example of Floodplain Compensation Storage (Environment Agency 2009)

5.6.4 The requirement for no loss of floodplain storage means that it is not possible to modify ground levels on sites which lie completely within the floodplain (when viewed in isolation), as there is no land available for lowering to bring it into the floodplain. It is possible to provide off-site compensation within the local area e.g. on a neighbouring or adjacent site, or indirect compensation, by lowering land already within the floodplain, however, this would be subject to detailed investigations and agreement with the Environment Agency to demonstrate (using an appropriate flood model where necessary) that the proposals would improve and not worsen the existing flooding situation or could be used in combination with other measures to limit the impact on floodplain storage. It may also be necessary to put in place agreements (e.g. legal or wayleaves) to ensure that the offsite compensation is not developed during the lifetime of the proposed development. Indirect schemes are complicated to

[59] CIRIA (2004) CIRIA Report 624: Development and Flood Risk - Guidance for the Construction Industry.

design and construct and can require a more intensive maintenance regime which must continue indefinitely. The Environment Agency is generally opposed to indirect schemes unless it can be clearly demonstrated it is the only remaining option.

5.6.5 Whilst the use of stilts and voids below buildings may be an appropriate approach to mitigating flood risk to the buildings themselves, such techniques should not normally be relied upon for compensating for any loss of floodplain storage. This is because voids do not allow water to freely flow through them, trash screens get blocked, voids get silted up, they have limited capacity, and it is difficult to stop them being used for storing belongings or other materials.

5.6.6 Where car parks are specified as areas for the temporary storage of surface water and fluvial floodwaters, flood depths should not exceed 300mm given that vehicles may be moved by water of greater depths and floodwater should be able to flow out of the car park when floodwaters recede. Where greater depths are expected, car parks should be designed to prevent the vehicles from floating out of the car park. Signs should be in place to notify drivers of the susceptibility of flooding and flood warning should be available to provide sufficient time for car owners to move their vehicles if necessary.

5.7 Risk of Groundwater Flooding

Recommendation 5-12 *New development should not result in an increased risk of groundwater flooding elsewhere. Where subsurface development is proposed, an impact assessment should be undertaken to determine the potential impact on groundwater and identify proposed mitigation measures.*

5.7.1 The superficial geology underlying Elmbridge is predominantly permeable and in connection with the River Thames and other watercourses. This creates pathways for groundwater to flow through the subsurface and the potential for groundwater flooding to occur, which is exacerbated when water levels in the watercourses are elevated. Additional subsurface development or additional infiltration has the potential to modify groundwater flows, leading to potential flooding elsewhere and/or impacting on groundwater abstractions downstream.

5.7.2 A preliminary Hydrogeological Risk Assessment (HRA) should be undertaken for all proposed developments. The preliminary HRA should identify:

i. the depth and geometry of the penetration of works into the sub-surface from the construction of the proposed development (for example piled foundations, basements, excavation for services). These features can disrupt groundwater flow, alter groundwater levels, and therefore increase the risk of groundwater flooding at or around the site.

ii. any changes in drainage, for example impermeable surfaces or infiltration/SuDS systems which could alter groundwater flow patterns and the elevation of the water table.

5.7.3 If the preliminary HRA identifies works below ground and/or changes in drainage a HRA (sometimes called a Basement Impact Assessment) will be required. The scope and detail required for the HRA will vary depending on the scale of sub-surface construction proposed and the local geological and hydrogeological conditions.

5.7.4 The HRA should identify the presence or otherwise of an aquifer and the depth to water table. The area is known to be at risk of groundwater flooding. In other areas the geology and hydrogeology may be different.

5.7.5 The HRA should therefore be used to determine the geological and hydrogeological setting and whether sub-surface development will reach the water table. The water table will move up and down depending on rainfall; the assessment should consider the highest level. If the development does extend down to the water table, it may disrupt groundwater flow in the aquifer by creating a barrier and increase the risk of flooding. The HRA should identify the impact and any required mitigation measures.

5.7.6 In some settings there may be an aquifer at depth and, depending on the proposed depth of the development, this may also have to be assessed. A site-specific ground investigation with trial pits and boreholes should be recommend if there is uncertainty over the geological or hydrogeological conditions at any proposed development site.

5.7.7 The HRA should also identify changes in drainage as these may create additional inflows to ground which can also exacerbate groundwater flood risk.

5.8 Property Flood Resilience

Recommendation 5-13 *Where development or redevelopment is proposed in areas at risk of flooding, flood resilience and resistance measures should be implemented.*

5.8.1 'Property Flood Resilience' is an approach to building design which aims to reduce flood damage and speed recovery and reoccupation following a flood. It uses a combination of flood resistance and recovery measures and is described in the industry-developed CIRIA Property Flood Resilience Code of Practice[60], which provides advice for both new-build and retrofit resilience measures. It includes specific guidance for local authority planners.

5.8.2 Resistance and recovery measures are unlikely to be suitable as the only mitigation measure to manage flood risk, but they may be suitable in some circumstances, such as:

- Water Compatible and Less Vulnerable uses where temporary disruption is acceptable, and the development remains safe.
- Where the use of an existing building is to be changed and it can be demonstrated that the avoidance measures are not practicable, and the development remains safe.
- As a measure to manage residual flood risk from flood risk management infrastructure when avoidance measures have been exhausted.

5.8.3 Flood resistance and recovery measures cannot be used to justify development in inappropriate locations.

5.8.4 Where historic buildings are involved, early consultation with Historic England should be undertaken and their flood resilience for historic properties guidance[61] used to provide additional information.

Flood Resistance 'Water Exclusion Strategy'

5.8.5 Flood resistant construction can prevent entry of water or minimise the amount that may enter a building where there is short duration flooding with water depth up to approximately 0.6 metres, depending on the building's characteristics. Where measures to exclude water in this way are proposed above this level, advice should be sought from a suitably qualified building surveyor, architect, or structural engineer.

5.8.6 There is a range of flood resistance and resilience construction techniques that can be implemented in development to mitigate potential flood damage. Flood resistance measures, or dry proofing, stops water entering a building up to a safe structural limit. Resistance measures can be passive, such as flood doors which are normally closed; or active, such as air brick covers or removable flood barriers. Passive measures are to be prioritised over active measures.

5.8.7 This form of construction needs to be used with caution and accompanied by measures that will speed-up flood recovery, as effective flood resistance can be difficult to achieve. Hydrostatic pressures exerted by floodwater can cause long-term structural damage, undermine the foundations of a building or cause leakage through the walls, floor, or sub-floor, unless the building is specifically designed to withstand such stresses. In addition, temporary and demountable defences are not appropriate for new-build developments.

5.8.8 There are a range of property flood protection devices available on the market, designed specifically to resist the passage of floodwater. These include removable flood barriers and gates designed to fit openings, vent covers and stoppers designed to fit WCs. These measures can be appropriate for preventing water entry associated with fluvial flooding as well as surface water and sewer flooding. The efficacy of such devices relies on their being deployed before a flood event occurs. It should also

[60] Kelly, D, Barker, M, Lamond, J, McKeown, S, Blundell, E and Suttie, E (2020) Guidance on the code of practice for property flood resilience, C790B, CIRIA, London (ISBN: 978-0-86017-895-8) https://www.ciria.org/CIRIA/Resources/Free_publications/CoP_for_PFR_resource.aspx

[61] Historic England, April 2015, Flooding and Historic Buildings. https://historicengland.org.uk/images-books/publications/flooding-and-historic-buildings-2ednrev/

be borne in mind that devices such as air vent covers, if left in place by occupants as a precautionary measure, may compromise safe ventilation of the building in accordance with Building Regulations.

Flood Recovery 'Water Entry Strategy'

5.8.9 Flood recoverability measures (or wet proofing), accept that water will enter the building, but through careful design and changes to the construction will minimise damage and allow faster cleaning, drying, repairing and re-occupancy of the building after a flood. Measures are preferably passive, such as the use of resilient building materials, or active such as moving sensitive equipment or belongings to upper floors when flooding is expected.

5.8.10 Materials should be used which allow the passage of water whilst retaining their structural integrity and they should also have good drying and cleaning properties. Alternatively sacrificial materials can be included for internal and external finishes; for example, the use of gypsum plasterboard which can be removed and replaced following a flood event. Flood resilient fittings should be used to at least 0.1m above the design flood level. Recovery measures are either an integral part of the building fabric or are features inside a building that will limit the damage caused by floodwaters.

5.8.11 A variety of flood recovery tools can be implemented, such as:

- Using materials with either, good drying and cleaning properties or, sacrificial materials that can easily be replaced post-flood.
- Design for water to drain away after flooding.
- Design access to all spaces to permit drying and cleaning.
- Raise the level of electrical wiring, appliances, and utility metres.

5.8.12 Structures such as (bus, bike) shelters, park benches and refuse bins (and associated storage areas) located in areas with a high flood risk should be flood resilient and be firmly attached to the ground and designed in such a way as to prevent entrainment of debris which in turn could increase flood risk and/or breakaway posing a danger to life during high flows.

5.9 Finished Floor Levels

Recommendation 5-14 *All More Vulnerable and Highly Vulnerable development within Flood Zones 2 and 3 should set Finished Floor Levels 300mm above the known or modelled 1 in 100 year (1% AEP) flood level including an allowance for climate change.*

5.9.1 Where developing in Flood Zone 2 and Flood Zone 3 is unavoidable, the recommended method of mitigating flood risk to people, particularly with More Vulnerable (residential) and Highly Vulnerable land uses, is to ensure internal floor levels are raised a freeboard level above the design flood level. Table 5-3 provides an overview of the requirements for finished floor levels for development in Elmbridge.

5.9.2 In certain situations (e.g. for proposed extensions to buildings with a lower floor level or conversion of existing historical structures with limited existing ceiling levels), it could prove impractical to raise the internal ground floor levels to sufficiently meet the general requirements. In these cases, the Environment Agency and/or EBC should be approached to discuss options for a reduction in the minimum internal ground floor levels provided flood resistance measures are implemented up to an agreed level. There are also circumstances where flood resilience measures should be considered first. These are described further below. For both Less and More Vulnerable developments where internal access to higher floors is required, the associated plans showing the access routes and floor levels should be included within any site-specific FRA.

Table 5-3 Requirements for Finished Floor Levels in Elmbridge BC

Development Type	Flood Zone 3	Flood Zone 2
Minor development (i.e. non-residential extensions with a floor space <250m2 and householder developments)	Provide evidence to EBC that EITHER, Floor levels within the proposed development will be set no lower than existing levels AND, flood proofing of the proposed development has been incorporated where appropriate. Details of	Provide evidence to EBC that, Floor levels within the proposed development will be set no lower than existing levels AND, flood proofing of the proposed development has been incorporated where appropriate. Details of

Development Type	Flood Zone 3	Flood Zone 2
	flood proofing / resilience and resistance techniques to be included (refer to Section 5.8). OR, Floor levels within the extension will be set 300mm above the known or modelled 1 in 100 year river flood event (1% AEP) including climate change. Applicants should provide a plan showing floor levels relative to flood levels. All levels should be stated in relation to Ordnance Datum.	flood proofing / resilience and resistance techniques to be included (refer to Section 5.8).
New residential development (More Vulnerable)	Where appropriate, subject to there being no other planning constraints (e.g. restrictions on building heights), finished floor levels should be set a minimum of 300mm above the 1 in 100 year (1% AEP) flood level including climate change. The design flood level should be derived for the immediate vicinity of the site (i.e. relative to the extent of a site along a watercourse as flood levels are likely to vary with increasing distance downstream) as part of a site-specific FRA. Sleeping accommodation should be restricted to the first floor level or above to offer the required 'safe places'. Internal ground floors below this level could however be occupied by either Less Vulnerable commercial premises, garages or non-sleeping residential rooms (e.g. kitchen, study, lounge) (i.e. applying a sequential approach within a building).	
New non-residential development (e.g. Less Vulnerable)	Finished floor levels may not need to be raised, although to make buildings resilient raising floor levels above the 1% annual probability flood level including climate change should be encouraged. Where there may be constraints to raising floor levels, the use of flood resilience measures should be encouraged to reduce impact and it is essential that internal access is provided to upper floors (first floor or a mezzanine level) to provide safe refuge in a flood event. Such refuges will have to be permanent and accessible to all occupants and users of the site and an Emergency Plan should be prepared to document the actions to take in the event of a flood.	
Basements	Basements, basement extensions, conversions of basements to a higher vulnerability classification or self-contained units are not to be permitted in Flood Zone 3b. Nor should they be permitted in areas prone to groundwater flooding. Self-contained residential basements and bedrooms at basement level are not permitted in Flood Zone 3a. Internal access to a higher floor situated 300mm above the 1 in 100 year (1% AEP) flood level including climate change must be provided for all other basements, basement extensions and conversions.	All basements, basement extensions and conversions must have internal access to a higher floor situated 300mm above the 1 in 100 year (1% AEP) flood level including climate change.

6. Measures to Manage Residual Risk

Residual risk describes the risks that remain after taking into account flood risk management infrastructure and/or any site specific mitigation measures that have been applied. The following measures are required to manage the remaining residual risk. The recommendations made in this section are not to specifically enable development to take place in areas of flood risk, sites outside of flood risk areas should still be favoured, with the Sequential and Exception Tests followed.

6.1 Flood Warning Areas

6.1.1 The Environment Agency operates a free Flood Warning Service[62] for many areas at risk of flooding from rivers and the sea. In some parts of England, the Environment Agency may also be able to tell when flooding from groundwater is possible.

6.1.2 The Environment Agency has provided a GIS layer of Flood Warning Areas in Elmbridge. There are 17 Flood Warning Areas within the Borough, as shown in **Appendix A Figure 16** and Table 6-1. The Environment Agency issues flood warnings to residents and businesses that have registered for the service in these specific areas when flooding is expected.

Appendix A Figure 16 – Flood Warning Areas and Rest Centres

Table 6-1 Environment Agency Flood Warning Areas in Elmbridge

Flood Warning Area Name	Description
Properties closest to the River Wey between Walsham Meadow and Byfleet town	Properties closest to the River Wey between Walsham Meadow and Byfleet town, including the Walsham Lock and Ockham Mill, Common Meadows, and Plough Bridge areas of Byfleet
River Wey at Weybridge	River Wey at Weybridge, Wey Meadows and Hamm Court, Surrey
River Wey at Wisley and Byfleet	River Wey at Wisley, Pyrford and Byfleet including, Wisley Village, Pyrford Lock and Marina, the Church Road, Oyster Lane, High Road & Fullerton Road and Brooklands areas of Byfleet
Properties closest to the River Thames at Sunbury	River Thames at Sunbury from Wheatley's Eyot to Sunbury Court Island including Wheatley's Eyot, Sunburylock Ait, Sunbury Ait, Sunbury Court Island and properties on The Creek, Parke Road, Thames Street and Lower Hampton Road
Properties closest to the River Thames from Platts Eyot to Hampton Court Bridge	River Thames from Platts Eyot to Hampton Court Bridge, including Platts Eyot, area around Hampton Sailing Club, Garrick's Eyot, Taggs Island, Ash Island and Molesey Lock
Properties closest to the River Thames from Shepperton Lock to Beasley's Ait	The River Thames from Shepperton Lock to Beasley's Ait, including Sandhills Meadow, Thames Meadow, Penny Lane, and Felix Lane areas
River Thames at East and West Molesey	River Thames at East and West Molesey including Hurst Park, Buckingham Avenue, and the Royal Mews area
River Thames at Hamm Court	River Thames at Hamm Court including Shepperton Lock, Hamhaugh Island, Hamm Court Estate and Dorney Grove
River Thames at Hampton and Hampton Wick	River Thames at Hampton and Hampton Wick including Hampton Court, properties on the Barge Walk, Hampton Court Palace Golf Club and Hampton Court Road
River Thames at Sunbury	River Thames in the Sunbury town area, including Longwood Business Park, Halliford Road areas of Upper Halliford and Sunbury, Lower Hampton Road Park, Kenton Court Meadow and Kempton Park Racecourse areas
River Thames at Thames Ditton	River Thames at Thames Ditton including Ditton Field and Ditton Reach

[62]Environment Agency Flood Warning Service https://check-for-flooding.service.gov.uk/

Flood Warning Area Name	Description
River Thames at Thames Ditton Island	River Thames at Thames Ditton Island including Boyle Farm Island
River Thames at Walton	River Thames at Walton-on-Thames including Desborough Island, Walton Bridge and Elmbridge Leisure Centre
River Mole at Esher and East Molesey	River Mole at Esher and East Molesey including Walton on Thames, West Molesey and Thames Ditton, Surrey
River Mole at Leatherhead and Fetcham	River Mole at Leatherhead and Fetcham, Surrey
River Mole at Stoke D'Abernon, Cobham and South Hersham	River Mole at Stoke D'Abernon, Cobham and South Hersham, Surrey
River Rythe between Oxshott and Thames Ditton	River Rythe from Oxshott to the Thames at Thames Ditton, including Arbrook Common, Claygate, Littleworth Common and Hinchley Wood

6.1.3 EBC has 7 emergency rest centres, as identified in **Appendix A Figure 16**, in the urban areas of Weybridge (Churchfield Road), Walton (Manor Road), East Molesey (Bishops Fox Way), Thames Ditton (Mercer Close), Claygate (Elm Road), Hersham (Queen's Road) and Cobham (Oakdene Road). It should be noted that although these have been identified as emergency rest centres, whether each of the centres are operational during a flood event is dependent upon the locations and extent of flooding across the Borough at that particular time. The Multi Agency Flood Plan prepared by EBC will provide more detail on the appropriate use of each rest centre.

Appendix A Figure 16 – Flood Warning Areas and Rest Centres

Recommendation 6-1 *EBC Emergency Planners should use the findings of the SFRA to inform the next planned review of the Multi-Agency Flood Plan.*

6.2 Access and Escape

Recommendation 6-2 *New development must have safe access / escape during design flood conditions including an allowance for climate change.*

6.2.1 Where development may be proposed in areas at risk of flooding, safe access and egress are required to enable the evacuation of people from the development, provide the emergency services with access to the development during times of flood and enable flood defence authorities to carry out any necessary duties during periods of flood.

6.2.2 A safe access/escape route must be provided to allow occupants to safely enter and exit the buildings and be able to reach land outside the flooded area (e.g. within Flood Zone 1) using public rights of way without the intervention of emergency services or others during design flood conditions, including climate change allowances (i.e. 1 in 100 year (1 % AEP) fluvial flood event and surface water event including an appropriate climate change allowance). The potential for evacuation before a more extreme flood should also be considered when deciding a safe access/escape route.

6.2.3 Where access and escape are important to the overall safety of development in areas of flood risk, the LPA should consult with emergency planning staff and, where appropriate with the emergency services, unless local standards or guidelines have been put in place in lieu of consultation.

Dry Islands

6.2.4 The floodplain in in the Borough, particularly along the River Thames and River Wey, is relatively flat and broad. There may be small areas within the floodplain where the ground levels are slightly higher. During times of flood, it is possible that all the land surrounding these areas becomes flooded, resulting in this higher area becoming a 'dry island'. During prolonged periods of flooding, it may prove difficult to provide resources and emergency services to those living in these areas. In order to reduce the flood risk, these 'dry islands' should be treated the same as for the level of flood risk in the area

surrounding them, regardless of their size. When contemplating development, it is important to study the wider area of the flood map to ensure that there is a dry route to a point outside the floodplain.

6.2.5 Guidance prepared by the Environment Agency[63] uses a calculation of flood hazard to determine safety in relation to flood risk (Table 6-2). Flood hazard is a function of the flood depth and flow velocity at a particular point in the floodplain along with a suitable debris factor to account for the hazard posed by any material entrained by the floodwater. The derivation of flood hazard is based on the methodology in Flood Risks to People[63] FD2320, the use of which, for the purpose of planning and development management, is clarified in the abovementioned publication.

Table 6-2 Hazard to People Rating (HR=d x (v +0.5) +DF) (Table 13.1 FD2320/TR2)

Flood Hazard (HR)	Description
Less than 0.75	Low hazard – Caution
0.75 to 1.25	Dangerous for some – includes children, the elderly and the infirm
1.25 to 2.0	Dangerous for most – includes the general public
More than 2.0	Dangerous for all – includes the emergency services

6.2.6 For developments located in areas at risk of fluvial flooding, safe access / escape must be provided for new development as follows in order of preference:

- Safe dry route for people and vehicles.
- Safe dry route for people.
- If a dry route for people is not possible, a route for people where the flood hazard (in terms of depth and velocity of flooding) is low and should not cause risk to people.
- If a dry route for vehicles is not possible, a route for vehicles where the flood hazard (in terms of depth and velocity of flooding) is low to permit access for emergency vehicles. However, the public should not drive vehicles in floodwater.

6.2.7 In all these cases, a 'dry' access/escape is a route located above the 1 in 100 year (1% AEP) plus appropriate allowance for climate change flood level for river flooding and surface water flooding.

6.2.8 In exceptional circumstances, safe access above the 1 in 100 year (1% AEP) flood level including climate change for river flooding and surface water flooding to an area outside the floodplain may not be achievable. In these circumstances the Environment Agency, EBC and emergency planners should be consulted to determine whether the safety of the site occupants can be satisfactorily managed.

6.2.9 This will be informed by the type of development, the number of occupants and their vulnerability and the flood hazard along the proposed egress route. For example, this may entail the designation of a safe place of refuge at an alternative building. It should be noted that sole reliance on a safe place of refuge is a last resort, and all other possible means to evacuate the site should be considered first. Provision of a safe place of refuge will not guarantee that an application will be granted.

6.2.10 During a prolonged flood event, safe refuge within the development may not be suitable due to lack of supplies (i.e. fresh drinking water and food), power supply or sanitary provision. A place of safety should preferentially be an area outside the flooded area.

6.3 Places of Safety

Recommendation 6-3 *Where a failure of flood risk management infrastructure would result in flooding with a speed-of-onset that would not allow sufficient time for safe access and escape, an internally accessible place of safety, capable of accommodating the likely number of occupants or users of the proposed development should also be provided.*

[63] Environment Agency (2008) Supplementary note on Flood hazard ratings and thresholds for development planning and control purpose. Clarification of Table 13.1 FD2320/TR2 and Figure 3.2 FD2321/TR1. Available from: http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/FD2321_7400_PR_pdf.sflb.ashx

6.3.1 Places of safety should be located above the extreme flood level (1 in 1000 year (0.1% AEP) including an appropriate allowance for climate change).

6.3.2 Local planning authorities should consider whether the development can be considered safe given the predicted duration of flooding and the vulnerability of occupants/users. In doing so, local planning authorities should account for the likely impacts of flooding on essential services such as electricity, gas, telecommunications, water supply and sewerage. Any place of safety needs to be designed to facilitate rescue in case emergency care is needed or if it is unlikely to be safe for occupants/users to wait until flood waters have receded sufficiently for safe access/escape to be possible.

6.3.3 Reference should be made to the ADEPT/EA guidance[64] section entitled 'How should residual risks be considered?' as well as Section 7 of its Emergency Plan checklist which provides guidance on how the Emergency Plan for a development should include information on temporary facilities/areas.

6.4 Emergency Planning

6.4.1 Evacuation is where flood alerts and warnings provided by the Environment Agency enable timely actions by residents or occupants to allow evacuation to take place unaided, i.e. without the deployment of trained personnel to help people from their homes, businesses, and other premises. Rescue by the emergency services is likely to be required where flooding has occurred, and prior evacuation has not been possible. An emergency plan will be needed wherever emergency flood response is an important component of making a development safe. Emergency plans will be essential for sites at risk of flooding used for holiday or short-let caravans and camping and for any site with transient occupancy (e.g. hostels and hotels).

Recommendation 6-4 *For all developments (excluding minor developments and change of use) proposed in Flood Zone 2, Flood Zone 3 and within Flood Zone 1 'Dry Islands', an Emergency Plan should be prepared to demonstrate what actions site users will take before, during and after a flood event to ensure their safety, and to demonstrate their development will not impact on the ability of the local authority and the emergency services to safeguard the current population.*

6.4.2 For sites in Flood Zone 1 that are located on 'dry islands', it may also be necessary to prepare an Emergency Plan to determine potential egress routes away from the site through areas that may be at risk of flooding during the 1 in 100 year (1% AEP) including an appropriate allowance for climate change.

6.4.3 The Environment Agency has a tool on their website to create a Personal Flood Plan[65]. The Plan comprises a checklist of things to do before, during and after a flood and a place to record important contact details. Where proposed development comprises non-residential extension <250m^2 and householder development (minor development), it is recommended that the use of this tool to create a Personal Flood Plan will be appropriate.

6.4.4 Emergency Plans should include:

- How flood warning is to be provided, such as:
  - Availability of existing flood warning systems,
  - Where available, rate of onset of flooding and available flood warning time, and,
  - How flood warning is given.
- What will be done to protect the development and contents, such as:
  - How easily damaged items (including parked cars) or valuable items (important documents) will be relocated,
  - How services can be switched off (gas, electricity, water supplies),
  - The use of flood protection products (e.g. flood boards, airbrick covers),
  - The availability of staff/occupants/users to respond to a flood warning, including preparing for evacuation, deploying flood barriers across doors etc., and,

[64] ADEPT, Environment Agency Flood Risk Emergency Plans for New Development. https://adeptnet.org.uk/floodriskemergencyplan
[65] Environment Agency Tool 'Make a Flood Plan'. Available from: https://www.gov.uk/government/publications/personal-flood-plan

- The time taken to respond to a flood warning.

- Ensuring safe occupancy and access to and from the development, such as:
  - Occupant awareness of the likely frequency and duration of flood events, and the potential need to evacuate,
  - Safe access route to and from the development,
  - If necessary, the ability to maintain key services during an event,
  - Vulnerability of occupants, and whether rescue by emergency services will be necessary and feasible, and,
  - Expected time taken to re-establish normal use following a flood event (clean-up times, time to re-establish services etc.)

6.4.5 There is no statutory requirement for the Environment Agency or the emergency services to approve emergency plans. EBC is accountable via planning condition or agreement to ensure that plans are suitable. This should be done in consultation with emergency planning staff.

6.4.6 Where development is proposed or expected in flood risk areas with implications for emergency planning, LPAs should work with their emergency planning officers to produce local guidelines setting out requirements for flood warning, evacuation and places of safety, against which individual planning applications can then be judged. These should avoid additional burdens on emergency services, explore opportunities for development proposals to address any shortfall in emergency service and infrastructure capacity, and minimise the need for further consultation at planning application stage.

6.5 Emergency planning considerations for reservoirs

6.5.1 EBC plan for civil emergencies based on hazards contained in the Surrey Community Risk Register. The EBC Emergency Plan[66] contains information for the Council to be able to respond effectively to major incidents that may affect the borough including reservoir inundation.

6.5.2 EBC will need to evaluate the potential damage to buildings or loss of life in the event of dam failure, compared to other risks, when considering development downstream of a reservoir. EBC is also advised to consult with the owners/operators of raised reservoirs, to establish constraints upon safe development.

6.5.3 EBC should also consider any implications for reservoir safety and reservoir owners and operators caused by new development located downstream of a reservoir, such as the cost of measures to improve the design of the dam to reduce flood risk, the operation of the reservoir, and general maintenance costs, by consulting with reservoir owners and operators on plan and development proposals. Local authorities, as Category 1 responders, can access more information about reservoir risk and reservoir owners using the Resilience Direct system. Developers should be expected to cover any additional costs incurred, as required by the NPPF ‘agent of change’ policy (paragraph 187). This could be through Community Infrastructure Levy or Section 106 obligations for example.

[66] Elmbridge Borough Council Emergency Plan V3.3. February 2021. https://www.elmbridge.gov.uk/sites/default/files/2023-03/Elmbridge%20Borough%20Council%20Emergency%20Plan.pdf

7. Preparing a Site-Specific FRA

7.1 What is a Flood Risk Assessment?

7.1.1 A site-specific FRA is a report suitable for submission with a planning application which provides an assessment of flood risk to and from a proposed development and demonstrates how the proposed development will be made safe, will not increase flood risk elsewhere and where possible will reduce flood risk overall in accordance with paragraph 163 of the NPPF and supporting PPG. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users. An FRA must be prepared by a suitably qualified and experienced person and must contain all the information needed to allow EBC to satisfy itself that the requirements have been met.

7.2 When is a Flood Risk Assessment required?

7.2.1 The NPPF states that a site-specific FRA is required in the following circumstances:

- Proposals for new development (including minor development and change of use) in Flood Zones 2 and 3.
- Proposals for new development (including minor development and change of use) in an area within Flood Zone 1 which has critical drainage problems (as notified to the LPA by the Environment Agency).
- Proposals in an area within Flood Zone 1, which was identified in a SFRA as being at increased flood risk in future.
- Proposals of 1 hectare or greater in Flood Zone 1.
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.

7.3 How detailed should an FRA be?

7.3.1 The PPG states that the objectives of a site-specific flood risk assessment are to establish:

- Whether a proposed development is likely to be affected by current or future flooding from any source,
- Whether it will increase flood risk elsewhere,
- Whether the measures proposed to deal with these effects and risks are appropriate,
- The evidence for the local planning authority to apply (if necessary) the Sequential Test, and,
- Whether the development will be safe and pass the Exception Test, if applicable.

7.3.2 The PPG states that site-specific FRAs need to be credible, fit for purpose, and proportionate to the anticipated degree of flood risk and the nature and scale of the development. Site-specific FRAs need to make optimum use of information already available, including information on the Flood Map for Planning and surface water flood risk information, although in some cases additional modelling or detailed calculations will need to be undertaken. FRAs need to include the information set out in the FRA checklist in the PPG[67].

7.3.3 As a result, the scope of each site-specific FRA will vary considerably. Table 7-1 presents the different levels of site-specific FRA as defined in the CIRIA publication C624[59] and identifies typical sources of information that can be used. Sufficient information must be included to enable the Council and where appropriate, consultees, to determine that the proposal will be safe for its lifetime, not increase flood risk elsewhere and where possible, reduce flood risk overall. Failure to provide sufficient information will result in applications being refused.

[67] Site specific FRA Checklist https://www.gov.uk/guidance/flood-risk-and-coastal-change#para80

Table 7-1 Levels of Site-Specific FRA

Description
Level 1 Screening study to identify whether there are any flooding or surface water management issues related to a development site that may warrant further consideration. This should be based on readily available existing information. The screening study will ascertain whether a Level 2 (Scoping) or Level 3 (Detailed) FRA is required. Typical sources of information include: • EBC SFRA • Flood Map for Planning (Rivers and Sea) • Environment Agency Standing Advice • NPPF Tables 1, 2 and 3
Level 2 Scoping study to be undertaken if the Level 1 (Screening) FRA indicates that the site may lie within an area that is at risk of flooding, or the site may increase flood risk due to increased run-off. This study should confirm the sources of flooding which may affect the site. The study should include: • An appraisal of the availability and adequacy of existing information, • A qualitative appraisal of the flood risk posed to the site, and potential impact of the development on flood risk elsewhere, and, • An appraisal of the scope of possible measures to reduce flood risk to acceptable levels. The scoping study may identify that sufficient quantitative information is already available to complete an FRA appropriate to the scale and nature of the development. Typical **sources of information** include those listed above, plus: • Local policy statements or guidance. • Lower Thames CFMP. • SCC PFRA and LFRMS. • Data request from the Environment Agency to obtain result of existing hydraulic modelling studies relevant to the site and outputs such as maximum flood level, depth and velocity. • Consultation with the Environment Agency/SCC/sewerage undertakers and other flood risk consultees to gain information and to identify in broad terms, what issues related to flood risk need to be considered including other sources of flooding. • Historic maps. • Interviews with local people and community groups. • Walkover survey to assess potential sources of flooding, likely routes for floodwaters, the key features on the site including flood defences, their condition. • Site survey to determine general ground levels across the site, levels of any formal or informal flood defences
Level 3 Detailed study to be undertaken if a Level 2 (Scoping) FRA concludes that further quantitative analysis is required to assess flood risk issues related to the development site. The study should include: • Quantitative appraisal of the potential flood risk to the development, • Quantitative appraisal of the potential impact of the development site on flood risk elsewhere, and • Quantitative demonstration of the effectiveness of any proposed mitigations measures. Typical **sources of information** include those listed above, plus: • Detailed topographical survey. • Detailed hydrographic survey. • Site-specific hydrological and hydraulic modelling studies which should include the effects of the proposed development. • Monitoring to assist with model calibration/verification. • Continued consultation with the EBC, Environment Agency and other flood risk consultees.

Environment Agency Data Requests

7.3.4 The Environment Agency offers a series of 'products' for obtaining flood risk information suitable for informing the preparation of site-specific FRAs as described on their website https://www.gov.uk/planning-applications-assessing-flood-risk.

- **Products 1 – 4** contain maps of modelling outputs including flood level and flood depth information and the presence of flood defences local to the proposed development site.
- **Product 5** is the hydraulic modelling report.
- **Product 6** is the model output data, so the applicant can interrogate the data to inform the FRA.
- **Product 7** is the hydraulic model itself.
- **Product 8** is the flood defence breach output data.

7.3.5 Products 1 – 6 can be used to inform an FRA. In some cases, it may be appropriate to obtain Product 7 to use as the basis for developing a site-specific model for a proposed development as part of a detailed FRA. This can be requested via either their National Customer Contact Centre via enquiries@environment-agency.gov.uk or the Customer and Engagement Team via KSLEnquiries@environment-agency,gov.uk or enquiries_THM@environment-agency.gov.uk.

Modelling of Ordinary Watercourses

7.3.6 It should be noted that the scope of modelling studies undertaken by the Environment Agency typically cover flooding associated with Main Rivers, and therefore Ordinary Watercourses, which form tributaries to the Main Rivers, may not always be included in the model. Where a proposed development site is in close proximity to an Ordinary Watercourse and either no modelling exists, or the available modelling is considered to provide very conservative estimates of flood extents (due to the use of national generalised JFLOW modelling), applicants may need to prepare a simple hydraulic model to enable more accurate assessment of the probability of flooding associated with the watercourse and to inform the site-specific FRA. This should be carried out in line with industry standards and in agreement with the Environment Agency and SCC (as the LLFA). This may also need to be undertaken if a proposed development site is in close proximity to a Main River which does not have detailed modelling available.

7.4 What needs to be addressed in a Flood Risk Assessment?

7.4.1 The PPG states that the objectives of a site-specific flood risk assessment are to establish:

- Whether a proposed development is likely to be affected by current or future flooding from any source,
- Whether it will increase flood risk elsewhere,
- Whether the measures proposed to deal with these effects and risks are appropriate,
- The evidence for the LPA to apply (if necessary) the Sequential Test, and,
- Whether the development will be safe and pass the Exception Test, if applicable.

7.5 Flood Risk Assessment Checklist

7.5.1 Table 7-2 provides a checklist for site-specific FRAs including the likely information that will need to be provided along with references to sources of relevant information. The exact level of detail required under each heading will vary according to the scale of development and the nature of the flood risk. It is expected that this Checklist is completed for all planning applications.

Table 7-2 Site specific Flood Risk Assessment Checklist (developed from guidance in PPG)

What to include in the FRA		***Source(s) of Information***
1. Site Description		
Site address	*-*	*-*
Current use of the site	*Identify the current use of the site.*	*-*
Flood Zones	*Identify which Flood Zone the site is within.* *Check the SFRA to identify if the site is within Flood Zone 1 but at increased risk of flooding in future due to climate change.* *Check the SFRA to identify if there are any other sources of flooding that may affect the site now or in the future.*	*Environment Agency Flood Map for Planning (Rivers and Sea).* *SFRA Appendix A*
Location plan	*Including geographical features, street names, catchment areas, watercourses, and other bodies of water.*	*OS Mapping* *SFRA Appendix A*
Site plan	*Plan of site showing development proposals and any structures which may influence local hydraulics e.g. bridges, pipes/ducts crossing watercourses, culverts, screens, embankments, walls, outfalls, and condition of channel.*	*OS Mapping* *Site Survey*

What to include in the FRA		Source(s) of Information
Topography	*Include general description of the topography local to the site. Where necessary, site survey may be required to confirm site levels (in relation to Ordnance datum).* *Plans showing existing and proposed levels.*	*SFRA Appendix A* *Site Survey*
Geology	*General description of geology local to the site.*	*SFRA Appendix A* *Ground Investigation Report*
Watercourses	*Identify Main Rivers and Ordinary Watercourses local to the site.*	*SFRA Appendix A*
Status	*Is the development in accordance with the Council's Local Plan?*	*See advice from EBC if necessary.*
2. Development proposals		
Proposed use	*Include the development proposal(s) for the site.* *Determine if it involves a change of use of the site and, if so, describe the change.*	-
Vulnerability Classification	*Determine the vulnerability classification of the development.* *Is the vulnerability classification appropriate within the Flood Zone?*	*SFRA* Table 4-1 *SFRA* Table 4-2
Estimated lifetime	*What is the expected or estimated lifetime of the proposed development likely to be (e.g. 100 years (residential or 75 non-residential) years)?*	*PPG Flood Risk and Coastal Change paragraph 006.*
3. Sequential test		
Application of the Sequential Test	*Determine whether the Sequential Test is required.* *Consult EBC to determine if the site has been included in the Sequential Test already.* *If required, present the following information to EBC to enable their determination of the Sequential Test for the site on an individual basis.*	*SFRA Section 4* *Refer to Local Plan and/or consult EBC.*
Search area	*Provide details of the search area you have used.* *Provide justification for choosing this search area.*	-
Alternative sites	*Provide details on the alternative site(s) within the search area you have identified.* *Do you consider the site(s) to be reasonably available and appropriate for the proposed development? If not, what is your justification for this?* *With reference to the relevant strategic and site-specific FRAs, justify if the alternative sites are at lower flood risk than your proposed site.*	-
Wider sustainable objectives	*If you have identified any reasonably available, lower risk site(s), appropriate for the proposed development, do you consider there to be any other wider sustainable development objectives that would make steering the development to these other locations inappropriate? Provide a justification for your response.*	*Refer to the sustainability objectives in EBC's Sustainability Appraisal*[7]*.*
4. Climate Change		
Climate change	*Check how the flood risk at the site is likely to be affected by climate change.*	*SFRA Appendix A* *Site specific modelling if required.*
5. Site specific flood risk		
Describe the risk of flooding to and from the proposed development over its expected lifetime, including appropriate allowances for the impacts of climate change. Consider flooding from rivers, land, groundwater, sewers and flooding from reservoirs, canals and other artificial sources.		
Main sources of flood risk	*Describe the main source(s) of flood risk to the site (e.g. tidal/sea, fluvial or rivers, surface water, groundwater, other?).*	*SFRA Appendix A* *Historic flooding records (e.g. the historic flood map and local authority Section 19 flood investigation reports* ***Flooding from Rivers:***
Probability of flooding	*Describe the probability of the site flooding, taking account of the maps of flood risk available from the Environment Agency's Flood Map for Planning, the LPAs SFRA and any further flood risk information.*	

What to include in the FRA		Source(s) of Information
Other sources of flooding	*Are you aware of any other sources of flooding that may affect the site? What are the interactions between different sources of flooding?*	*Environment Agency Flood Map for Planning (Rivers and Sea).*
Design flood	*Provide the expected depth and level for the design flood. See paragraph 002 of the PPG for information on what is meant by a "design flood". If possible, flood levels should be presented in metres above Ordnance Datum.*	*Environment Agency Products 1-7.* *New hydraulic model (where Environment Agency data is not available)* ***Flooding from Land:*** *Topographic survey.* *Site walkover.* *Risk of Flooding from Surface Water mapping (Environment Agency website).* *Flooding from Groundwater:* *Ground Investigation Report* ***Flooding from Sewers:*** *Where appropriate an asset location survey can be provided by Thames Water Utilities Ltd* http://www.thameswater-propertysearches.co.uk/ **Flooding from Reservoirs:** *Risk of Flooding from Reservoirs mapping (Environment Agency website)*
Internal flooding	*With any relevant flood risk management infrastructure operating effectively, are properties expected to flood internally in the design flood and to what depth and velocity?* *The nature of any internal flooding resulting from any residual risk should also be specified. Internal flood depths should be provided in metres.*	*Environment Agency Products 1-7.* *Site specific model if required.*
Safety of the development	*Provide details on how the development will be made safe from flooding and the impacts of climate change, for its lifetime, taking residual risk into account.* *Demonstrate how the steps set out in paragraph 004 of the PPG have been followed to develop the strategy for addressing flood risk for the development.*	*SFRA Sections 5 and 6.*
Increase in flood risk off-site	*Provide details on how you will ensure that the development and any measures to protect the site from flooding will not cause any increase in flood risk off-site and elsewhere.* *Have you taken into account the impacts of climate change, over the expected lifetime of the development (e.g. providing compensatory flood storage which has been agreed with the Environment Agency)?*	*SFRA Section 5.*
Reduction of the causes and impacts of flooding	*Provide details on opportunities offered by the development to reduce the causes and impacts of flooding.*	*SFRA Section 5.*
Sources of uncertainty in the assessment of risk	*Describe the sources of uncertainty in the assessment of risk and how have they been accounted for in the proposed strategy for addressing flood risk.*	-

6. Surface Water Management

What to include in the FRA		Source(s) of Information
SuDS	*Completion of SuDS Proforma for all major development proposals in Flood Zones 1, 2 or 3.* *Details of the following within FRA for all other developments located within Flood Zones 2 and 3:* • *Calculations (and plans) showing areas of the site that are permeable and impermeable pre and post-development.* • *Calculations of pre and post-development runoff rates and volumes including consideration of climate change over the lifetime of the development.* • *Details of the methods that will be used to manage surface water (e.g. permeable paving, swales, wetlands, rainwater harvesting etc).* *Where appropriate, reference the supporting Outline or Detailed Drainage Strategy for the site.* *Information on proposed maintenance and adoption arrangements.*	*SFRA Section 5* *SCC SuDS planning advice https://www.surreycc.gov.uk/people-and-community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/suds-planning-advice*
7. Occupants and users of the development		
Increase of the number of occupants	*Will the development proposals increase the overall number of occupants and/or people using the building or land, compared with the current use?* *If this is the case, by approximately how many will the number(s) increase?*	-
Change of use	*Will the proposals change the nature or times of occupation or use, such that it may affect the degree of flood risk to these people?* *If this is the case, describe the extent of the change.*	-
Vulnerable occupants	*Demonstrate how the occupants and users that may be more vulnerable to the impact of flooding (e.g. residents who will sleep in the building; people with health or mobility issues etc) will be located primarily in the parts of the building and site that are at lowest risk of flooding.* *If not, are there any overriding reasons why this approach is not being followed?*	-
8. Exception Test		
Application of the Exception Test	*Determine whether the Exception Test is necessary.*	*SFRA* Table 4-2
Exception Test	*Where the Exception Test is necessary, present details of:* *a. Would the proposed development provide wider sustainability benefits to the community? If so, with reference to the site-specific FRA, could these benefits be considered to outweigh the flood risk to and from the proposed development?* *b. How can it be demonstrated that the proposed development will remain safe over its lifetime, taking account of the vulnerability of its users, without increasing flood risk elsewhere?*	*Refer to EBC sustainability objectives[7].*
Reduction of risk overall	*Will it be possible for the development to reduce flood risk overall (e.g. through the provision of new or improved flood defences, or improved drainage)?*	
9. Residual Risk		
Remaining flood related risks	*What flood related risks will remain after the flood risk avoidance, management and mitigation measures have been implemented?*	-
Management of residual risks	*Provide details on how and by whom will these residual risks be managed over the lifetime of the development (e.g. putting in place emergency plans).*	*SFRA Section 6.*
10. FRA credentials		
FRA author(s)	*Who has undertaken the FRA?*	-
FRA completion date	*When was the FRA completed?*	-

7.6 Pre-application Advice

7.6.1 At all stages, EBC, and where necessary the Environment Agency and/or the Statutory Water Undertaker may need to be consulted to ensure the FRA provides the necessary information to fulfil the requirements for planning applications.

7.6.2 The Environment Agency, SCC and EBC each offer pre-application advice services which should be used to discuss particular requirements for specific applications.

- Elmbridge Borough Council https://www.elmbridge.gov.uk/planning/planning-permission-and-applications/planning-applications-developers-and-businesses/pre
- Surrey County Council suds@surreycc.gov.uk
- Environment Agency https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications#contact

7.6.3 The following government guidance sets out when LPAs should consult with the Environment Agency on planning applications https://www.gov.uk/flood-risk-assessment-local-planning-authorities.

8. Next steps

8.1 Next steps

8.1.1 EBC should use this SFRA, the associated mapping and resulting recommendations to:

- Develop their Local Plan and associated strategic policies,
- Safeguard land for flood risk management and green infrastructure,
- Carry out the Sequential Test for potential allocation sites,
- Carry out the Sequential Test for individual planning applications,
- Make decisions about individual planning applications,
- Decide whether a development can be made safe without increasing flood risk elsewhere,
- Aid discussions with emergency planning teams; and,
- Identify the need for local design guidance or codes.

8.1.2 Where development must be allocated in areas at risk of flooding further assessment of the risk of flooding may be required, for example through the preparation of a Level 2 SFRA.

8.2 Future monitoring and update

8.2.1 SFRAs are living documents that should be reviewed after a significant flood event or when there are changes to:

- The predicted impacts of climate change on flood risk,
- Flood products, for example surface water mapping, flood map for planning,
- Detailed flood modelling - such as from the Environment Agency or LLFA,
- Local Plans, spatial development strategies or relevant local development documents,
- Local flood management schemes,
- Flood Risk Management Plans,
- Shoreline Management Plans,
- Local Flood Risk Management Strategies, and,
- National planning policy or guidance.

Appendix A Mapping

Map	Title
Figure 1	Topography, Watercourses, Waterbodies
Figure 2	Bedrock Geology
Figure 3	Superficial Deposits
Figure 4	AIMS Spatial Flood Defences, Waterbodies
Figure 5	Flood Map for Planning Flood Zones, Watercourses, Waterbodies
Figure 6	Maximum Flood Extents – Dead River, Mole, Rythe, Wey
Figure 7	Maximum Flood Extents – Lower Thames: Thames Dominated
Figure 8	Maximum Flood Extents – Lower Thames: Tributary Dominated
Figure 9	Historic Records of Flooding
Figure 10	Risk of Flooding from Surface Water
Figure 11	BGS Susceptibility to Groundwater Flooding
Figure 12	Sewer Flood Records by Postcode
Figure 13	Risk of Flooding from Reservoirs
Figure 14	Working With Natural Processes
Figure 15	BGS Infiltration SuDS
Figure 16	Flood Warning Areas and Rest Centres

Appendix B Settlement Area Schedules

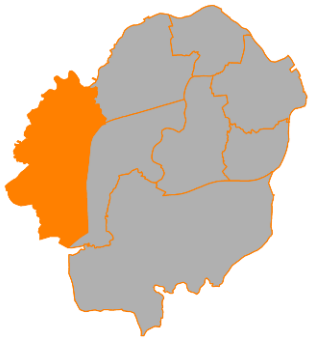
A strategic assessment of the flood risk from all sources has been undertaken for each of the eight Settlement Areas in the Borough. The findings are presented in the following schedules.

The schedules should be read with reference to the mapping in Appendix A. The schedules have been presented in the following order (as viewed from west to east across the Borough):

- Weybridge (Main Settlement Area),
- Walton-on-Thames (Main Settlement Area),
- Hersham (Suburban Settlement Area),
- Cobham, Oxshott, Stoke D'Abernon and Downside (Service Centre and Rural Fringe),
- East and West Molesey (Suburban Settlement Area),
- Esher (Suburban Settlement Area),
- Thames Ditton, Long Ditton, Hinchley Wood, and Weston Green (Suburban Settlement Area), and
- Claygate (Suburban Village).

Weybridge

General Information

Area	Weybridge covers an area of **15.8km²**	
Character[68]	Weybridge is located in the west of Elmbridge, adjoining the boroughs of Runnymede, Spelthorne and Woking. It is the second largest settlement in the Borough supporting a population of approximately 29,837[69]. The north of the Settlement Area comprises high density residential development, in St George's Hill in the south; the density of residential dwellings is much lower. Alongside the residential neighbourhoods, the settlement also contains the majority of the Borough's commercial floor space. Brooklands and Wintersells Road Industrial Parks and 'The Heights' business park to the south of the settlement area are strategic areas for employment uses. The businesses in this area provide jobs not only for the residents of Elmbridge but also for those living in adjacent boroughs and beyond. The area also has a large out-of-town retail park, two large hotels and two popular visitor attractions: Mercedes Benz World and Brooklands Museum.	
Topography	The western edge of the Settlement Area is low lying land adjacent to the floodplain of the River Wey. The land rises towards the urban area of Weybridge (25-45m AOD), and St George's Hill (75m AOD) in the eastern part of the Settlement Area.	Appendix A Figure 1
Geology	Superficial - the Settlement Area is underlain by superficial deposits – either Lynch Hill Gravel Member (Sand & Gravel) or small area of Sand & Gravel of unknown age (e.g. St Georges Hill). In some areas of Weybridge, no superficial deposits are present. Bedrock - the Settlement Area is underlain by the Bagshot Formation (Sand).	Appendix A Figure 1 and Figure 2.
Aquifer Type	The superficial deposits are classified as either a Secondary A aquifer or as Unproductive Strata. According to Environment Agency definitions, a Secondary aquifer is defined as" *a permeable layer capable of supporting water supplies a local rather than strategic scale and in some cases forming an important source of base flow to rivers*". Unproductive Strata are "*rock strata (see bedrock) or drift deposits with low permeability that has negligible significance for water supply or river base flow*". The underlying bedrock is classified as a Secondary A aquifer or Unproductive Strata. An important factor which influences this classification in Elmbridge is the limited thickness of the layers, particularly the Bagshot Formation in the Weybridge area.	-
Groundwater Vulnerability Classification and Source Protection Zone	The superficial deposits give the settlement area a minor aquifer medium or high category of risk vulnerability. The Environment Agency defines Source Protection Zones (SPZ) around all major public and private water supply abstractions to safeguard groundwater resources from potentially polluting activities. There are no SPZs within this settlement area. The Environment Agency records of smaller abstractions have not been reviewed at this stage.	-
Main Rivers	The River Wey flows north along the western edge of the Settlement Area and through the Brooklands Industrial Park area. The catchment of the River Wey lies within Hampshire and Surrey and has a total area of approximately 904 km^2. It falls approximately 190 m in level and is approximately 104 km in length from its source in Hampshire to the confluence with the River Thames near Weybridge. The Lower Wey is navigable from its confluence with the River Thames up to Godalming. It includes a number of navigation channels separate from the Main River, with water levels regulated by structures such as locks and weirs. Through the urban area of Weybridge, the natural channels have been engineered and canalised to varying degrees[70]. After the confluence with the River Wey at Weybridge, the River Thames flows east along the northern part of the Settlement Area. The Desborough Channel, located in the north of the Settlement Area, is an artificial channel that was cut in the 1930s to improve flow and ease navigation along the Thames. The cut takes the river on a straight course between Weybridge and Walton and its construction created Desborough Island.	Appendix A Figure 1, 5

[68] Extracted from the Consultation Settlement ID Plans http://consult.elmbridge.gov.uk/consult.ti/Draft_ID_Plans/consultationHome
[69] https://www.nomisweb.co.uk/reports/localarea?compare=1119885117
[70] Mott MacDonald, Environment Agency Thames Region (December 2009) *Lower Wey Remodelling and ABD Flood Mapping Study, Hydrology Report.*

Weybridge

Ordinary Watercourses	The Engine River flows east parallel to the Desborough Channel and the River Thames in the north of the Settlement Area. Several tributaries of the River Wey flow west from the urban area to their confluence with the River Wey.	Appendix A Figure 1, 5

Flood Risk

Flooding from Rivers	*Flood Zones* The Settlement Area is located within Flood Zones 1, 2, and 3 as follows: • Flood Zone 1: 11.9 km^2 (75%) • Flood Zone 2: 1.1 km^2 (7%) • Flood Zone 3: 0.6 km^2 (4%) • Flood Zone 3b: 2.1 km^2 (13%) *Functional Floodplain* Approximately 13% of the Settlement Area (2.1km^2) is shown to be at risk during the 1 in 30 year (3.3% AEP) flood event from the Lower Wey and the Lower Thames. These areas include the developed areas of Walton Lane, Dorney Grove, Wey Road, Round Oak Road, Wey Meadows, Brooklands Museum, and parts of Brooklands Road, as well as the undeveloped areas of Plough Bridge Farm, Brooklands Community Park, Trinity Island and Bulldog Island. Areas within the modelled flood extents shown in Table 3-2 are defined by EBC as Flood Zone 3b Functional Floodplain, with the exception of developed areas which are prevented from flooding by the presence of existing infrastructure or solid buildings – these areas are not considered Functional Floodplain. Section 5.3 provides further information. *Climate Change* Land close to Brooklands Industrial Park is shown to be at risk during the 1 in 100 year (1% AEP) flood event including an allowance for climate change. The extent of flooding associated with the River Thames around Wey Meadows and Desborough Island is shown to increase slightly during the 1 in 100 year (1% AEP) flood event including an appropriate allowance for climate change. *Historic Records* The floodplain of the River Wey is very constrained in this area and EBC and the Environment Agency hold records of flooding adjacent to the River Wey. Further south, incidents have also been recorded along Connaught Drive, Brooklands Road, Davis Road, Dorney Grove, Walton Lane (Desborough Island), Church Walk and Eyston Drive. Notable flooding occurrences within the Wey catchment have been reported in 1900, 1947, 1968, 1979, 1985, 1987, 1990, 2000, 2003, 2006, 2007, 2008 and 2013-14. The flooding occurrence in the Lower Wey is influenced by the geology, and the rapid rate of urbanisation within the study area. Floods have been exacerbated by the high runoff generated, coupled with the considerable amount of debris carried into drains and streams, leading to blockages and a reduction in the capacity of the watercourses. This has eventually led to the River Wey overflowing its banks, and drains being unable to cope with the excess water leading to widespread flood inundation. *Flood Defences* The Environment Agency AIMS dataset identifies that high ground is present along the edge of the River Wey channel as well as adjacent to the River Thames and Desborough Cut.	Appendix A Figures 4, 5, 6, 7, 8 and 9
Flooding from Land	The RoFSW identifies a higher risk of surface water flooding in the natural topographic low points in the Settlement Area. Flow paths follow the natural drainage of the local area, ponding in lower lying areas adjacent to the River Wey and adjacent to embanked railway lines. *Historic Records* SCC have identified 'wetspots' which are susceptible to surface water flooding located in Queens Road and Seven Hills Road, Weybridge.	Appendix A Figure 10
Flooding from Groundwater	The majority of the Settlement Area is classed as having limited potential for groundwater flooding to occur; however, the north of the Settlement Area has potential for groundwater flooding to occur at the surface with some small areas having potential of groundwater flooding of property situated below ground level.	Appendix A Figure 11
Flooding from Sewers	The TWUL Register identifies that sewer flooding has affected 45 properties in the KT13 area which covers the majority of the Settlement Area. The south of the Settlement Area is partly covered by the KT11 postcode which has 48 properties affected by sewer flooding.	Appendix A Figure 12

Weybridge

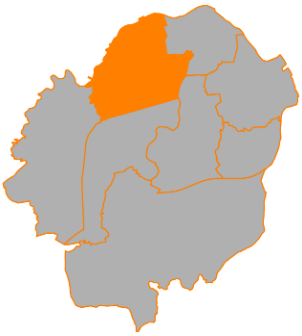
Reservoirs, canals, other artificial sources	Small waterbodies in the Weybridge Settlement Area include Broad Water Lake near Templemere, north of Weybridge; Silver Mere set in the grounds of the Silvermere Golf Course; Upper Pond set in the grounds of St George's Golf Course, Warrens Pond, off Warreners Lane near St George's Hill, two ponds near The Heights and one at Brooklands. The Environment Agency dataset 'Risk of Flooding from Reservoirs' shows that the northern fringe of the Settlement Area and the areas along the edge of the River Wey could be flooded if a reservoir were to fail.	Appendix A Figure 13

Managing and Mitigating Flood Risk

Flood Warning Areas	The Environment Agency Flood Warning Areas relevant to the Settlement Area are: 'River Thames at Walton', 'River Thames at Ham Court', 'River Wey at Weybridge', 'River Wey at Wisley and Byfleet' and 'Properties closest to the River Wey between Walsham Meadow and Byfleet town'.	Appendix A Figure 16
Rest Centres	EBC has a designated primary rest centre in Weybridge centre, near Churchfields Recreation Ground. Depending on the type and extent of flooding in the local area, this may be available for use as an emergency rest centre. The Multi Agency Flood Plan should be consulted for further information.	Appendix A Figure 16
Infiltration SuDS Suitability	The north of the Settlement Area is likely to suffer very significant constraints in the widespread use of infiltration SuDS. Along the western boundary and in small areas to the east and south, there may be opportunities for bespoke infiltration SuDS. The majority of the centre and south of the Settlement Area is likely to be highly compatible for the application of infiltration SuDS.	Appendix A Figure 15
Site-specific FRA Guidance	Sections 5 and 6 provide detailed guidance on measures to manage and mitigate flood risk, and Section 7 provides guidance on preparation of site-specific FRAs.	Section 5, 6 and 7
Policy Recommendations	Appendix C provides spatial planning and development management recommendations for the Borough.	Appendix C

Walton-on-Thames

General Information

Area	Walton-on-Thames covers an area of **10.9km²**.	
Character[71]	Walton-on-Thames is the largest settlement in Elmbridge. The settlement is in the northwest of the Borough with the River Thames forming the northern border. It has one of the two bridges crossing the River Thames into the Borough and is a key crossing point for traffic travelling to and from the M3 to the north. Walton town centre is the largest centre in the Borough and one that has grown in recent years, primarily through the development of The Heart, a comprehensive mixed-use town centre scheme. In addition to Walton Town Centre, there are local centres at Walton Halfway, located close to Walton Station and at Terrace Road to the north of Walton Town Centre. The character of the area is predominantly residential. There is a mix of densities including some areas of higher density development as well as pockets of lower density. Open spaces within the urban area are limited. However, greenbelt to the north and west of the settlement and the River Thames on the eastern boundary offer valuable opportunities for informal recreation.	
Topography	The Settlement Area is located predominantly within the low-lying floodplain of the River Thames, at approximately 0-12m AOD. Some sites along the Thames frontage have steep banks down to the river. The land rises in the south west corner of the Settlement Area to approximately 26m AOD.	Appendix A Figure 1
Geology	Superficial - the Settlement Area is underlain by River Terrace Deposits. The named formations are the Kempton Park Gravel Formation and Taplow Gravel Formation. Bedrock - the Settlement Area is underlain by Bagshot Formation (Sand), Claygate Member (London Clay Formation – Sand, Silt and Clay) and London Clay Formation (Silt and Clay) in different parts of the area.	Appendix A Figures 2 and 3.
Aquifer Type	The River Terrace Deposits are classified as a Principal Aquifer. According to Environment Agency definition, a Principal Aquifer is defined as "*having intergranular permeability, can provide a high level of water storage, can support water supply and/ or river base flow on a strategic scale*". The underlying bedrock is classified as Unproductive Strata.	-
Groundwater Vulnerability Classification and Source Protection Zone	The RTDs covering the surface give the Settlement Area a major aquifer high category of risk vulnerability. The Environment Agency defines SPZs around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. There are no SPZs within the Settlement Area. The Environment Agency records of smaller abstractions have not been reviewed at this stage.	-
Main Rivers	The River Thames flows along the northern edge of the Settlement Area. The Lower Thames floodplain is relatively broad and flat and the river itself contains several islands. The normal tidal limit of the River Thames occurs at Teddington Weir, approximately 5km downstream from Thames Ditton (TQ 1675 7149), but on a high tide, the tidal influence can extend as far back upriver as Molesey Weir. The Dead River passes around the southern edge of Queen Elizabeth II Storage Reservoir to its confluence with the River Mole. The Dead River drains a catchment of approximately 5km², 50% of which is urbanised. The Lower Mole extends from Esher Railway Bridge downstream along the south eastern edge of the Walton-on-Thames Settlement Area to its confluence with the River Thames at Molesey, near Hampton Court. The catchment covers an area of approximately 11km². The Lower Mole has been extensively modified by the construction of the Lower Mole Flood Alleviation Scheme between 1977 and 1991.	Appendix A Figure 1, 5
Ordinary Watercourses	An Ordinary Watercourse flows from Rydens allotments, along Rydens Lane to join the Dead River. There is also a tributary of the Dead River to the rear of Regency Gardens, adjacent to the Queen Elizabeth II Storage Reservoir. There is a SCC highways ditch along Hurst Road in the north east of the Settlement Area.	Appendix A Figure 1, 5

Flood Risk

[71] Extracted from the Consultation Settlement ID Plans http://consult.elmbridge.gov.uk/consult.ti/Draft_ID_Plans/consultationHome

Walton-on-Thames

Flooding from Rivers	*Flood Zones* The Settlement Area is located within Flood Zones 1, 2, and 3 as follows: • Flood Zone 1: 9.0 km2 (82%) • Flood Zone 2: 0.9 km2 (8%) • Flood Zone 3: 0.2 km2 (2%) • Flood Zone 3b: 0.8 km2 (8%) *Functional Floodplain* Approximately 8% of the Settlement Area (0.8 km^2) is shown to be at risk during the 1 in 50 year (2% AEP) flood event from the Dead River and the 1 in 30 year (3.3% AEP) from the Lower Thames. This comprises the fringe of the Settlement Area along the River Thames frontage at Ash Estates, Wheatley's Eyot and Beasley's Ait, as well as land to the south and east of Queen Elizabeth II Storage Reservoir, extending from Braycourt Avenue to Rydens Road and Molesey Road. Areas within the modelled flood extents shown in Table 3-2 are defined by EBC as Flood Zone 3b Functional Floodplain, with the exception of developed areas which are prevented from flooding by the presence of existing infrastructure or solid buildings – these areas are not considered Functional Floodplain. Section 5.3 provides further information. *Climate Change* The extent of flooding in the area of Walton-on-Thames north east and to the south of the Queen Elizabeth II Storage Reservoir is shown to increase during the 1 in 100 year (1% AEP) flood event including an allowance for climate change. The extent of flooding associated with the River Thames around Beasley's Ait and Rivernook Farm is shown to increase slightly during the 1 in 100 year (1%AEP) flood event including an appropriate allowance for climate change. *Historic Records* EBC and the Environment Agency hold records of fluvial flooding along the edge of the River Thames and within central Walton-On-Thames. *Flood Defences* The Environment Agency AIMS database identifies the presence of high ground adjacent to the Lower Mole, Dead River and River Thames in this location. Embankments are also present along the edge of the Lower Mole.	Appendix A Figures 4, 5, 6, 7, 8 and 9
Flooding from Land	The RoFSW identifies a higher risk of surface water flooding in the natural topographic low points in the Settlement Area. Areas identified to be at particular risk include the area around Cottimore Lane and Cottimore Avenue and the area around the junction between the A244 and the B365 south of Walton Library. *Historic Records* SCC has identified 'wetspots' which are susceptible to surface water flooding located on Hersham Road and Rydens Road.	Appendix A Figure 10
Flooding from Groundwater	The majority of the Settlement Area is classed as having potential for groundwater flooding to occur at the surface with some small areas along the northern boundary of the Settlement Area having potential for groundwater flooding of property situated below ground level. This is because much of the area is covered by Kempton Park Gravel Formation. A factor in influencing this risk is that beneath the RTDs lies the London Clay Formation Including Claygate Member. In those areas with less RTDs and underlain by the Bagshot Formation, the mapping by the BGS indicates limited potential for groundwater flooding to occur.	Appendix A Figure 11
Flooding from Sewers	The TWUL Register identifies that sewer flooding has affected 67 properties in the KT12 area which covers the majority of the Settlement Area. A small area in the north is covered by the KT8 postcode which has 28 properties affected by sewer flooding.	Appendix A Figure 12
Reservoirs, canals, other artificial sources	There are 3 large reservoir bodies in the Settlement Area: Beesborough Reservoir, Knight Reservoir (each designated Site Special Scientific Interest (SSSI), Special Protection Area (SPA), and Ramsar) and Queen Elizabeth II Storage Reservoir. There are also several smaller waterbodies including the Molesey Reservoirs Nature Reserve, Rivernook Farm, Fieldcommon Farm and waterbodies associated with disused gravel pits in the east of the Settlement Area with Island Barn Reservoir located just outside to the north east. The Environment Agency dataset 'Risk of Flooding from Reservoirs' shows that the majority of the Settlement Area could be flooded if a reservoir were to fail and release the water they hold.	Appendix A Figure 13

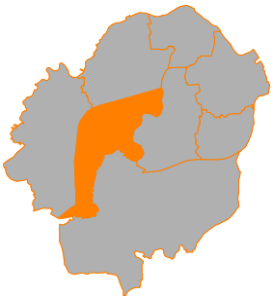
Managing and Mitigating Flood Risk

Walton-on-Thames

Flood Warning Areas	The Warning Areas relevant to the Walton Settlement Area are: 'Properties closest to the River Thames from Shepperton Lock to Beasley's Ait', 'Properties closest to the River Thames at Sunbury', 'River Mole at Esher and East Molesey', and 'River Thames at Walton'.	Appendix A Figure 16
Rest Centres	EBC has a designated primary rest centre in Walton Centre, on Manor Road. Depending on the type and extent of flooding in the local area, this may be available for use as an emergency rest centre. The Multi Agency Flood Plan should be consulted for further information.	Appendix A Figure 16
Infiltration SuDS Suitability	The majority of the Settlement Area is likely to suffer very significant constraints in the widespread use of infiltration SuDS. This is especially in the areas underlain by the London Clay Formation. Use of attenuation SuDS must be considered in these areas. Infiltration SuDS may be applicable in the areas underlain by Bagshot Formation, although confirmation would be needed in specific locations to determine the depth to the water table. This would be particularly the case for property with below ground surface elements.	Appendix A Figure 15
Site-specific FRA Guidance	Sections 5 and 6 provide detailed guidance on measures to manage and mitigate flood risk, and Section 7 provides guidance on preparation of site-specific FRAs.	Section 5, 6 and 7
Policy Recommendations	Appendix C provides spatial planning and development management recommendations for the Borough.	Appendix C

Hersham

General Information

Area	Hersham covers an area of **10.3km²**	
Character[72]	Hersham lies in the centre of the Walton, Weybridge and Esher triangle and is primarily a residential area supporting a population of around 12,500[73]. The majority of housing is detached or semi-detached and is at a relatively high density, although the area does include Burwood Park, one of the Borough's three Special Low-Density Areas. The urban area is bounded by greenbelt to the east with the settlement boundary following the River Mole. Within the greenbelt is Whiteley Village, a historic model village, which was built in 1907 devoted to the provision of housing for older people of limited means. The majority of buildings here are listed and the village has been designated a Conservation Area.	
Topography	The eastern part of the Settlement Area is low lying land, adjacent to the River Mole floodplain. The land rises steeply to the west towards St George's Hill in the Weybridge Settlement Area, and areas such as Burwood Park and Whiteley Village are located at approximately 30-50m AOD.	Appendix A Figure 1
Geology	Superficial - The Settlement Area is underlain by River Terrace Deposits. The named formations are the Kempton Park Gravel Formation (Sand & Gravel) and Taplow Gravel Formation. Bedrock - The Settlement Area is underlain by Claygate Member (upper part of the London Clay Formation – Sand, Silt and Clay).	Appendix A Figures 2 and 3.
Aquifer Type	The superficial deposits are classified as a principal aquifer. According to Environment Agency definitions, a Principal Aquifer is defined as "*having intergranular permeability, can provide a high level of water storage, can support water supply and/ or river base flow on a strategic scale*". The underlying bedrock is classified as a Secondary A Aquifer. According to Environment Agency definitions, a Secondary Aquifer is defined as "*a permeable layer capable of supporting water supplies a local rather than strategic scale and in some cases forming an important source of base flow to rivers*". An important factor which influences this classification in Elmbridge is the limited thickness of the layers, particularly the Claygate Member in the Hersham area.	-
Groundwater Vulnerability Classification and Source Protection Zone	The River Terrace Deposits covering the surface give the Settlement Area a major aquifer high and intermediate category of risk vulnerability. The Environment Agency defines SPZs around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. There are no SPZs within this Settlement Area. The Environment Agency records of smaller abstractions have not been reviewed at this stage.	-
Main Rivers	The River Mole forms the eastern boundary of the Settlement Area. The River Mole and its tributaries have a catchment of approximately 487km². The Mole rises in the North Sussex Hills near Rusper and flows into the River Thames at Molesey, near Hampton Court. The Middle Mole extends from where the Salford Stream tributary meets the River Mole in Reigate and Banstead Borough, to the Esher Railway Bridge. The catchment of the Middle Mole covers approximately 270km².	Appendix A Figure 1, 5
Ordinary Watercourses	A tributary of the Dead River flows from Bell Farm Junior School northwards towards Walton on Thames. Tributaries of the River Mole drain eastwards from the Seven Hills Estate and Whiteley Village.	Appendix A Figure 1, 5

Flood Risk

Flooding from Rivers	*Flood Zones* The Settlement Area is located within Flood Zones 1, 2, and 3 as follows: • Flood Zone 1: 8.3 km² (80%) • Flood Zone 2: 1.3 km² (13%) • Flood Zone 3: 0 km² (0%) • Flood Zone 3b: 0.7 km² (6%) *Functional Floodplain*	Appendix A Figures 4, 5, 6, 7, 8 and 9

[72] Extracted from the Consultation Settlement ID Plans http://consult.elmbridge.gov.uk/consult.ti/Draft_ID_Plans/consultationHome
[73] https://www.nomisweb.co.uk/reports/localarea

Hersham

	Approximately 6% of the Settlement Area (0.7 km^2) is shown to be at risk during the 1 in 30 year (3.3% AEP) flood event from the Middle Mole. This comprises the rural land adjacent to the River Mole along the eastern boundary of the Hersham Settlement Area. Areas within the modelled flood extents shown in Table 3-2 are defined by EBC as Flood Zone 3b Functional Floodplain, with the exception of developed areas which are prevented from flooding by the presence of existing infrastructure or solid buildings – these areas are not considered Functional Floodplain. Section 5.3 provides further information. *Climate Change* The extent of flooding associated with the River Mole is shown to increase slightly during the 1 in 100 year (1% AEP) flood event including an allowance for climate change, affecting the north of the Settlement Area in Hersham and the rural land associated with Willow Tree Farm and Southwood Manor Farm, where the course of the River Mole meanders. *Historic Records* The Environment Agency Historic Flood Map shows the extent of flooding from a range of sources. The map shows flooding within the Horsham Settlement area however, the source is unknown. *Flood Defences* The Environment Agency AIMS dataset identifies that as part of the Lower Mole Flood Alleviation Scheme earth embankments and concrete walls are present along the right and left banks of the Lower Mole in the north of the Hersham Settlement Area. The area between Esher Road and the River Mole channel, land to the east of Hersham Golf Club adjacent to the River Mole, and Winterhouse Farm are formally identified as areas with reduction in risk of flooding from Rivers and Sea due to defences.	
Flooding from Land	The RoFSW identifies a higher risk of surface water flooding in the natural topographic low points in the Settlement Area and where particular barriers present an obstruction behind which surface water can collect. The mapping identifies the potential for garden and highway flooding in the north of the Settlement Area and parts of Burwood Park and Broad Water. Ponding is also modelled to occur adjacent to Ordinary Watercourses in the south of the Settlement Area. *Historic Records* SCC has identified 'wetspots' which are susceptible to surface water flooding including Seven Hills Road.	Appendix A Figure 10
Flooding from Groundwater	The eastern part of the Settlement Area is classed as having potential for groundwater flooding to occur at the surface with some small areas having potential for groundwater flooding of property situated below ground level. The western and southern areas have limited potential for groundwater flooding to occur. This is because much of the area is covered by Kempton Park Gravel Formation and Taplow Gravel Formation. A factor in influencing this risk is that the beneath the River Terrace Deposits lies the London Clay Formation Including Clay Member.	Appendix A Figure 11
Flooding from Sewers	The TWUL Register identifies that sewer flooding has affected 67 properties in the KT12 area which covers the central and northern section of the Settlement Area. The south of the Settlement Area is partly covered by the KT11 postcode which has 48 properties affected by sewer flooding.	Appendix A Figure 12
Reservoirs, canals, other artificial sources	There are a number of small lakes within the Settlement Area, The Lake to the south, Manor Pond, a pond near North Avenue in Whiteley Village, and ponds near Willow Tree Farm and Broad Water in Burwood Park. The water supply reservoirs, including Queen Elizabeth II Reservoir, Island Barn Reservoir, Beesborough Reservoir and Knight Reservoir, are located to the north of the Settlement Area. The Environment Agency dataset 'Risk of Flooding from Reservoirs' shows the area that could be flooded if one of these reservoirs were to fail and release the water it holds. The extent of flooding is shown to extend into the northern part of the Hersham Settlement Area.	Appendix A Figure 13

Managing and Mitigating Flood Risk

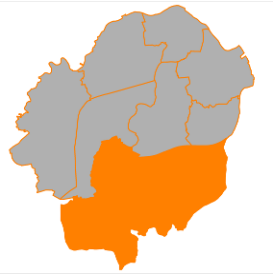
Flood Warning Areas	The Warning Area relevant to the Settlement Area is: 'River Mole at Esher and East Molesey', 'River Mole at Stoke D'Abernon, Cobham and South Hersham'.	Appendix A Figure 16
Rest Centres	EBC has a designated primary rest centre in Hersham Centre, on Queen's Road. Depending on the type and extent of flooding in the local area, this may be available for use as an emergency rest centre. The Multi Agency Flood Plan should be consulted for further information.	Appendix A Figure 16
Infiltration SuDS Suitability	The northern part of the Settlement Area is likely to suffer very significant constraints in the use of infiltration SuDS. This is especially the case in the areas underlain by the Claygate Member Formation.	Appendix A Figure 15

Hersham

	In some small areas in the north and the eastern part of the Settlement Area, there may be opportunities for bespoke infiltration SuDS. In the southern part of Settlement Area and the western side, these areas are generally highly compatible for infiltration SuDS.	
Site-specific FRA Guidance	Sections 5 and 6 provide detailed guidance on measures to manage and mitigate flood risk, and Section 7 provides guidance on preparation of site-specific FRAs. Modelling for the Lower Mole does not include all the Ordinary Watercourse tributaries in the catchment. For development sites in close proximity to Ordinary Watercourses it is likely that modelling will be required in order to determine the probability of flooding and local flood levels to inform a site-specific FRA.	Section 5, 6 and 7
Policy Recommendations	Appendix C provides spatial planning and development management recommendations for the Borough.	Appendix C

Cobham, Oxshott, Stoke D'Abernon and Downside

General Information

Area	Cobham, Oxshott, Stoke D'Abernon and Downside cover a large area of **30.6km²**.	
Character[74]	Cobham, Oxshott, Stoke D'Abernon and Downside are located in the south of the Borough and are separated from the rest of Elmbridge by the A3 as well as by extensive areas of greenbelt. This acts as an important recreational resource with locations such as Oxshott Heath, Fairmile Park and Cobham Park being popular with both residents and visitors alike. Cobham, Oxshott, Stoke D'Abernon and Downside Village are four distinctly different areas. Whilst recognising that they share a variety of common characteristics, their individuality is of primary importance to the local community. The vast majority of development in the area is residential.	
Topography	Fairmile and Oxshott located in the eastern part of the Settlement Area are located on high land, at approximately 45-75m AOD. The land falls away to the west towards Stoke D'Abernon (40m AOD) and Cobham (20m AOD) towards the floodplain of the River Mole (15-20m AOD). The land rises again towards Downside and Pointer's Green (30m AOD) where the M25 passes through the Settlement Area and Hatchford (50m AOD).	Appendix A Figure 1
Geology	Superficial - The Settlement Area is underlain by superficial deposits – either Taplow Gravel Formation (Sand & Gravel) or alluvium. Bedrock - The Settlement Area is underlain by Bagshot Formation (Sand) and Claygate Member (London Clay Formation – Sand, Silt and Clay).	Appendix A Figures 2 and 3.
Aquifer	The superficial deposits are classified as either a Principal Aquifer or Secondary A Aquifer. According to Environment Agency definitions, a Principal Aquifer is defined as "*having intergranular permeability, can provide a high level of water storage, can support water supply and/ or river base flow on a strategic scale*". A Secondary A Aquifer is defined as "*a permeable layer capable of supporting water supplies a local rather than strategic scale and in some cases forming an important source of base flow to rivers*". The underlying bedrock is classified as a Secondary A Aquifer. An important factor which influences this classification in Elmbridge is the limited thickness of the layers, in particular the Bagshot Formation and Claygate Member.	-
Groundwater Vulnerability Classification and Source Protection Zone	The superficial deposits give the Settlement Area a range of risk vulnerabilities from Principal aquifer high to secondary aquifer. The Environment Agency defines SPZs around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. There are no SPZs within this Settlement Area. The Environment Agency records of smaller abstractions have not been reviewed at this stage.	-
Main Rivers	The River Mole and its tributaries have a catchment of approximately 487km². The Mole rises in the North Sussex Hills near Rusper and flows into the River Thames at Molesey, near Hampton Court. The Middle Mole extends from where the Salford Stream tributary meets the River Mole in the Reigate and Banstead District, to the Esher Railway Bridge. The catchment of the Middle Mole covers approximately 270km². The Middle Mole enters the Settlement Area close to Stoke D'Abernon bridge, where it passes beneath the M25. The Middle Mole then meanders through the Settlement Area towards Hersham. The River Rythe flows south to north from Oxshott to its confluence with the River Thames, adjacent to Ferry Road. It flows through the developed areas of Oxshott, Claygate, Hinchley Wood, Esher, and Thames Ditton. The River Rythe drains a total catchment area of approximately 19km², of which approximately 50% is urbanised	Appendix A Figure 1, 5
Ordinary Watercourses	There are numerous Ordinary Watercourses in the Settlement Area that drain into the Rivers Rythe or Mole. Several large tributaries join the River Mole in this Settlement Area, draining the areas of Fairmile and Oxshott in the east and Hatchford and May's Green in the southwest. There are also a number of SCC highways ditches in the Settlement Area.	Appendix A Figure 1, 5

Flood Risk

[74] Extracted from the Consultation Settlement ID Plans http://consult.elmbridge.gov.uk/consult.ti/Draft_ID_Plans/consultationHome

Cobham, Oxshott, Stoke D'Abernon and Downside

Flooding from Rivers	*Flood Zones* The Settlement Area is located within Flood Zones 1, 2, and 3 as follows: • Flood Zone 1: 25.7 km^2 (84%) • Flood Zone 2: 1.4 km^2 (5%) • Flood Zone 3: 0.2 km^2 (1%) • Flood Zone 3b: 3.2 km^2 (11%) *Functional Floodplain* Approximately 12% of the Settlement Area (3.2 km^2) is shown to be at risk during the 1 in 30 year (3.3% AEP) flood event from the Middle Mole and the River Rythe. This comprises the rural land within the relatively wide floodplain of the Middle Mole. It also includes the developed areas of Cobham and Stoke D'Abernon train station, including Winston Drive and Station Road, Blundel Lane, Chelsea FC Cobham Training Ground on Stoke Lane, Prince's Drive, Birds Hill Drive, Montrose Gardens and Fairoak Lane. Areas within the modelled flood extents shown in Table 3-2 are defined by EBC as Flood Zone 3b Functional Floodplain, (with the exception of areas which are prevented from flooding by the presence of existing infrastructure or solid buildings – these areas are not considered Functional Floodplain). Section 5.3 provides further information. *Climate Change* The extent of flooding associated with the Middle Mole and River Rythe is shown to marginally increase during the 1 in 100 year (1% AEP) flood event including an allowance for climate change predominately in the Cobham Court and Cobham Lodge area. *Historic Records* The Environment Agency Historic Flood Map shows the extent of flooding from a range of sources. The map shows flooding within the Cobham, Oxshott, Stoke D'Abernon and Downside Settlement area, however the source is unknown. *Flood Defences* The Middle Mole is not formally defended; however, the Environment Agency AIMS dataset identifies high ground on either side of the watercourse. Some of the tributaries of the River Mole, near Stoke D'Abernon, are culverted for short sections. No defences are present along the River Rythe.	Appendix A Figures 4, 5, 6, 7, 8 and 9
Flooding from Land	The RoFSW identifies a higher risk of surface water flooding in the natural topographic low points in the Settlement Area and where particular barriers present an obstruction behind which surface water can collect. The mapping identifies surface water flood risk in the low-lying land adjacent to the River Mole and River Rythe, as well as built up areas including Fairmile, Fairmile Park and the Stoke Road area. The mapping also identifies the potential for surface water to pond in a number of areas around the settlement area. *Historic Records* SCC has identified 'wetspots' which are susceptible to surface water flooding including Downside Road, Plough Lane and Fairmile Lane, as well as a number of other areas with dormant wetspots.	Appendix A Figure 10
Flooding from Groundwater	The majority of the Settlement Area is classed as having limited potential for groundwater flooding to occur. Parts of the Settlement area along the River Mole floodplain have potential for groundwater flooding to occur at the surface and small areas below ground level as well as a small area to the north of the Settlement Area adjacent to the River Rythe.	Appendix A Figure 11
Flooding from Sewers	The TWUL Register identifies that sewer flooding has affected 48 properties in the KT11 area which covers the majority of the central and western side of the Settlement Area. The east of the Settlement Area is covered by the KT22 postcode which has 18 properties affected by sewer flooding.	Appendix A Figure 12
Reservoirs, canals, other artificial sources	There are a number of small waterbodies within the Settlement Area: Norwood Farm to the north, Middle Pond at Fairmile Common and a pond in Fairmile Park. The Environment Agency dataset 'Risk of Flooding from Reservoirs' shows that should a reservoir fail, water would follow the course of the River Mole and cause flooding of the River Mole floodplain.	Appendix A Figure 13

Managing and Mitigating Flood Risk

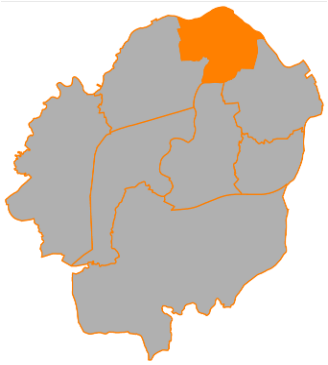
Flood Warning Areas	The Flood Warning Area of relevance to this area is: 'River Mole at Stoke D'Abernon, Cobham and South Hersham' and 'The River Rythe between Oxshott and Thames Ditton'.	Appendix A Figure 16

Cobham, Oxshott, Stoke D'Abernon and Downside

Rest Centres	EBC has a designated primary rest centre in Cobham Centre, on Oakdene Road. Depending on the type and extent of flooding in the local area, this may be available for use as an emergency rest centre. The Multi Agency Flood Plan should be consulted for further information.	Appendix A Figure 16
Infiltration SuDS Suitability	The area around the River Mole floodplain is likely to suffer very significant constraints in the use of infiltration SuDS. The main built-up area around Cobham and Oxshott is likely to be highly compatible for infiltration. In the rest of Settlement Area, there may be opportunities for bespoke infiltration SuDS, although confirmation would be needed in specific locations to determine the depth to the water table.	Appendix A Figure 15
Site-specific FRA Guidance	Sections 5 and 6 provides detailed guidance on measures to manage and mitigate flood risk, and Section 7 provides guidance on preparation of site-specific FRAs. Modelling and Flood Zone mapping for the Lower Mole does not include all the Ordinary Watercourse tributaries in the catchment. For development sites in close proximity to these watercourses it is likely that modelling will be required in order to determine the probability of flooding and specific flood levels to inform a site-specific FRA.	Section 5, 6 and 7
Policy Recommendations	Appendix C provides spatial planning and development management recommendations for the Borough.	Appendix C

East and West Molesey

General Information

Area	East and West Molesey covers an area of **5.9km²** comprising **76% urban area** and **24% Green Belt**.	
Character[75]	The Settlement Area of East and West Molesey is in the northeast of the Borough bordering the London Boroughs of Richmond and Kingston, which lie on the opposite side of the River Thames. Its role within the settlement hierarchy is as a suburban Settlement Area, and whilst it is primarily residential in character there are two substantial areas currently designated as Strategic Employment Land – Molesey Industrial Estate and Imber Court Trading Estate, both of which support a range of light industrial, storage, distribution and service industries. The general character of the residential area is varied, ranging from predominantly Victorian houses in the east to 1960s housing in the west. In total there are 5355 dwellings[76] and a population approaching 13,000[77]. A particular feature of the area is the amount of social housing and ex-local authority owned properties in West Molesey.	
Topography	The Settlement Area is largely flat, located adjacent to the River Thames at approximately 5-10m AOD.	Appendix A Figure 1
Geology	Superficial - The Settlement Area is underlain by superficial deposits – either Kempton Park Gravel Formation (Sand & Gravel) or alluvium. Bedrock - The Settlement Area is underlain by London Clay Formation (Silt and Clay).	Appendix A Figures 2 and 3.
Aquifer Type	The superficial deposits are classified as a Principal Aquifer. According to EA definitions, a principal aquifer is defined as having intergranular permeability, can provide a high level of water storage, can support water supply and/ or river base flow on a strategic scale. The underlying bedrock is classified as unproductive strata. According to EA definitions, unproductive strata are rock strata or drift deposits with low permeability that has negligible significance for water supply or river base flow.	-
Groundwater Vulnerability Classification and Source Protection Zone	The superficial deposits give the Settlement Area a major aquifer high category of risk vulnerability. The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. There are no SPZs within this Settlement Area. The EA records of smaller abstractions have not been reviewed at this stage.	-
Main Rivers	The River Thames flows along the northern edge of the Settlement Area. The Lower Thames floodplain is relatively broad and flat and the river itself contains several islands. The normal tidal limit of the River Thames occurs at Teddington Weir, approximately 5km downstream from Thames Ditton (TQ 1675 7149), but on a high tide, the tidal influence can extend as far back upriver as Molesey Weir. The Dead River flows eastwards, south of the Molesey Industrial Estate, to join the River Mole in the west. The Dead River is the only significant tributary of the Lower Mole. The Dead River drains a catchment of approximately 5km², 50% of which is urbanised. The Lower Mole extends from Esher Railway Bridge downstream, round the western side of Island Barn Reservoir, to its confluence with the River Thames at Molesey. The River Ember is a channel of the River Mole which flows around the east of Island Barn Reservoir before flowing northeast, parallel to the Lower Mole channel towards its confluence with the River Thames. The Lower Mole catchment covers an area of approximately 11km² and has been extensively modified by the construction of the Lower Mole Flood Alleviation Scheme between 1977 and 1991.	Appendix A Figure 1, 5
Ordinary Watercourses	There is an ordinary watercourse adjacent to the River Ember channel and Island Barn Reservoir.	Appendix A Figure 1, 5

Flood Risk

Flooding from Rivers	*Flood Zones* The Settlement Area is located within Flood Zones 1, 2, and 3 as follows: • Flood Zone 1: 2.7 km² (45%)	Appendix A Figures 4,

[75] Extracted from the Consultation Settlement ID Plans http://consult.elmbridge.gov.uk/consult.ti/Draft_ID_Plans/consultationHome
[76] Dwelling stock by Council Tax Band (VOA)
[77] Resident Population Estimates 2010 (ONS)

East and West Molesey

	• Flood Zone 2: 2.3 km^2 (39%) • Flood Zone 3: 0.2 km^2 (3%) • Flood Zone 3b: 0.7 km^2 (12%) *Functional Floodplain* Approximately 12% of the Settlement Area (0.7 km^2) is shown to be at risk during the 1 in 50 year (2% AEP) flood event from the Dead River, the 1 in 75 year (1.33% AEP) flood event from the Lower Mole and 1 in 30 year (3.3% AEP) flood event from the River Thames. These areas include the developed areas along the River Thames frontage along Hurst Road in East Molesey and developed land to the east of Queen Elizabeth II Storage Reservoir near Molesey Road and Pool Road in West Molesey. Areas within the modelled flood extents shown in Table 3-2 are defined by EBC as Flood Zone 3b Functional Floodplain, with the exception of developed areas which are prevented from flooding by the presence of existing infrastructure or solid buildings – these areas are not considered Functional Floodplain. Section 5.3 provides further information. *Climate Change* The extent of flooding associated with the River Thames is shown to increase during the 1 in 100 year (1% AEP) flood event including an allowance for climate change to the south of Hurst Park and south of Walton Road. The extent of flooding associated with the Dead River is also shown to increase in West Molesey. *Historic Records* EBC hold records of fluvial flooding associated with the River Thames at Hurst Road, Bridge Road and Graburn Road. *Flood Defences* The Environment Agency AIMS dataset identifies the presence of high ground along the River Thames in this location. The Lower Mole has been modified by the construction of the Lower Mole Flood Alleviation Scheme, between 1977 and 1991, which comprises embankments along the reach of the Lower Mole adjacent to Island Barn Reservoir and a 0.6km length of flood defence wall further downstream.	5, 6, 7, 8 and 9
Flooding from Land	The Settlement Area is flat and low lying. The RoFSW identifies small pockets of surface water flood risk along highways in natural topographic low points of adjacent to buildings and higher ground. Surface water is also shown to pond adjacent to the River Thames and River Mole watercourses. *Historic Records* SCC have identified Esher Road as a known 'wetspot' which is susceptible to surface water flooding.	Appendix A Figure 10
Flooding from Groundwater	The north and centre of the Settlement Area are classed as having potential for groundwater flooding to occur at the surface and below ground level. This is because much of the area is covered by Kempton Park Gravel Formation.	Appendix A Figure 11
Flooding from Sewers	The TWUL Register identifies that sewer flooding has affected 28 properties in the KT8 area which covers the majority of the Settlement Area. The south of the Settlement Area is covered by the KT12 postcode which has 67 properties affected by sewer flooding.	Appendix A Figure 12
Reservoirs, canals, other artificial sources	The Island Barn water supply reservoir is located in the south of the Settlement Area. The reservoir has an area of 0.5km^2 and is managed by TWUL. Beesborough, Knight and Queen Elizabeth II Reservoirs are also located close to the Settlement Area. The Environment Agency dataset 'Risk of Flooding from Reservoirs' shows that the whole of the East and West Molesey Settlement Area could be flooded if these reservoirs were to fail and release the water they hold. The Molesey Reservoirs Nature Reserve is also located in the north of the Settlement Area adjacent to the River Thames and comprises two former gravel pits.	Appendix A Figure 13
Managing and Mitigating Flood Risk		
Flood Warning Areas	The Warning Areas relevant to the Settlement Area are: 'Properties closest to the River Thames from Platts Eyot to Hampton Court Bridge', 'River Thames at East and West Molesey', 'River Thames at Walton', 'River Thames at Thames Ditton', 'River Thames at Hampton and Hampton Wick' and 'River Mole at Esher and East Molesey'.	Appendix A Figure 16
Rest Centres	EBC has a designated primary rest centre in Molesey Centre, on Bishops Fox Way. Depending on the type and extent of flooding in the local area, this may be available for use as an emergency rest centre. The Multi Agency Flood Plan should be consulted for further information.	Appendix A Figure 16

East and West Molesey

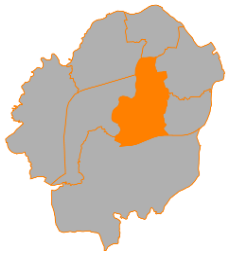
Infiltration SuDS Suitability	The north and centre of the Settlement Area are likely to suffer very significant constraints in the widespread use of infiltration SuDS. There are opportunities for bespoke infiltration SuDS in the east and south of the Settlement Area.	Appendix A Figure 15
Site-specific FRA Guidance	Sections 5 and 6 provide detailed guidance on measures to manage and mitigate flood risk, and Section 7 provides guidance on preparation of site-specific FRAs.	Section 5, 6 and 7
Policy Recommendations	Appendix C provides spatial planning and development management recommendations for the Borough.	Appendix C

Esher

General Information

Area	Esher covers an area of **9.3km^2**

Esher

Character[78]	Esher is located in the centre of the Borough and is one of the smaller settlements. The town is surrounded by open space with the south of the settlement area containing Esher Commons, the largest of the Borough's three Sites of Special Scientific Interest (SSSI) and Claremont Landscape Gardens. To the north is the internationally renowned Sandown Park Racecourse. These local assets, alongside the relatively low density of the existing development, interspersed with the village greens at Esher, Hare Lane and West End, all contribute to the character and high-quality environment of this area. 	
Topography	The central and eastern part of the Settlement Area, including the urban centre of Esher, Claremont Park and Esher Common are located on high land (35-50m AOD). The land falls away to the west towards the River Mole floodplain where levels are approximately 10-15m AOD.	Appendix A Figure 1
Geology	Superficial - The Settlement Area is underlain by superficial deposits – either small area of Black Park Gravel Member (Sand &Gravel) or no deposits. Bedrock - The Settlement Area is underlain by Bagshot Formation (Sand) and Claygate Member (upper part of London Clay Formation – Sand, Silt and Clay).	Appendix A Figures 2 and 3.
Aquifer Type	The superficial deposits are classified as Principle and Secondary A aquifers. The underlying Claygate Member bedrock is classified as a Secondary A aquifer or unproductive strata. According to EA definitions, a secondary aquifer is defined as a permeable layer capable of supporting water supplies a local rather than strategic scale and in some cases forming an important source of base flow to rivers. An important factor which influences this classification in Elmbridge is the limited thickness of the layers, in particular the Bagshot Formation and Claygate Member.	-
Groundwater Vulnerability Classification and Source Protection Zone	The superficial deposits give the Settlement Area a major aquifer high and intermediate category of risk vulnerability. The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. There are no SPZs within this Settlement Area. The EA records of smaller abstractions have not been reviewed at this stage.	-
Main Rivers	The River Mole flows northwards along the western edge of the Esher Settlement Area. The Middle Mole extends from where the Salford Stream tributary meets the River Mole, just upstream of Sidlow Bridge in the Reigate and Banstead District, to the Esher Railway Bridge and its catchment covers approximately 270km^2. The Lower Mole extends from Esher Railway Bridge downstream to its confluence with the River Thames at Molesey, near Hampton Court. The catchment covers an area of approximately 11km^2. The Lower Mole has been extensively modified by the construction of the Lower Mole Flood Alleviation Scheme between 1977 and 1991. The Dead River is the main tributary of the Lower Mole. The River Rythe flows northwards through Abrook Common and the eastern part of the Settlement Area. This watercourse rises near Oxshott, in the Prince's Coverts woodland and flows northwards, through Claygate and along the edge of Hinchley Wood. The river then follows the Portsmouth Road towards Thames Ditton, and runs into the River Thames near Ferry Road, forming the boundary between Kingston and Thames Ditton.	Appendix A Figure 1, 5
Ordinary Watercourses	Tributaries of the River Mole drain areas such as Esher Common, West End Common and the River Mole Business Park/Sandown Industrial Estates in the north of the Settlement Area. Tributaries of the River Rythe drain the eastern part of Esher Common and Claremont Park.	Appendix A Figure 1, 5

Flood Risk

Flooding from Rivers	*Flood Zones* The Settlement Area is located within Flood Zones 1, 2, and 3 as follows: • Flood Zone 1: 7.5 km^2 (80%) • Flood Zone 2: 1.2 km^2 (13%) • Flood Zone 3: 0.1 km^2 (2%) • Flood Zone 3b: 0.5 km^2 (5%) *Functional Floodplain* Approximately 5% of the Settlement Area (0.5km^2) is shown to be at risk during the 1 in 30 year (3.3% AEP) flood event from the Middle Mole and River Rythe and the 1 in 75 year (1.33% AEP) flood event from the Lower Mole. This comprises the rural land adjacent to the River Mole west of	Appendix A Figures 4, 5, 6, 7, 8 and 9

[78] Extracted from the Consultation Settlement ID Plans http://consult.elmbridge.gov.uk/consult.ti/Draft_ID_Plans/consultationHome

Esher

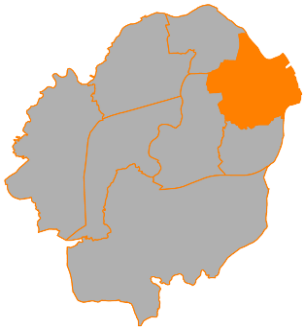
	West End. Areas within the modelled flood extents shown in Table 3-2 are defined by EBC as Flood Zone 3b Functional Floodplain, with the exception of developed areas which are prevented from flooding by the presence of existing infrastructure or solid buildings – these areas are not considered Functional Floodplain. Section 5.3 provides further information. *Climate Change* The extent of flooding associated with the River Mole is shown to increase during the 1 in 100 year (1% AEP) flood event including an allowance for climate change, affecting the area of Lower Green the West End Recreation Ground. *Historic Records* EBC hold records of fluvial flooding from the River Rythe on Hare Lane, Raleigh Drive and Littleworth Road. *Flood Defences* The Environment Agency Asset Information Management Systems (AIMS) dataset identifies the presence of high ground either side of the River Rythe and River Mole. Embankment is present to the north of the Settlement Area, along the River Mole and flood walls are present near West End Ponds.	
Flooding from Land	The ROFSW identifies a higher risk of surface water flooding in the natural topographic low points in the Settlement Area and where particular barriers present an obstruction behind which surface water can collect. Surface water is modelled to pond adjacent to the Rythe watercourse, in the open land in West End, in Drake's Close, Riverside Drive, Lammas Lane and Wolsey Road. Ponding is also modelled in the Lakeside Drive area and to the south of the railway track in the north of the Settlement Area. *Historic Records* SCC has identified a number of small roads as known 'wetspots' which are susceptible to surface water flooding.	Appendix A Figure 10
Flooding from Groundwater	The majority of the Settlement Area to the south and east is classed as having limited potential for groundwater flooding to occur. In the northern area and along the western fringe of the Settlement Area, there is a potential for groundwater flooding at the surface and below ground level.	Appendix A Figure 11
Flooding from Sewers	The TWUL Register identifies that sewer flooding has affected 31 properties in the KT10 area which covers the majority of the Settlement Area.	Appendix A Figure 12
Reservoirs, canals, other artificial sources	There are no large surface water bodies within the Settlement Area. A number of smaller waterbodies are present; Claremont Lake, is located in the Claremont Landscape Gardens, West End Ponds, The Lake at Lakeside Drive, Stable Pond at Ardbrook House and Black Pond at Esher Common. The Environment Agency dataset 'Risk of Flooding from Reservoirs' shows the area that could be flooded if one of the reservoirs within the Borough were to fail and release the water it holds extends just to the south of the railway line that passes east-west through the north of the Settlement Area.	Appendix A Figure 13

Managing and Mitigating Flood Risk

Flood Warning Areas	The Warning Area relevant to the Settlement Area is: 'River Mole at Esher and East Molesey', 'River Mole at Stoke D'Abernon, Cobham and South Hersham' and 'The River Rythe between Oxshott and Thames Ditton'.	Appendix A Figure 16
Rest Centres	There is no formally designated primary rest centre in the Esher Settlement Area. The rest centres in Hersham and Claygate Settlement Areas are in close proximity to Esher. Depending on the type and extent of flooding in the local area, these centres may be available for use as emergency rest centres. The Multi Agency Flood Plan should be consulted for further information.	Appendix A Figure 16
Infiltration SuDS Suitability	In the northern and western areas there are likely to be very significant constraints on the application of SuDS. There are opportunities for bespoke infiltration SuDS in the eastern part of the Settlement Area. The remainder of the Settlement Area is likely to be highly or probably suitable for the application of infiltration SuDS.	Appendix A Figure 15
Site-specific FRA Guidance	Sections 5 and 6 provide detailed guidance on measures to manage and mitigate flood risk, and Section 7 provides guidance on preparation of site-specific FRAs.	Section 5, 6 and 7
Policy Recommendations	Appendix C provides spatial planning and development management recommendations for the Borough.	Appendix C

Thames Ditton, Long Ditton, Hinchley Wood and Weston Green

General Information

Area	Thames Ditton, Long Ditton, Hinchley Wood and Weston Green covers an area of **8.7km²**	
Character[79]	The Settlement Area of Thames Ditton, Long Ditton, Hinchley Wood and Weston Green, is situated in the northeast of the Borough bordering the London Boroughs of Richmond and Kingston. The River Thames forms the boundary to the north with rural greenbelt to the south. Whilst the majority of the built environment has in the past been developed at a higher density than other areas of Elmbridge, reflecting its location on the edge of London, the majority of all dwellings are still either detached or semi-detached houses. The area has convenient road and rail access to and from London and is served by three rail stations at Esher, Hinchley Wood and Thames Ditton. 	
Topography	The northern part of the Settlement Area is low lying land adjacent to the River Thames, at 5-10m AOD. Land rises steeply south of Hinchley Wood to levels of up to 50m AOD at the Surbiton Golf Course and the southern part of Long Ditton.	Appendix A Figure 1
Geology	Superficial -, The Settlement Area is underlain by superficial deposits –either Kempton Park Gravel Formation (Sand & Gravel), Langley Silt Member (Clay and Silt) or alluvium. Bedrock - The Settlement Area is underlain by London Clay Formation (Silt and Clay).	Appendix A Figures 2 and 3.
Aquifer Type	The superficial deposits are classified as either a Principal Aquifer or Secondary Aquifer undifferentiated. According to EA definitions, a principal aquifer is defined as having intergranular permeability, can provide a high level of water storage, can support water supply and/ or river base flow on a strategic scale. A secondary aquifer undifferentiated has been assigned in cases where it is not been possible to attribute whether either category A (general formation) or B (localised features) provides the flow mechanisms. The underlying bedrock is classified as unproductive strata. According to EA definitions, unproductive strata are rock strata or drift deposits with low permeability that has negligible significance for water supply or river base flow.	-
Groundwater Vulnerability Classification and Source Protection Zone	The superficial deposits give the Settlement Area a major aquifer high category of risk vulnerability. The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. There are no SPZs within this Settlement Area. The EA records of smaller abstractions have not been reviewed at this stage.	-
Main Rivers	The River Rythe rises near Oxshott, in the Prince's Coverts woodland and flows northwards, through Claygate and along the edge of Hinchley Wood. The river then follows the Portsmouth Road towards Thames Ditton, and runs into the River Thames near Ferry Road, forming the boundary between Kingston and Thames Ditton. The Lower Thames forms the boundary along the eastern edge of the Settlement Area. The Lower Thames floodplain is relatively broad and flat and the river itself contains several islands. The normal tidal limit of the River Thames occurs at Teddington Weir, approximately 5km downstream from Thames Ditton (TQ 1675 7149), but on a high tide, the tidal influence can extend as far back upriver as Molesey Weir.	Appendix A Figure 1, 5
Ordinary Watercourses	There are several drains and Ordinary Watercourses throughout the Settlement Area that are tributaries of the River Rythe and drain areas including Surbiton Golf Course and Long Ditton in the east of the Settlement Area. There is an Ordinary Watercourse that flows from Weston Green northwards to the confluence of the River Mole and River Thames near Ditton Field.	Appendix A Figure 1, 5

Flood Risk

Flooding from Rivers	*Flood Zones* The Settlement Area is located within Flood Zones 1, 2, and 3 as follows: • Flood Zone 1: 5.9 km² (68%)	Appendix A Figures 4,

[79] Extracted from the Consultation Settlement ID Plans http://consult.elmbridge.gov.uk/consult.ti/Draft_ID_Plans/consultationHome

Thames Ditton, Long Ditton, Hinchley Wood and Weston Green

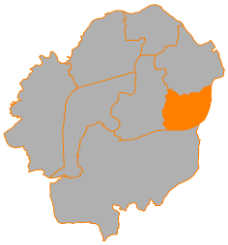
	• Flood Zone 2: 2.1 km^2 (24%) • Flood Zone 3: 0.3 km^2 (3%) • Flood Zone 3b: 0.4 km^2 (5%) *Functional Floodplain* Approximately 5% of the Settlement Area (0.4 km^2) is shown to be at risk during the 1 in 30 year (3.3% AEP) flood event from the River Rythe and the Lower Thames and the 1 in 75 year (1.33% AEP) from the Lower Mole. This comprises the fringe of the Settlement Area along the River Thames frontage at Summer Road, as well as land to the south near Hinchley Wood including Couchmore Avenue, Montgomery Avenue, Heathside and Medina Avenue. Areas within the modelled flood extents shown in Table 3-2 are defined by EBC as Flood Zone 3b Functional Floodplain, with the exception of developed areas which are prevented from flooding by the presence of existing infrastructure or solid buildings – these areas are not considered Functional Floodplain. Section 5.3 provides further information. *Climate Change* The extent of flooding associated with the River Thames is shown to increase during the 1 in 100 year (1% AEP) flood event including an allowance for climate change. The extent of flooding from the River Rythe is shown to increase in the Littleworth Common area and in Western Green by the railway line. The extent of flooding from the Lower Mole is also shown to increase, affecting parts of Lower Green north of the railway line. *Historic Records* EBC and the Environment Agency hold records of flooding associated with the River Thames on Aragon Avenue, Queen's Road, Alexandra Road, River Bank, Riversdale Road, Thames Ditton Island. *Flood Defences* The Environment Agency Asset Information Management Systems (AIMS) dataset identifies high ground on either side of the River Thames and the River Rythe.	5, 6, 7, 8 and 9
Flooding from Land	The ROFSW identifies a higher risk of surface water flooding in the natural topographic low points in the Settlement Area and where particular barriers present an obstruction behind which surface water can collect. Surface water is modelled to pond adjacent to the Kingston By-pass and Hinchley Way, along Claygate Lane and adjacent to the railway embankment. *Historic Records* SCC has identified a number of roads as known 'wetspots' which are susceptible to surface water flooding: Speer Road (Dormant) and Summer Road (Resolved).	Appendix A Figure 10
Flooding from Groundwater	The central part of the Settlement Area has potential for groundwater flooding to occur at the surface. Some areas close to the River Thames, are classed as potential for groundwater flooding of property situated below ground surface. These areas coincide with the Kempton Park Gravel Formation. The London Clay Formation which underlies the Kempton Gravel Park will play an important role in the risk rating. In the southwest of Settlement Area, there are small areas with limited potential for groundwater flooding to occur.	Appendix A Figure 11
Flooding from Sewers	The TWUL Register identifies that sewer flooding has affected 22 properties in the KT7 area which covers the north of the Settlement Area. The east of the Settlement Area is covered by the KT6 postcode which has 5 properties affected by sewer flooding. The south and west of the Settlement Area is covered by the KT10 postcode which has 31 properties affected by sewer flooding. The PFRA identifies that during periods of high water levels in the River Thames there can be issues relating to sewage surcharge in this area.	Appendix A Figure 12
Reservoirs, canals, other artificial sources	There are no large surface water bodies within the Settlement Area. There are small ponds in the ground of The Manor House and Ditton Common off Alma Road. The water supply reservoirs including Queen Elizabeth II Reservoir, Island Barn Reservoir, Beesborough Reservoir and Knight Reservoir are located to the west of the Settlement Area. The Environment Agency dataset 'Risk of Flooding from Reservoirs' shows that a large area in the north west of the Settlement Area could be flooded if one of these reservoirs were to fail and release the water it holds.	Appendix A Figure 13
Managing and Mitigating Flood Risk		
Flood Warning Areas	The Warning Areas relevant to the Settlement Area are: 'River Thames at Thames Ditton', 'River Thames at Thames Ditton Island', 'The River Rythe between Oxshott and Thames Ditton' and 'River Mole at Esher and East Molesey'.	Appendix A Figure 16

Thames Ditton, Long Ditton, Hinchley Wood and Weston Green

Rest Centres	EBC has a designated primary rest centre in Thames Ditton Centre, on Mercer Close. Depending on the type and extent of flooding in the local area, this may be available for use as an emergency rest centre. The Multi Agency Flood Plan should be consulted for further information.	Appendix A Figure 16
Infiltration SuDS Suitability	The central part of the Settlement Area is likely to suffer very significant constraints in the widespread use of infiltration SuDS. In the other parts, there may be opportunities for bespoke infiltration SuDS, although this will depend on confirmation of the depths to the water table. Some small areas to the south and north are probability compatible for infiltration SuDS.	Appendix A Figure 15
Site-specific FRA Guidance	Sections 5 and 6 provide detailed guidance on measures to manage and mitigate flood risk, and Section 7 provides guidance on preparation of site-specific FRAs. Modelling for the Lower Mole does not include all the Ordinary Watercourse tributaries in the catchment. For development sites in close proximity to these watercourses it is likely that modelling will be required in order to determine the probability of flooding and the flood levels to inform the site-specific FRA.	Section 5, 6 and 7
Policy Recommendations	Appendix C provides spatial planning and development management recommendations for the Borough.	Appendix C

Claygate

General Information

Area	Claygate covers an area of **4.7km²** comprising **40% urban area** and **60% Green Belt**.	
Character[80]	Claygate is a small suburban village with only 2,577 dwellings[81] and a population of nearly 7,000[82]. It is surrounded by greenbelt that gives a distinct character to the village. The area is predominately residential with two retail areas. One focused around the village green on the High Street and Church Road and the other at the Parade, the main shopping area adjacent to the station. There is also one small area currently designated as Strategic Employment Land at Claygate House, Littleworth Lane. 	
Topography	The eastern part of the Settlement Area comprises high land, at approximately 40-70m AOD. The western fringe is low lying, where the River Rythe flows north. Levels in this area are between 15-20m AOD.	Appendix A Figure 1
Geology	Superficial – The Settlement Area is mainly free of any superficial deposits. Bedrock – The Settlement Area is underlain by Claygate Member (upper part of London Clay Formation – Sand, Silt and Clay) and London Clay Formation (Silt and Clay).	Appendix A Figures 2 and 3.
Aquifer Type	The surface is classified as unproductive strata. According to EA definitions, unproductive strata are rock strata (see bedrock) or drift deposits with low permeability that has negligible significance for water supply or river base flow. The underlying bedrock is classified as either a secondary A aquifer or unproductive strata. According to EA definitions, a secondary A aquifer is defined as a permeable layer capable of supporting water supplies a local rather than strategic scale and in some cases forming an important source of base flow to rivers. An important factor which influences this classification in Elmbridge is the limited thickness of the layers, in particular the Claygate Member in the Claygate area.	-
Groundwater Vulnerability Classification and Source Protection Zone	The surface is made up of different bedrocks giving the Settlement Area a range of risk vulnerabilities from minor aquifer high and intermediate (Claygate Member) to non-aquifer (LCF). The EA defines Source Protection Zones (SPZ) around all major public and private water supply abstractions in order to safeguard groundwater resources from potentially polluting activities. There are no SPZs within this Settlement Area. The EA records of smaller abstractions have not been reviewed at this stage.	-
Main Rivers	The River Rythe flows northwards between Esher and Claygate in the west of the Settlement Area. One of the branches of the River Rythe rises in the Prince's Coverts woodland to the south of the Settlement Area, and then flows northwards through Claygate to join the main branch of the river.	Appendix A Figure 1, 5
Ordinary Watercourses	The north eastern corner of the Claygate Settlement Area is drained by a collection of drainage ditches that feed into a tributary of the Hogsmill River. The Hogsmill River passes through Kingston upon Thames and joins the River Thames near Kingston High Street.	Appendix A Figure 1, 5

Flood Risk

Flooding from Rivers	*Flood Zones* The Settlement Area is located within Flood Zones 1, 2, and 3 as follows: • Flood Zone 1: 4.5 km² (96%) • Flood Zone 2: 0.1 km² (1%) • Flood Zone 3: 0 km² (1%) • Flood Zone 3b: 0.1 km² (2%) *Functional Floodplain* Approximately 96% of Claygate is defined as Flood Zone 1. 2% (0.1 km²) is within Flood Zones 2 or 3, which is all within the greenbelt area along the western edge of the Settlement Area near Milbourne Lodge Senior School. 2% of the Settlement Area (0.1 km²) is shown to be at risk during the 1 in 30 year (3.3% AEP) flood event from the River Rythe. These areas include the developed area of Station Road. Areas within the modelled flood extents shown in Table 3-2 are defined by	Appendix A Figures 4, 5, 6, 7, 8 and 9

[80] Extracted from the Consultation Settlement ID Plans http://consult.elmbridge.gov.uk/consult.ti/Draft_ID_Plans/consultationHome
[81] Dwellings by Council Tax Band (VOA)
[82] Resident Population Estimates 2010 (ONS)

Claygate

	EBC as Flood Zone 3b Functional Floodplain, with the exception of developed areas which are prevented from flooding by the presence of existing infrastructure or solid buildings – these areas are not considered Functional Floodplain. Section 5.3 provides further information. *Climate Change* The extent of flooding associated with the River Rythe is shown to increase slightly during the 1 in 100 year (1% AEP) flood event including an allowance for climate change to the south of Littleworth Common. *Historic Records* EBC has records of fluvial flooding affecting Hare Lane and Rayleigh Drive. *Flood Defences* The River Rythe is not formally defended. The Environment Agency Asset Information Management Systems (AIMS) dataset identifies high ground on either side of the watercourse.	
Flooding from Land	The ROFSW identifies a higher risk of surface water flooding in the natural topographic low points in the Settlement Area and where particular barriers present an obstruction behind which surface water can collect. The mapping identifies surface water flood risk in the natural low points along the floodplain of the River Rythe as well as to the east of the railway line near Horringdon Farm and the area around the Claygate Centre to the north. *Historic Records* SCC have identified Woodstock Lane as a known 'wetspot'. In this location, 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.	Appendix A Figure 10
Flooding from Groundwater	The eastern part of the Settlement Area has limited potential for groundwater flooding to occur. There are some small areas classed as potential for groundwater flooding of property situated below ground surface and at ground surface to the west of the Settlement Area. A factor in influencing this risk is that the Settlement Area is mainly free of any superficial deposits and the bedrock geology consists of the London Clay Formation Including Clay Member.	Appendix A Figure 11
Flooding from Sewers	The majority of the Settlement Area is covered by the KT10 postcode which has 31 properties affected by sewer flooding.	Appendix A Figure 12
Reservoirs, canals, other artificial sources	There are no known significant water bodies in the Settlement Area. The water supply reservoirs, including Queen Elizabeth II Reservoir, Island Barn Reservoir, Beesborough Reservoir and Knight Reservoir, are located to the north of the Settlement Area. The Environment Agency dataset 'Risk of Flooding from Reservoirs' shows the area that could be flooded if one of these reservoirs were to fail and release the water it holds. The dataset shows that water would follow the course of the River Rythe and cause flooding of the floodplain. There is a small waterbody known as Barwell Court Lake (owned by Rysaffe Trustee Company (C.I.) Ltd) outside of the Settlement Area to the east that is included in the Environment Agency mapping; in the event of this watercourse releasing the water it holds, the water would follow the path of the River Rythe and cause flooding in the Rythe floodplain in Claygate.	Appendix A Figure 13

Managing and Mitigating Flood Risk

Flood Warning Areas	The Flood Warning Area of relevance to this area is: 'The River Rythe between Oxshott and Thames Ditton'.	Appendix A Figure 16
Rest Centres	EBC has a designated primary rest centre in Claygate Centre, on Elm Road. Depending on the type and extent of flooding in the local area, this may be available for use as an emergency rest centre. The Multi Agency Flood Plan should be consulted for further information.	Appendix A Figure 16
Infiltration SuDS Suitability	The majority of the Settlement Area has opportunities for bespoke infiltration SuDS. The east of the area is probably compatible for the application of infiltration SuDS.	Appendix A Figure 15
Site-specific FRA Guidance	Sections 5 and 6 provide detailed guidance on measures to manage and mitigate flood risk, and Section 7 provides guidance on preparation of site-specific FRAs. For sites located within or close to the floodplain of the River Rythe, results from the latest modelling study will need to be obtained from the Environment Agency to determine the probability of fluvial flooding and specific flood levels to inform a site-specific FRA.	Section 5, 6 and 7
Policy Recommendations	Appendix C provides spatial planning and development control development management recommendations for the Borough.	Appendix C

Appendix C Recommendations

The following recommendations are made throughout the SFRA report.